MICHIGAN STATE UNIVERSITY LIBRARIES
3 1293 01020 0750

THESIS
v.1

This is to certify that the

dissertation entitled

The Edible Oil Subsector in Uganda:
Can It Compete?

presented by

Rita J. Laker-Ojok

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Agricultural Economics

Erin W. Crawford
Major professor

Date 17 December 1993

MSU is an Affirmative Action/Equal Opportunity Institution

O-12771

LIBRARY
Michigan State
University

PLACE IN RETURN BOX to remove this checkout from your record.
TO AVOID FINES return on or before date due.

DATE DUE	DATE DUE	DATE DUE

MSU Is An Affirmative Action/Equal Opportunity Institution
c:\circ\datedue.pm3-p.1

THE EDIBLE OIL SUBSECTOR IN UGANDA: CAN IT COMPETE?

By

Rita J. Laker-Ojok

VOLUME I

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1994

Erin W. Crawford

ABSTRACT

THE EDIBLE OIL SUBSECTOR IN UGANDA: CAN IT COMPETE?

By

Rita J. Laker-Ojok

This study uses the tools of subsector analysis and DRC analysis to evaluate the potential competitiveness of the edible oils subsector in Uganda. The subsector is traced from farm-level production through marketing, and processing to final consumption.

Once a substantial net exporter of cottonseed oil in the 1960s, Uganda is now over 80% dependent on imported oils and fats. Average per capita consumption of fats and oils in Uganda is estimated at only 2.2 kg, well below recommended minimum levels. Low consumption of fats contributes to high levels of chronic undernutrition and the stunting of 45% of Ugandan children under age five. This study analyzes the historical and institutional causes of the collapse of the industry and provides a detailed description of the current organization of the subsector.

Several factors indicate that edible oil self-sufficiency is feasible for Uganda. National processing capacity was found to sufficient to meet projection national consumption needs in the year 2000. Cost of production analysis indicates that Uganda's land-locked position protects the subsector despite falling international oil prices. Not only would increased oil production improve local nutritional standards but, at current prices and costs of production it is an efficient source of foreign exchange savings for the country. Given the large extent of Uganda's foreign exchange deficit, this is an important potential contribution to national economic stability and development.

There are, however, serious institutional and coordination constraints that impede achievement of self-sufficiency. Lack of raw materials is the most important constraint to increased production. Returns to farm labor in production of cotton and sunflower are below

the rural market wage rate. Marketing is identified as a major bottleneck to increased oilseed production and processing. Active coordination of subsector participants at several levels will be necessary to break existing constraints and facilitate a more efficient utilization of productive resources. Strategic public sector facilitation combined with private sector cooperation and joint action at the processor, farmer and trader levels is recommended as the most feasible way to break the current low level equilibrium.

Copyright by
RITA JO LAKER-OJOK
1994

Dedicated to Laker. You really are something.

ACKNOWLEDGEMENTS

Primary funding for this research was provided by USAID under the terms of the Agricultural Research Impact Assessment add-on to the MSU Food Security in Africa Cooperative Agreement, #DAN 1190-1-00-4090-00. Local currency funds for data collection were provided by the Uganda USAID mission under the Manpower for Agricultural Development Project. Support for analysis and write-up was provided by the Cooperative Agriculture and Agri-business Support Project, also financed by USAID.

I am especially grateful to my major professor, Dr. Eric Crawford, and my thesis supervisor, Dr. John Staatz. Dr. Crawford graciously made three trips to Uganda to supervise the design and implementation of the study. His guidance and warm encouragement have been invaluable. Dr. Staatz stood by me through two abortive attempts to get this dissertation off the ground and provided critical theoretical guidance for the analysis. The other members of my Dissertation Committee, Dr. Michael Weber, Dr. James Shaffer, and Dr. Jim Oehmke made valuable suggestions that have strengthened the analysis immeasurably. The encouragement and logistical support provided by Janet Munn, Nancy Fair, Vicky Branstetter, Margie Aimery, and numerous other faculty and staff at MSU is also greatly appreciated.

Special recognition goes to Mr. Bernard Bashaasha, Ms. Elizabeth Balirwa and Mr. Godfrey Turiho-Habwe who served as research consultants on the project. Not only did I benefit from their knowledge of Uganda but also from their close companionship. Thanks are also due to Dr. Frank Calhoun, Mr. Mark Erbaugh, Ms. Marie Raum, and Dr. Edison Rugumayo for all their assistance. Dr. Vic Amann, chief of Party for the CAAS Project provided vital encouragement and support, both financial and moral.

On a personal level, none of this would have ever come to be without the loving encouragement of my parents and my husband Laker, who started me on this long road and kept me from getting lost along the way. Nancy, Val and Judy helped pull me up that last long hill, and Chaka, Phillip, Lillian and Maxwell provide the inspiration to make it all worthwhile.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS vi
LIST OF TABLES ix
LIST OF FIGURES xiii

CHAPTER ONE: OBJECTIVES AND OVERVIEW
1.1 INTRODUCTION 1
1.2 CONTRIBUTION OF THE EDIBLE OIL SUBSECTOR TO THE UGANDAN ECONOMY 2
1.2.1 Nutrition 3
1.2.1.1 The Role of Fats in the Human Diet 3
1.2.1.2 Nutrition in Uganda 4
1.2.2 Import Substitution and Foreign Exchange Savings 8
1.3 BACKGROUND TO THE STUDY 10
1.4 OBJECTIVES OF THE RESEARCH 11
1.5 ORGANIZATION OF THE DISSERTATION 12

CHAPTER TWO: ANALYTIC FRAMEWORK
2.1 OVERVIEW OF THE ANALYTIC FRAMEWORK 14
2.2 THE SUBSECTOR APPROACH 15
2.2.1 History of the Approach 15
2.2.2 Central Concepts 17
2.2.2.1 Vertical Systems Orientation . . 18
2.2.2.2 Environment and Institutional Context 19
2.2.2.3 Coordination 22
2.2.2.4 Performance 23
2.2.3 Sources of Data and Analytical Tools 24
2.2.3.1 The Subsector Map 24
2.2.3.2 Consumption Analysis 25
2.2.3.3 Partial Budgets 25
2.2.4 Advantages and Disadvantages of the Approach 26
2.3 INTERNATIONAL COMPETITIVENESS AND DRC ANALYSIS 27
2.3.1 Calculation of the Domestic Resource Cost Ratio 30
2.3.1.1 Development of Enterprise Budgets 31
2.3.1.2 Estimation of Social (Shadow) Prices for Primary and Tradable Inputs 32
2.3.1.3 Estimation of the DRC Ratio . . . 33
2.3.2 Interpretation of the DRC Ratio 34
2.3.3 The uses of DRC Analysis 34
2.3.4 Difficulties with the Approach 35
2.3.4.1 Predicting General Equilibrium Effects 36
2.3.4.2 Comparative Advantage Versus Competitive Advantage 37
2.3.5 The Application of DRC Analysis in Uganda . 37
2.3.6 Sensitivity Analysis 38
2.4 DYNAMIC CONSIDERATIONS 39
2.5 ADVANTAGES OF THE ANALYTIC APPROACH 39

CHAPTER THREE: THE DEMAND FOR EDIBLE OILS IN UGANDA
3.1 CURRENT EDIBLE OIL CONSUMPTION PATTERNS 41
3.1.1 Data Analysis 41
3.1.2 Consumption Patterns 45
3.1.3 Package size and Product Differentiation . . 51
3.2 ANTICIPATED CONSUMPTION TRENDS 53



3.3 INTERNATIONAL PRODUCTION AND PRICE TRENDS FOR EDIBLE OILS 58
3.4 PROJECTED COSTS OF CONTINUED IMPORTATION 64
3.4.1 World Market Price Projections 64
3.4.2 Factors Affecting the Costs of Imported Edible Oil Products in Uganda 65
3.4.3 Projected Costs of Importation 67

CHAPTER FOUR: HISTORY AND INSTITUTIONAL CONTEXT
4.1 INTRODUCTION 69
4.2 THE UGANDAN INSTITUTIONAL CONTEXT 69
4.2.1 Land Tenure 69
4.2.2 Coercion and the Subsistence Economy. . . . 70
4.2.3 Competition, Marketing and Price Control . . 71
4.2.4 Subsidization of Information and Inputs . . 73
4.2.5 Patronage 75
4.2.6 Expulsion of the Asian Community and the Rise of Magendo 77
4.2.7 Resulting Institutional Legacy 78
4.3 THE HISTORY OF THE EDIBLE OIL INDUSTRY IN UGANDA . . . 81
4.3.1 The Colonial Period 81
4.3.2 Independence Before Amin 85
4.3.3 Nationalization and Decline 88
4.3.4 The Introduction of Sunflower 91
4.3.5 A Resurrection of Interest 92
4.3.6 Donor-Led Trends 94

CHAPTER FIVE: THE STRUCTURE OF THE EDIBLE OIL SUBSECTOR
5.1 INTRODUCTION 99
5.2 MAPPING CONVENTIONS 99
5.3 THE UGANDAN EDIBLE OIL SUBSECTOR MAP 100
5.3.1 Channel One: The Traditional Oil Producers 103
5.3.2 Channel Two: Ram Press Processors 109
5.3.3 Channel Three: Small Expellers 112
5.3.4 Channel Four: Cooperative Processors . . . 116
5.3.5 Channel Five: Departed Asian Properties . . 119
5.3.6 Channel Six: Large-Scale Processors 123
5.3.7 Channel Seven: The Feeds Industry 124
5.4 OVERVIEW: NUMBER OF FIRMS, EMPLOYEES AND PRODUCTION CAPACITY 127
5.5 FINAL PRODUCT MARKETS 129
5.5.1 Imports and Importers 129
5.5.2 Retail/Wholesale Functions 133
5.5.3 Competition, Prices and Market Margins . . . 138
5.6 THE 1990S: A CHANGING INSTITUTIONAL AND POLICY ENVIRONMENT 143

CHAPTER SIX: OILSEEDS PRODUCTION IN UGANDA
6.1 INTRODUCTION 151
6.2 THE PRODUCTION OF RAW MATERIALS FOR CRUSHING 153
6.2.1 Groundnut Production 158
6.2.2 Soybean Production 161
6.2.3 Sesame Production 164
6.2.4 Sunflower Production 168
6.2.5 Cotton Production 172
6.3 THE MICROECONOMICS OF OILSEEDS PRODUCTION 175
6.3.1 Price Responsiveness of Ugandan Farmers . . 175
6.3.2 Comparative Returns to Agricultural Labor . 175

CHAPTER SEVEN: THE OILSEEDS MARKETING SYSTEM
7.1 THE MARKET SYSTEM LINKING PRODUCER TO PROCESSOR . . . 185
7.1.1 Market Structure 186
7.1.1.1 Infrastructure 187
7.1.1.2 Rural Traders 189



7.1.1.3 Urban Traders 190
7.1.1.4 Exporters 191
7.1.1.5 The Parastatals 192
7.1.2 Marketing Constraints 196
7.1.3 Prices, Margins and Market Performance . . . 199
7.2 EXPORT MARKETS FOR UGANDAN PRODUCTS 206
7.2.1 International Market Prospects for Groundnuts 207
7.2.2 The Export Demand Prospects for Sesame . . . 209
7.2.3 The Export Market for Ugandan Maize 212
7.2.4 The Projected Market for Ugandan Cotton . . 214
7.2.5 The Export Potential of Soybeans and Oilseed Cake 217

CHAPTER EIGHT: EXPORT POTENTIAL AND POLICY ANALYSIS FOR OILSEEDS AND COMPETING CROPS
8.1 INTRODUCTION 218
8.2 POLICY ANALYSIS FOR OILSEEDS AND COMPETING CROPS . . . 220
8.3 SENSITIVITY ANALYSIS 235
8.3.1 Sensitivity Analysis for Cotton 236
8.3.2 Sensitivity Analysis for Groundnuts 240
8.3.3 Sensitivity Analysis for Sesame 241

CHAPTER NINE: THE ECONOMIC VIABILITY OF EDIBLE OILS PROCESSING IN UGANDA
9.1 THE ADVANTAGES AND DISADVANTAGES OF ALTERNATIVE PROCESSING TECHNOLOGIES 242
9.1.1 Manual Ram-Press Processing 245
9.1.2 Small-Scale Processing With a Motorized Expeller 248
9.1.3 Large-Scale Commercial Processing 252
9.1.3.1 Rehabilitation of Former Asian Large-Scale Mills 252
9.1.3.2 Modern Large-Scale Facilities . . 253
9.1.4 Summary of the Advantages and Disadvantages of Alternative Technologies 254
9.2 THE RETURNS TO ALTERNATIVE PROCESSING TECHNOLOGIES . . 256
9.2.1 The Returns to Ram Press Investment 263
9.2.2 The Returns to Investment in Small Expellers 272
9.2.3 The Returns to Rehabilitation of Large-scale Mechanical Processing 275
9.2.4 The Problem of Debt and Cash Flow 282
9.3 THE CHOICE OF TECHNOLOGY 283
9.4 DRC ANALYSIS - IS DOMESTIC PRODUCTION OF EDIBLE OIL AN EFFICIENT USE OF RESOURCES? 293
9.5 THE ROLE OF OILCAKE IN THE PROCESSING EQUATION 301

CHAPTER TEN: CONCLUSIONS AND POLICY RECOMMENDATIONS
10.1 KEY FINDINGS 303
10.1.1 Potential Strengths of the Edible Oil Subsector 303
10.1.2 Constraints Facing the Subsector 309
10.1.3 Summary of the Constraints: the Vicious Circle Revisited 314
10.2 THE POTENTIAL FOR IMPROVED PERFORMANCE 314
10.2.1 Recent Changes in the Subsector 314
10.2.2 The Vicious Circle Broken 316
10.3 RECOMMENDATIONS 316
10.4 LIMITATIONS OF THE STUDY AND QUESTIONS FOR FURTHER RESEARCH 327
10.4.1 Outstanding Issues Regarding Coordination . 327
10.4.2 Questions Regarding On-farm Production . . . 328
10.4.3 Marketing Questions 329



10.4.4 Processing Issues 330
Appendix 1: Edible Oil Mills in Uganda 331
Appendix 2: Calculation of the Opportunity cost of Land for 1992 335
Appendix 3: Calculation of the Rate of Return to Investment in Manual Oil Pressing 336
Appendix 4: Calculation of the Rate of Return to Investment in Small Expellers 338
Appendix 5: Calculation of the Rate of Return to Investment in Rehabilitation on Former Asian Mills 340
Appendix 6: Isocost Graphs for Sensitivity Analysis of the Choice of Technology 342
Appendix 7: Calculation of the Unit Isoquant in Value Added Under Scenario Four 347
Appendix 8: Policy Analysis Matrices for Sunflower Oil . 348
Appendix 9: Policy Analysis Matrices for Cottonseed Oil 352
BIBLIOGRAPHY 355



LIST OF TABLES

Table 3.1	National Edible Oils and Fats Consumption	43
Table 3.2	Distribution of Household Purchases and Total National Sales of Edible Oils and Fats by Package Size	52
Table 3.3	Projected National Oil and Fats Consumption, 1991 to 2005	54
Table 3.4	Income Elasticity Estimation for Edible Oils and Fats	56
Table 3.5	World Market Price Projections for Edible Oils	65
Table 4.1	Improved Sunflower Variety Adoption in Uganda	98
Table 5.1	The Import Gap for Edible Oil and Fats in Uganda	130
Table 5.2	Edible Oil and Fats Imports Documented by the Customs and Excise Department 1990/1991	132
Table 5.3	The Difference Between U.A.I. Import Costs and Retail Prices	134
Table 5.4	Correlation Matrix between Ugandan and World Market Prices	140
Table 5.5	The Correlation in Edible Oil Prices in Uganda	140
Table 5.6	Mean Edible Oil Prices at Various Locations in Uganda; August 1990	143
Table 5.7	Regression Results on the Price of Edible Oils and Fats by Location	144
Table 6.1	Comparison Between Alternative Estimates of Oilseed Area and Production	157
Table 6.2	Extractable Oil Yield Per Ha for Alternative Oilseeds	158
Table 6.3	Estimated Price Elasticities of Supply for Selected Crops in Uganda	176
Table 6.4	The Returns to Family Labor on Competing Food Crops	177
Table 6.5	The Cost of Production of Cotton, Maize and Groundnuts	178
Table 6.6	The Cost of Production of Soybeans, Sesame and Sunflower	179
Table 6.7	Adjusted Returns To Family Labor For Food Crops	180
Table 7.1	Average Marketing Margins in Uganda	203
Table 7.2	Lint Price Forecasts, CIF North Europe: 1992/93-2003/04	216
Table 8.1	Policy-Induced Disincentives to Cotton Production	219
Table 8.2	Policy Analysis Matrices for Tobacco: 1991 and 1992	224
Table 8.3	Policy Analysis Matrices for Beans: 1991 and 1992	225
Table 8.4	Policy Analysis Matrices for Sesame: 1991 and 1992	226
Table 8.5	Policy Analysis Matrices for Cotton: 1991 and 1992	227
Table 8.6	Policy Analysis Matrices for Maize Exported Outside the Region: 1991 and 1992	228
Table 8.7	Policy Analysis Matrix for Maize Exported by Relief Agencies	229
Table 8.8	Policy Analysis Matrices for Groundnuts: 1991 and 1992	230
Table 8.9	Policy Analysis Matrices for Soybeans: 1991 and 1992	231
Table 8.10	The Private Cost and DRC Ratios for Alternative Crops: 1991 and 1992	233
Table 8.11	Cross-Country Comparison of Cotton Production Costs	237
Table 8.12	The Policy Analysis Matrix for Cotton Exported by Cooperative Unions in 1993	240
Table 9.1	The CIF Price and Capacity of Available Types of Small Expellers	249
Table 9.2	Advantages and Disadvantages of Alternative Crushing Technologies	254
Table 9.3	Technical Assumptions for Analysis of the ROR to Ram Press Investment	265
Table 9.4	The Rate of Return to Ram Press Investment in Uganda	268



Table 9.5 Assumptions for the Analysis of Sesame Crushing with the Ram Press 270
Table 9.6 The Financial and Economic Rate of Return to Sesame Crushing Using the CAPU Ram Press Under Alternative Scenarios 271
Table 9.7 Technical Assumptions for the Small-Scale Expeller Analysis 273
Table 9.8 The Rate of Return to Small-Scale Expelling 274
Table 9.9 Technical Assumptions for Analysis of the Rehabilitated Asian Mill. 278
Table 9.10 Returns to Investment in Rehabilitation of Existing Large Mills 280
Table 9.11 Derivation of a Unit Isoquant in Value Added From Oil Processing Assuming Equal Plant Utilization, and Equal Output and Input Prices. 286
Table 9.12 The Lowest Cost Choice of Technology Under Alternative Analysis Scenarios. 291
Table 9.13 The DRC Ratio for Sunflower Processing Using Alternative Technologies 296
Table 9.14 DRC Analysis for Cotton Processing in Uganda Including the Value of Oil and Cake 299
Appendix 1.1 Large New and Former Asian Oil Mills in Uganda 331
Appendix 1.2 Medium Sized Oil Mills in Uganda 332
Appendix 1.3 Small Oil Mills in Uganda 333
Appendix 1.4 Oil Mills Ordered But Not Yet Installed In Uganda . . 334
Appendix 3.1 Base Case Scenario Calcualtion of the Financial Rate of Return to Investment in the Capu Press 336
Appendix 3.2 Base Case Calculation of the Economic Rate of Return to Investment in the CAPU Press 337
Appendix 4.1 Base Case Calculation of the Financial ROR to Small Scale Expelling 338
Appendix 4.2 Base Case Scenario Calculation of the Economic Rate of Return to Small Oil Expelling 339
Appendix 5.1 Base Case Calculation of the Economic Rate of Return to Investment in Rehabilitation of an Asian Mill for Crushing Sunflower 340
Appendix 5.2 Base Case Calculation of Financial ROR to Investment in Rehabilitation of Asian Mill for Sunflower Processing 341
Appendix 7.1 Derivation of the Unit Isoquant Given Longer Plant Life and Double Shifts for Larger Mills and Import Parity Price for Oil 347
Appendix 8.1 Sunflower Oil Policy Analysis Matrix for the Ram Press 348
Appendix 8.2 Sunflower Oil Policy Analysis Matrix for the Small Expeller 349
Appendix 8.3 Sunflower Oil Policy Analysis Matrix for the Rehabilitated Asian Mill 350
Appendix 8.4 Sunflower Oil Policy Analysis Matrix for the New Large Mill 351
Appendix 9.1 Cotton Policy Analysis Matrix at the National Level: Uganda 1992 352
Appendix 9.2 Cotton Policy Analysis Matrix Including the Value of Oil Processed in a Rehabilitated Asian Mill 353
Appendix 9.3 Cotton Policy Analysis Matrix Including the Value of Oil Processed in a New Large Mill 354

LIST OF FIGURES

Figure 1.1	Calorie Composition of the Ugandan Diet	6
Figure 1.2	Composition of Fats in the Ugandan Diet	7
Figure 1.3	Value Of Ugandan Exports	9
Figure 3.1	Average Annual Per Capita Consumption of Fats and Oils by Region	44
Figure 3.2	Average Annual Per Capita Consumption of Fats By Income Group and Rural/Urban Status	47
Figures 3.3,	**3.4, & 3.5**	48
Figure 3.6	Proportion of Annual Expenditures Spent on Fats By Region	49
Figure 3.7	Proportion of Expenditures Spent on Fats by Income Group and Rural/Urban Status	50
Figure 3.8	Projected Demand for Oils and Fats: 1991-2005	58
Figure 3.9	Real International Edible Oil Price Trends	63
Figure 3.10	Projected Cost of Import Dependence for Shortening and Refined Oil	68
Figure 4.1	Cotton Production 1970-1992	87
Figure 4.2	Ugandan Cottonseed Oil Production, 1963-1986	90
Figure 5.1	The Ugandan Edible Oils Subsector Map	101
Figure 5.2	The Traditional Processors	104
Figure 5.3	The Intermediate Technology Processors	110
Figure 5.4	Trend in the Number and Capacity of Small and Mini Mills	115
Figure 5.5	The Industrial Processors	117
Figure 5.6	The Modern Feeds Processors	125
Figure 5.7	The Edible Oils Subsector: Production Overlay	128
Figure 5.8	Real International and Local Prices for Oil, 1981-1992	139
Figure 5.9	Average Real Monthly Edible Oil Prices in Kampala	141
Figure 6.1	The Vicious Cycle of Low Productivity Agriculture	152
Figure 6.2	The Vicious Cycle of Low Productivity in the Edible Oils Subsector	154
Figure 6.3	Area Planted to Oilseeds from 1970-1992	156
Figure 6.4	Oilseeds Production From 1970-1991	157
Figure 6.5	Real Returns Per Day of Labor on Alternative Crops	182
Figure 7.1	The Real Wholesale Price of Oilseeds	200
Figure 7.2	The Real Price of Oil Compared to the Real Price of Extractable Oil from Various Oilseeds	201
Figure 7.3	Monthly Real Price Comparison Between Edible Oil and the Extractable Oil Content of Various Oilseeds	202
Figure 9.1	The Cost of Edible Oil Processing in the U.S. Using Alternative Technologies	258
Figure 9.2	Isoquant Relating Investment and Labor Costs For Three Alternative Crushing Technologies, Assuming a Wage Rate of $202/year.	288
Figure 9.3	Isoquant Relating Investment and Labor Costs For Three Crushing Technologies Assuming a Shadow Wage Rate of $101/year.	289
Figure 9.4	Isoquant Relating Investment and Labor Costs Assuming a High Minimum Wage of $600/year.	290
Figure 10.1	The Vicious Circle of Low Productivity in the Edible Oil Subsector: Revisited	315
Figure 10.2	The Potential Upward Spiral of Improved Performance in the Edible Oil Subsector	317
Appendix 6.1	Isoquant Relating Investment Costs and Labor Assuming a Shadow Price for Labor of $101/Year.	342
Appendix 6.2	Isoquant Relating Investment Cost and Labor Assuming Rural Market Wage Rate of $202/yr	342
Appendix 6.3	Isoquant Relating Investment Cost and Labor Assuming A Wage of $600	343



Appendix 6.4 Isoquant Valuing Oil at the Import Parity Price Assuming a Shadow Wage Rate of $101/year 343
Appendix 6.5 Isoquant Valuing Oil at its Import Parity Price Assuming the Market Wage Rate of $202/year 344
Appendix 6.6 Isoquant Using the Import Parity Price for Oil Assuming a Wage Rate of $600/year 344
Appendix 6.7 Isoquant of Investment Cost and Labor Needed When Replacement Costs Are Included: Assuming a Wage Rate of $101/Year 345
Appendix 6.8 Isoquant Relating Investment Cost and Labor Including Replacement Cost of Equipment, Assuming a Wage rate of $202/Year 345
Appendix 6.9 Isoquant Relating Investment Cost and Labor Including Replacement Cost for Equipment, Assuming a Wage Rate of $600/Year 346



CHAPTER ONE: OBJECTIVES AND OVERVIEW

1.1 INTRODUCTION

With per-capita Gross National Product of only $250, Uganda ranks among the poorest nations of the world[1] (The World Bank, 1991). This has not always been the case. At independence in 1962, Uganda had one of the most vigorous and promising economies in sub-Saharan Africa. Favored with a good climate and fertile soil, Uganda was self-sufficient in food production. Both agriculture and industry earned large foreign exchange revenues that resulted in a current account surplus.

Cotton and the processing of cottonseed into edible oil and soap made a major contribution to the Ugandan economy. Prior to 1972 there was a well-established privately owned edible oil industry that processed primarily cottonseed. As a result, Uganda was self sufficient in edible oils, and exported substantial quantities of liquid oils and hydrogenated solid fats to Kenya and Tanzania (Coles, 1968).[2]

The regime of Idi Amin radically reversed the economic and social progress that Uganda had achieved since independence. Between 1970 and 1980 national output fell by 25%, exports by 60% and imports by 50%. Cotton and the related edible oil industry were major casualties of the economic collapse. The 1972 expulsion of the Asians who owned the national crushing capacity, and the subsequent nationalization of those industrial assets led to the demise of the edible oil industry. The situation was further exacerbated by the gradual breakdown of the cotton marketing structures under the cooperative monopoly. Insufficient operating capital, poor price incentives, and grossly inefficient cooperative management led to serious shortages of cottonseed for crushing. Commercial edible oil production fell to negligible levels by

---

[1] The World Bank indicators (1991, p. 204) rank Uganda as number 14 among the poorest countries.

the mid-1970s and has only recently begun to rise because of efforts to develop sunflower as an alternative oil source (Laker-Ojok, 1986).

In recent years Uganda has corrected many of the policies that contributed to the decline of edible oil production. The Government is encouraging private sector involvement in commodity export and agro-processing. There has been considerable new investment in processing capacity for both soap and edible oils. Price controls have been lifted and prohibitive tax rates reduced. Even so, edible oil production levels are negligible and Uganda remains highly dependent on commercial palm oil imports and American PL 480[3] commodity aid.

1.2 CONTRIBUTION OF THE EDIBLE OIL SUBSECTOR TO THE UGANDAN ECONOMY

In the last few years there has been considerable interest in reviving the edible oil industry in Uganda. Since the mid-1980s various donors including United States Agency for International Development (USAID), the Food and Agriculture Organization of the United Nations (FAO), African Development Bank (ADB), and smaller nongovernmental organizations (NGOs), have initiated efforts to increase the stock of processing capacity and the supply of oilseeds for crushing. In 1990 President Museveni appointed a Task Force Committee to investigate the problems of the industry and to propose practical solutions.

Rehabilitation of the edible oil subsector could contribute to the economy and social welfare of Ugandans in several ways:

1) improve the nutritional status of Ugandans,
2) reduce oil imports, thereby saving scarce foreign exchange,
3) diversify the sources of edible oil, which helps to stabilize the oil industry,
4) increase income-earning opportunities for farmers and raise rural living standards, and

---

[3] PL 480 refers to Public Law 480, the American legislative instrument that enables subsidized export of surplus commodities as part of American foreign assistance.

5) facilitate recovery in the northern and eastern regions, improving the distribution of income and helping to strengthen national unity[4].

Enhanced nutrition and foreign exchange savings are the most important potential contributions and are discussed further in the following sections.

1.2.1 Nutrition

1.2.1.1 The Role of Fats in the Human Diet

Fats serve many purposes in the human diet. They provide a major source of energy and are essential to normal growth and tissue development. They also add to the texture and palatability of foods and act as a vehicle for fat-soluble vitamins. Fat has more than twice the available energy value per gram of intake than either protein or carbohydrates. Children find it difficult to consume adequate quantities of high-bulk, low-calorie foods to meet their bodily requirements. With their high concentration of calories, fats form an especially important component in weaning foods and the feeding of small children.

Dietary fats come in a variety of molecular forms. The body requires linoleic and α-linolenic acid for the normal growth and functioning of tissues. Lack of these essential fatty acids can result in abnormal skin conditions, reduced growth rate, slower regeneration of tissues, impaired healing of wounds and burns, increased susceptibility to infections, sterility and kidney abnormalities. In addition, α-linolenic acid plays a specific role in the development and function of the brain and central nervous system (FAO, 1980a, pp. 23-25)[5].

Essential fatty acids are, therefore, important to fetal and early infant development and growth. Several neurological and mental

---

[4] For a further discussion of this point see Coppee Courtoy/Agrer (1989 p. xvi).

[5] Fish and fish oils are excellent sources of linolenic acid, perhaps accounting for their traditional reputation as "brain foods".

handicaps are associated with low birth weight at term. Generally, the highest incidence of low birth weight is found in lower socio-economic groups with maternal diets deficient in protein and essential fatty acids. The critical role of maternal nutrition continues throughout the lactation period. Studies indicate that malnutrition in lactating mothers can reduce human milk fat content to levels that cannot provide enough energy or essential fatty acids for the infant. With few exceptions[6], vegetable oils are high in polyunsaturated fatty acids, primarily linoleic acid. Some also include significant amounts of α-linolenic acid.

Fat consumption in developing countries averages only 35 g (315 kcal) a day (14% of total dietary energy). The FAO (1980a, p. 11&13) recommends that an increase to 15-20% of calories from fat, with adequate attention to the essential fatty acids, would have a markedly beneficial effect on nutrition. Unfortunately, fats tend to be high cost items in the diet. In developing countries there is an urgent need, therefore, to increase per-capita availability of edible fats at a cost that permits adequate consumption.

1.2.1.2 Nutrition in Uganda

The most recent nutritional report on Uganda (Jitta et al., 1992) found that over 45% of children under five years of age are stunted, 25% are underweight and 5% are wasted when compared with international WHO standards. Uganda has the highest rate of stunting among the seven African nations that conducted this standardized study. The high level of stunting indicates persistent undernutrition and poor health. While not directly life threatening, undernutrition has implications for vulnerability to disease, reduced mental development, poor reproductive capability, and low physical work capacity. It is the interaction between nutrition and disease that led a Ministry of Health study to

[6]Such as coconut, palm and palm kernel oils.

conclude that malnutrition was "a major factor in at least 40% of deaths" (Ministry of Planning, 1984, p. 39)[7].

Young children and lactating mothers in Uganda suffer from the low energy density of certain predominant staples, especially matooke (plantains), cassava, and sweet potatoes. It is difficult for a growing child to satisfy its requirements for energy and protein with such bulky foods. The low energy density of the diet could be improved by increasing the consumption of edible oils, groundnuts, sesame and other high fat content foods[8].

A comprehensive 1968 survey conducted in 4 districts in Uganda found that fat intake ranged from 18 to 39 grams per day. In three out of the four districts fat intake was well below the 35 g/day cited by the FAO as the average for developing countries. Most were invisible fats from pulses, oilseeds and nuts. The contribution of visible fats and oils to total calorie intake ranged from 0.1% to 2.2%[9].

FAO balance sheets are useful for illustrating trends in food consumption. FAO balance sheets are based on Ministry of Agriculture production statistics adjusted for seed use, losses, exports and imports. Figure 1.1 illustrates the general calorie composition of the Ugandan diet as calculated from the FAO (1991) food balance sheets.

Total caloric availability has declined only marginally, suggesting that food production has kept pace with population growth. There has been a gradual shift in consumption toward increasing reliance upon carbohydrates and away from visible fats; pulses and oilseeds; and

---

[7] Various infections contribute to protein-energy malnutrition and in turn, most of the deaths from measles, pneumonia and diarrhoea occur among malnourished children.

[8] There is some danger that cooking oil may replace peanuts and sesame in sauce preparation, reducing protein levels in the diet. The analysis of the expected nutritional impact of increased domestic oil production requires more information on the nature of the substitution between components of the diet as edible oils consumption increases.

[9] This estimate is similar to that in the FAO food balance sheets.

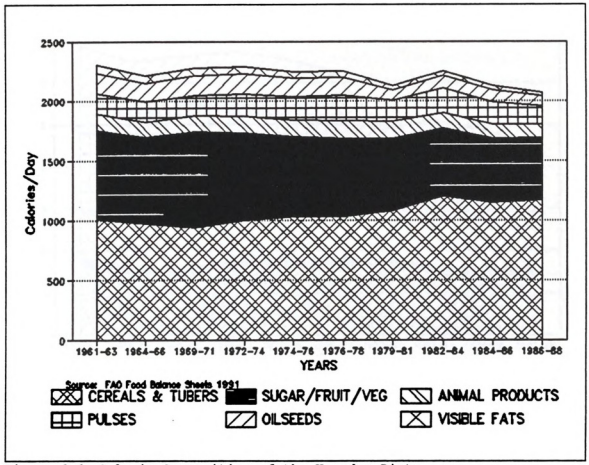


Figure 1.1 Calorie Composition of the Ugandan Diet

sugar, fruit and vegetables[10]. Animal product consumption has been stable, but low.

Figure 1.2 summarizes the available FAO information on trends in the fat composition of Ugandan diets. The FAO balance sheets show an apparent decline of nearly 30% in average fat consumption during the 1961-1988 period. The decline is almost entirely the result of falling edible oil and oilseeds consumption.

Current Ugandan consumption patterns for edible oils are analyzed in greater detail in Chapter Three. This analysis confirms that the level of edible oil consumption in Uganda is below the WHO recommended

[10] The noticeable decline in calorie consumption from sugar, vegetables and fruits is probably due to the gradual collapse of sugar production after the Asian expulsion and unsuccessful government efforts in the early 1980s to control sugar prices. Monopoly import privileges were given to a parastatal and there were severe sugar shortages. From 1980 to 1986, there was a significant parallel market for sugar.

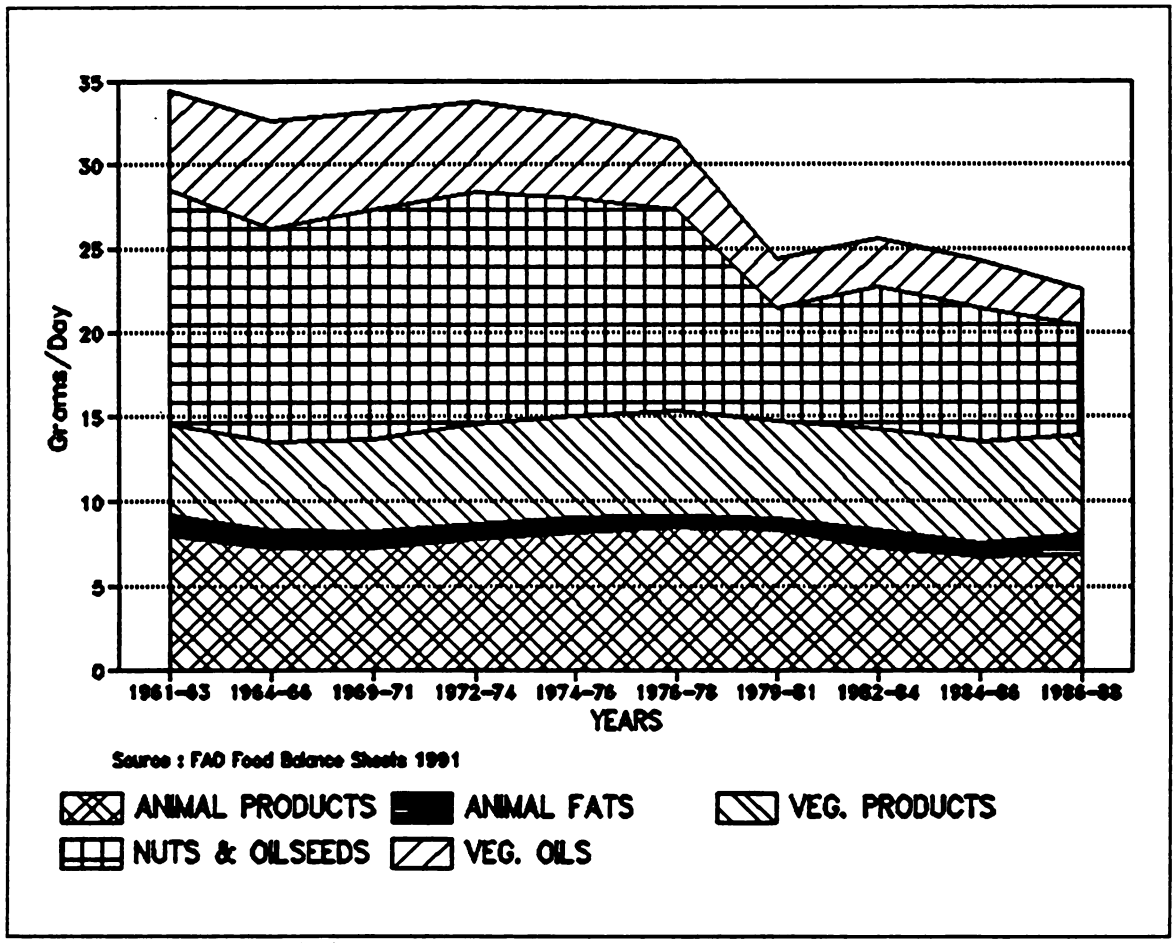


Figure 1.2 Composition of Fats in the Ugandan Diet

minimum intake of 3.3 kg/cap per annum, but is probably greater that illustrated in the FAO balance sheets. FAO figures for edible oil consumption are based on official production and trade statistics. As Chapter Five demonstrates, however, much of the edible oil consumed in Uganda is imported, and is under-represented in official trade records. Chapter Six analyzes the decline in oilseed production in more detail. More recent production data indicate that groundnut, soybean and sesame production have risen significantly since 1988, and per-capita consumption of oilseeds is now probably close to 1976 levels.

Improved food security and nutritional status will require a reduction in the real cost of food for poor consumers and vulnerable groups[11]. Driving down food costs increases the incomes of the poor. However, reducing prices by squeezing farmers and traders is unsustain-

[11] I.e., infants and pregnant or lactating women.

able. Only real improvements in the efficiency and productivity of the subsector can make sustained reductions in costs and still maintain incentives to farmers and traders. Efficiency can be enhanced at various levels including farm production, marketing and processing (Bernsten and Staatz, 1992).

Reviving the Ugandan edible oil industry will only improve nutrition if increased availability reduces costs for low income consumers. In contrast, the imposition of taxes or border controls to protect the Ugandan edible oil industry would raise the price of fats to consumers. Such measures would hurt vulnerable groups the most. The nutritional impact of the revival of the Ugandan edible oil industry will depend on the efficiency of its operation and the policy measures chosen to promote its development. This dissertation seeks to analyze these questions[12].

1.2.2 Import Substitution and Foreign Exchange Savings

Despite major policy reforms that are underway in Uganda, the economic recovery has been slow. Uganda emerged from the 1970s heavily dependent on coffee for its hard currency earnings. The extent of this dependence is readily apparent in Figure 1.3. Coffee generated more than 90% of all export earnings between 1980 and 1989. Falling coffee prices have spurred market liberalization efforts to expand "non-traditional" exports. The collapse of the International Coffee Agreement in 1989 sent coffee export earnings plummeting[13]. At their peak in 1986, coffee revenues totaled $394 million, exceeding the value of the country's imports that year. By 1992, although the quantity of coffee exported had risen, only $117 million was realized, leaving a

---

[12] See Chapter Three for an in-depth discussion of the demand for edible oils in Uganda including the nature of the demand function and the expected future demand trends. See Chapter Nine for a discussion of the potential impact of alternative technologies on the efficiency of edible oil processing.

[13] The average price of Ugandan coffee has fallen from a 1980 high of over $3.00 per kg. to less than $1.00 in 1991.

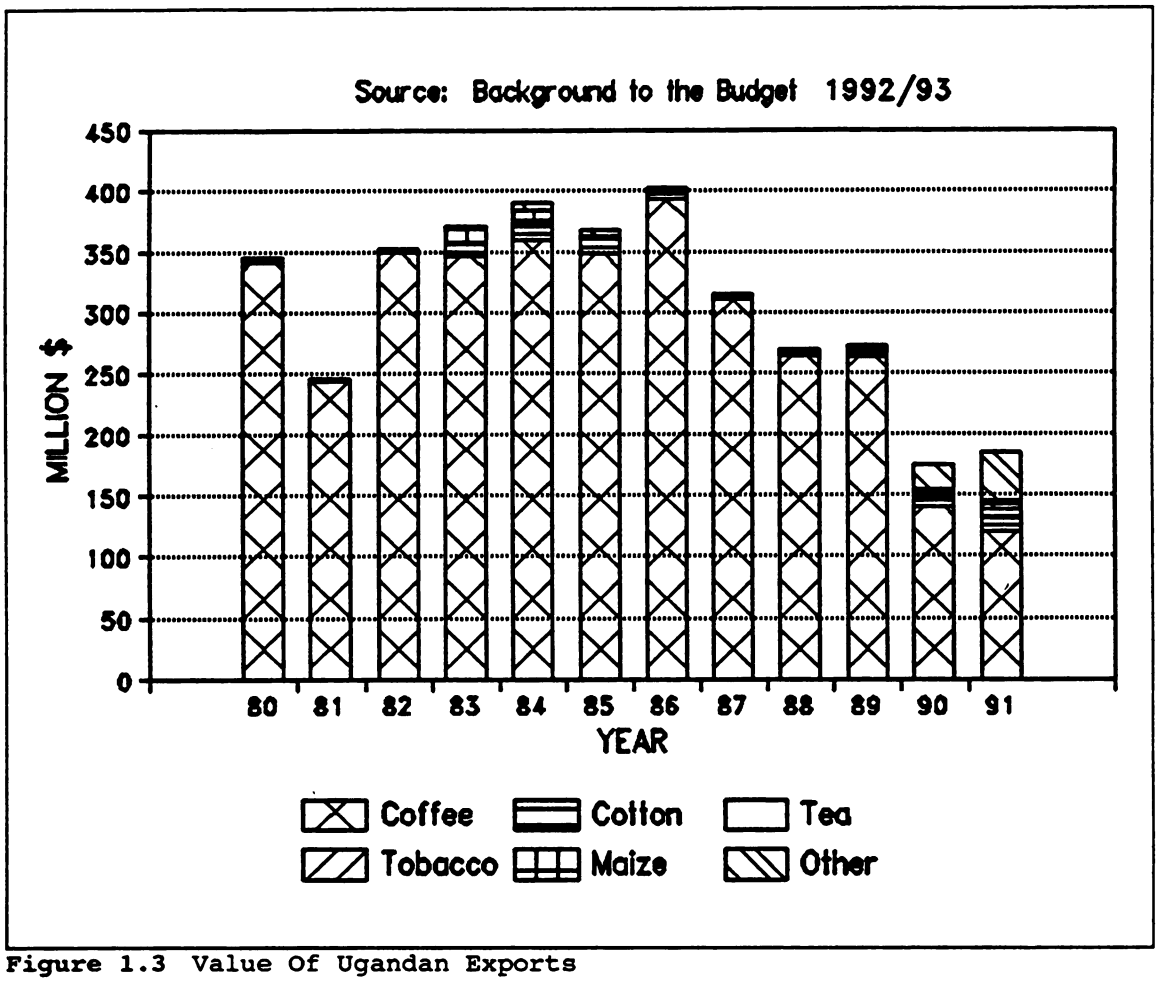


Figure 1.3 Value Of Ugandan Exports

crushing trade imbalance. Uganda is increasingly dependent upon multilateral donors to cover its foreign exchange deficits[14].

Encouragement of non-traditional exports and import substitution has been a priority under the National Resistance Movement (NRM) government since 1986. Figure 1.3 shows that other "non-traditional" exports have only begun to expand significantly since 1990. Despite this heavy emphasis on export diversification, over 71% of 1991 export earnings still came from coffee. Major efforts at ginnery rehabilitation and cotton price incentives have so far failed to resuscitate the cotton industry. The inherent managerial weakness and financial crises in the cooperative sector continue to discourage farmers from returning to cotton production.

---

[14] Figures compiled on the basis of statistics from the Ministry of Planning, Background to the Budget, various years.

Cooking oil is one of Uganda's main food imports[15]. In the light of existing foreign exchange deficits, the potential for import substitution through national production of edible oils looks increasingly attractive. Politicians have even suggested that Uganda could earn significant export revenues from edible oil.

In an increasingly interdependent world market, Ugandan exports face cut-throat competition. Only the most efficient producers will be able to compete profitably in today's market. Can Uganda compete effectively with other edible oil producers on the international market? This question needs to be answered before one can assess whether revival of the edible oil industry is feasible, much less whether it can produce the desired economic benefits.

The economic efficiency of Ugandan edible oil production is at the heart of any economic benefits from rehabilitation of the industry. Import substitution is not necessarily the most beneficial use of domestic resources such as land, labor, capital and foreign exchange. Economic analysis is necessary to determine which use of these resources will generate the greatest net foreign exchange earnings or savings. Investment in import substitution is one option. Investment in export crop production to generate the foreign exchange for imports is another. If edible oils can be produced at less than the cost of imported oil, then domestic production will benefit the economy. In addition, investment in domestic edible oil production could then boost rural employment and increase rural incomes. If Ugandan edible oil production is highly inefficient, production of higher-value exports and importation of cheap Malaysian palm oil may generate greater net foreign exchange earnings.

1.3 BACKGROUND TO THE STUDY

This study of the organization and efficiency of the edible oil subsector comprises the second phase of an earlier agricultural research impact assessment conducted for USAID. The Uganda study was one of

---

[15] The other principal food imports are salt, wheat, rice, sugar and milk powder. Good estimates of quantities are not available, however, because much of the imported oil comes into Uganda through unofficial channels. This subject is analyzed in detail in Chapter Three.

seven case studies carried out under the Agricultural Research Impact Assessment add-on to the Michigan State University "Food Security in Africa" cooperative agreement with USAID. The author was posted as MSU's in-country researcher for the Uganda case study.

Three institutions collaborated with the first phase of the study: Makerere University, Faculty of Agriculture and Forestry (MUFAF); the Ministry of Agriculture, Animal Industries and Fisheries (MAAIF); and Manpower for Agricultural Development Project (MFAD) of the Uganda USAID Mission. The Ministry and the Faculty granted release time to staff to allow them to participate fully in the research effort. MFAD financed transportation, enumerator salaries, and travel allowances. MFAD also provided access to administration and communication facilities. Three Ugandan research assistants (Mr. Bernard Bashaasha, Ms. Elizabeth Balirwa, and Mr. Godfrey Turiho-Habwe) assisted with data collection. The subsector component of the study was financed by the Cooperative Agriculture and Agribusiness Support (CAAS) Project of USAID.

1.4 OBJECTIVES OF THE RESEARCH

The impact assessment was designed from the outset as a two-stage study. The first phase calculated the Rate of Return (ROR) to USAID and Government of Uganda investments in agricultural research on maize and oilseeds. This dissertation is the product of the second phase of the study. It analyzes the broader context of the edible oil subsector, examining production, marketing, processing and final consumption.

The objectives of this subsector study are as follows:

1. To assess the future demand for edible oil in Uganda and estimate the foreign exchange implications of continued importation.
2. To provide a comprehensive picture of the Uganda edible oil subsector in terms of capacity, flow of commodity, and number of actors.
3. To evaluate the relative competitiveness of the Ugandan edible oil subsector and identify the major constraints to improved efficiency. This includes:
   a. evaluating the costs of production for oilseeds and constraints to improved agricultural productivity.

b. identifying the marketing channels from farmer through to consumer and analyzing the market coordination and cost margins at each level of the marketing chain.

c. evaluating the costs of edible oil processing in Uganda using alternative raw materials and technologies ranging from large-scale commercial processing to micro-enterprises at the farm level.

d. identifying those areas where technological or policy change would have the greatest impact on competitiveness.

4. To draw policy recommendations regarding:

a. the relative merits of importation *vis-à-vis* promotion of domestic edible oil production.

b. steps to reduce constraints to efficient development of the subsector as a whole.

1.5 ORGANIZATION OF THE DISSERTATION

This dissertation is organized into ten chapters. Chapter Two introduces the analytical framework for the subsequent analysis. This study employs a subsector approach that incorporates analytical tools from domestic resource cost analysis. The complementarity between these approaches is discussed. The data sources and analysis procedures employed in this study are outlined.

Chapter Three analyzes the demand for edible oil in Uganda. The chapter begins with a description of current edible oil consumption patterns. This is followed with an analysis of the international markets for edible oil including both production and price trends as they affect the Ugandan market. This information is combined to project the foreign exchange cost of future consumption, taking into consideration anticipated income, price and population growth effects.

Chapter Four provides an overview of the history of the evolution of the edible oil subsector. Current organization and performance can only be understood in the light of the institutional and policy environment that shaped the development of the subsector. Chapter Five presents a detailed picture of the organization of the edible oil subsector in Uganda. Subsector maps illustrating the number of firms,

flow of commodities and levels of employment generated are included. A description of the marketing channels for edible oil follows.

Chapter Six discusses oilseed production trends, costs of production and returns to labor. Chapter Seven describes the existing structure of the domestic and export markets for Uganda's oilseeds. Expected trends in international demand and prices are discussed. These international demand factors are applied in assessing alternative opportunities for export in Chapter Eight. DRC ratios are computed for oilseeds and competing export crops. The impact of the current policy structure on production and export incentives is examined.

Chapter Nine analyzes the economics of oil processing in Uganda. The advantages and disadvantages of alternative processing technologies are discussed. The financial and economic rates of return to investment in alternative technologies are calculated in the second section. The third section of the chapter uses this information to analyze the least cost choice of technology for edible oil processing under alternative scenarios. The last section of Chapter Nine expands the DRC analysis from Chapter Eight to include edible oil processing as an import substitution activity. Chapter Ten presents the final conclusions and recommendations of the study.

CHAPTER TWO: ANALYTIC FRAMEWORK

2.1 OVERVIEW OF THE ANALYTIC FRAMEWORK

This study presents a broad overview of the organization, operation and performance of the edible oil subsector in Uganda. To accomplish this, an analytical framework with a strategic development perspective is required. Emphasis is placed on diagnosis of system constraints and identification of dynamic interactions and disequilibria relevant to improving the performance of the system.

The study synthesizes two approaches in its analysis of the edible oil subsector. The analytical tools and concepts of subsector analysis are combined with DRC analysis based on the Policy Analysis Matrix. These two approaches complement each other. The subsector approach emphasizes an understanding the chain of dynamic relationships that make up the system. This analysis allows identification of possible reductions in the costs of production and marketing. DRC analysis stresses the idea of competitiveness. It builds on the detailed understanding of the micro-economic conditions under which production decisions occur to assess the relative efficiency of producing and trading alternative commodities. Emphasis is placed on understanding the international market context: and the supply and demand conditions that drive the subsector. Sensitivity analysis is used to assess whether changes suggested in the subsector analysis will alter the competitive position of the country in producing this commodity.

Secondary data are combined with information from key informants to generate an overview of the supply, demand, institutional environment, policies, and social aspects of the subsector. The major components of the costs of edible oil production and marketing are identified from cost of production and marketing data computed by the Agricultural Secretariat of the Bank of Uganda. The linkages between these components and national policies are explored using the Policy Analysis Matrix under alternative assumption scenarios.

2.2 THE SUBSECTOR APPROACH

Subsector analysis provides a vertical picture of the movement of a particular commodity from input supply, through farm-level production, processing and marketing, to the final consumer. In commodity subsector studies the key defining characteristic of the subsector is the major raw material, with the subsector describing the alternative transformations and distribution systems emanating from it. The subsector may also be defined around a particular final product, and include all firms engaged in raw material supply, production and distribution of that product.

For each commodity or group of products there are several alternative channels through the production and distribution system. Commodity subsectors are made up of competing channels of production, and their supporting input and output linkages. Each principal channel for production, transformation, and distribution to final consumers is characterized by a unique mix of functions and participants (Boomgard et al. 1991). Competing channels use different technologies. Some channels will be more efficient, or have better access to supplies or marketing arrangements. The subsector involves both organizations and the institutions (rules, laws, business practices etc.) that help those organizations to operate in a coordinated manner (Shaffer, 1973; Marion 1986, Bernsten and Staatz, 1992).

The analysis is both diagnostic and prescriptive in nature. By understanding the competitive position of firms in alternative channels, subsector analysis aims to highlight the dynamic forces at work, revealing the growth opportunities and constraints in the subsector.

2.2.1 History of the Approach

Subsector methods have evolved from concepts developed in the early work on industrial organization and in the agricultural marketing literature. The subsector approach builds on the structure, conduct, performance framework developed by industrial organization theorists

such as Bain (1968) and Scherer (1980)[16]. Industrial organization theory focused on examination of an industry or group of firms that produce similar commodities. The focus was on the horizontal linkages among firms. Structure was defined primarily as the number of firms, and therefore, the degree of concentration and competition. These structural variables were taken as given, and the macroeconomic and institutional environment was assumed to be exogenous. As a result, the analysis was primarily descriptive and essentially static. The subsector perspective differs from industrial organization by concentrating on the vertical links between participants who engage in transformations and transactions at every level from input supply through to final consumption.

Subsector analysis stresses the underlying supply and demand conditions for commodities and likely trends in commodity output and use. Demand is recognized as the force that "pulls commodities through the subsector" (Holtzman, 1986 p. 12). Changes in relative prices, consumer purchasing power, and tastes or preferences induce shifts in demand. These demand shifts affect the incentives to supply, produce, transform, store, and transport the commodity to satisfy the end consumer's quality, timing and location requirements. Shifts in supply, resulting from technological development, are recognized as another engine of change in the subsector. The emphasis on changes in supply and demand makes the subsector approach dynamic in orientation; going beyond the static efficiency perspective of neoclassical marketing systems analysis or industrial organization.

A third difference is the emphasis on institutional arrangements for coordination. The supply of a particular agricultural commodity fluctuates greatly from year to year, due to climatic and production factors. This creates an incentive for institutional arrangements to coordinate demand and supply without excessive price fluctuations. Such coordination may involve active intervention by government, private firms or public institutions.

---

[16] For a more extensive exploration of the historical evolution of the subsector approach see Mclaughlin (1983), Haggblade (1984) and Boomgard et. al (1986).

Rapid rural appraisal techniques, originally designed by Chambers (1980) to assess village level farming constraints, are often used in subsector analysis. There is an extensive literature on the application of rapid appraisal to understanding of the role of a commodity in a national economy (Abt Associates, 1988; Holtzman, 1986; Holtzman et al., 1989)[17].

Recently, the subsector or "production to consumption" approach to food system analysis was applied to the edible oil subsector in Kenya. This IDRC financed study took an action orientation[18]. Participants from every stage of the subsector were drawn into the analysis and policy debate. The resulting forum for policy reform has had considerable impact on Kenyan import and pricing policy with respect to edible oils.

Most recently, there has been a growing interest in the application of subsector analysis techniques to agricultural research priority setting for developing countries. The Africa Bureau's "Strategic Framework for Agricultural Technology Development and Transfer in Sub-Saharan Africa" (USAID, 1992) emphasizes this approach.

2.2.2 Central Concepts

While the application of subsector analysis varies, there are four key ideas that are inherent to the approach. These include a vertical systems orientation, the analysis of the environment or institutional context, an emphasis on coordination within and between channels, and the ultimate concern with evaluating subsector performance and making recommendations for interventions to enhance that performance. Each is discussed in more detail below.

---

[17] In recent years, the small-scale manufacturing subsector in the Third World has also been extensively analyzed using subsector techniques. Boomgard et al. (1991) review the coverage, approach and findings of eight such studies. Since that report, at least six other studies have been initiated under the Gemini project funded by USAID (Liedholm and Mead, 1990).

[18] For a detailed discussion of the research approach and primary findings see Zulberti (1988) and Zulberti and Lugogo (1989a and 1989b).

2.2.2.1 Vertical Systems Orientation

Subsector analysis emphasizes the interdependence between economic units in the production and distribution process (Davies, 1988, p.9). It is not possible to understand the opportunities and constraints facing firms by looking at firms in only one channel or stage of the subsector. Competing channels, input suppliers and market outlets, all need to be examined. The different functions in the subsector are undertaken by actors whose identity, motivations and resources for action need to be analyzed (Teme and Boughton, 1992). The activities of these economic actors mutually influence and condition each other. As economies become more integrated, changes in one level of the system increasingly affect other levels of the system. Optimization at one level will not necessarily lead to the most efficient system overall. To enhance the performance of the subsector it is necessary not only to increase productivity at each stage, but also to improve the coordination across stages. Individual firm constraints need to be understood from the perspective of the system as a whole.

The vertical systems approach presented by subsector analysis is of particular value in looking at the issues of technological change, specialization and structural adjustment. Development involves both technological change and specialization. In the process the production/distribution system becomes more complex. Increasingly farmers must rely on off-farm elements of the economy such as input supply, middlemen, and processors. As development takes place, the transformation of raw materials also generally involves expanding the number of production stages and the range of participants (Bernsten and Staatz, 1992).

In recent years, structural adjustment programs have also induced major changes in market structures. In particular there is pressure from donors to dismantle costly bureaucratic coordination mechanisms and increase reliance on market forces. The market mechanisms and supporting institutions may not, however, be in place to support a smooth transition. The challenge is to identify ways of coordinating the system and taking advantage of the technical production possibilities to lower distribution or processing costs (Bernsten and

Staatz, 1992). A laissez-faire policy of unsupported and unfacilitated "private sector initiatives" is insufficient. Effective coordination requires public and private sector provision of facilitating services and a policy environment that removes disincentives and fosters entrepreneurship (Holtzman 1986). The appropriate mix of measures will depend on the dynamics of the given subsector.

2.2.2.2 Environment and Institutional Context

The environment includes technologies, institutions and policies that exert an important influence on the operation of the subsector. The environment has three major components: the rules, the information flows and the supportive service organizations. Rules may be formal or informal. Examples of formal rules arising out of government policy include pricing legislation, tariffs, labor regulations, interest rate ceilings, investment codes, and import/export procedures. Informal rules and socio-cultural institutions are harder to identify and assess, but they affect the behavior of firms in the subsector.

Often the institutional environment affects firms differently depending upon their size and mode of operation. Research has shown that the relative strength of different channels can often be explained by factors in the institutional environment. Certain channels may owe their very existence to a particular market niche created by the institutional structure (Davies, 1988).

New Institutional Economics (NIE) is a growing body of thought within the discipline of economics that acknowledges that the neoclassical assumptions of perfect knowledge and costless transactions are overly simplistic and recognizes the need to incorporate institutional and organizational issues into the analysis of economic phenomena[19]. NIE theorists recognize the importance of information

---

[19] The term New Institutional Economics (NIE) denotes a large body of thought with its roots in a number of different schools, including Land Economics, Property Rights and Public Choice Theory, Agency Theory, Behavioral Economics, Transaction Costs Analysis, and Industrial Organization Economics. Each of the various schools has tended to adopt a different label for the movement as a whole. This paper draws insights in an eclectic fashion from various different works. I have adopted the label for this body of thought advocated by Oliver Williamson solely

flows. The concept has been incorporated into the subsector analysis emphasis on coordination. NIE holds that information and transaction costs, especially in the presence of asymmetrically held information and differences in market power, create possibilities for opportunistic and rent-seeking behavior. These costs strongly influence the nature of contracts and the extent of vertical integration in a given channel. Institutional relationships affect the competitive position of firms, the ease of coordination, and the obstacles to growth in alternative channels (Boomgard, Davies et al. 1991)

Institutions are the basic rules of the game under which a society, and its economy operates. They include property rights, laws, customs, rules of contract, and standard business practices that "structure incentives in human exchange whether economic, social or political" (North, 1990. p.1). The major role of institutions is to reduce uncertainty and promote exchange by establishing a stable structure to human interaction. Organizations develop to take advantage of opportunities created by the institutional environment and then struggle to modify and change that environment to achieve their objectives. Institutions, therefore, are an evolving system of formal and informal rules and enforcement mechanisms that serve to define the opportunity set within which individuals form coalitions and operate as economic and political actors.

Personalized exchange, based on small-scale production and local trade, has dominated most of economic history. This level of transaction is characterized by repeated interaction between known trading partners, cultural homogeneity and no third party enforcement. Compliance is ensured by internally enforced codes of behavior and societal sanctions or, in extreme cases, by the threat of second party retaliation.

In the process of economic development new institutions are needed to facilitate communication and enforcement of agreements over time and space between strangers. The more complex the transaction, the more important the availability of information and enforcement of agreements becomes. There are two components to transaction costs. One is the

---

because it seems to be most widely used in the literature.

cost of identifying and measuring the valued attributes of the good or service in question. The less transparent the desired attributes of the good and the more valuable they are, the more a person will be willing to invest to obtain the necessary information. The more one-sided the availability of information and the greater the advantage one opponent gains by hiding or subsidizing certain facts, the higher the cost of information becomes.

The second component of transaction cost is the cost of enforcing agreements. Enforcement often forms a critical obstacle to increasing specialization and division of labor. Without institutional constraints, self-interested behavior may foreclose the possibility of complex exchange because of the risk that the other party will not live up to the bargain. The perceived transaction cost, therefore, rises to include the risk premium associated with the likelihood of defection and its subsequent costs.

If the combined cost of information, enforcement and risk premium is too high, exchange will simply not take place. Non-specialization is a form of insurance when the costs and uncertainties of transactions are too high. Self-sufficiency keeps transaction costs to a minimum, but increases the cost of production. Specialization, on the other hand, improves efficiency and captures economies of size and scale. With specialization and high information costs, comes the need for institutions to enforce contracts and minimize risk.

Peripheral regulatory and service organizations are also participants in the subsector and must be included in the analysis. They undertake essential functions, provide coordinating mechanisms, and enforce formal rules and policies (Davies, 1988). A well-developed legal system to enforce contracts, a high literacy rate, adequate roads and communications infrastructure, equitable taxation and foreign exchange allocations systems, and functioning credit and financial institutions are critical to the performance of most subsectors (Liedholm and Mead, 1990).

2.2.2.3 Coordination

In the past, the "state versus market" debate tended to dichotomize the principal means of coordination into bureaucratic and market mechanisms[20]. Increasingly, however, analysts are being forced to recognize that both bureaucratic failure and market failure are endemic. Neither system is ideal. Under the pressure of structural adjustment, policy makers today are faced with the challenge of how to achieve coordination in a sustainable and financially viable manner. Often this implies the creation of supporting institutions that can facilitate market discipline.

Busch (1990) argues that the various participants do not so much coordinate their activities as they negotiate them. "Commodity chains are social networks held together through negotiations, persuasion and coercion." Each actor in a given commodity subsector seeks to find ways of rearranging the subsector to increase profits or market share. These bids for advantage take place not only in the market but also through negotiation or coercion. These negotiations may focus on price, but they also involve times of delivery and pickup, quality of the goods and services exchanged, regularity of supplies, etc.

The outcomes of these negotiations may become systematized as external rules or laws. Alternatively, they may take the form of new technology, i.e., instruments, plants, animals, buildings, etc. Sometimes negotiations result in informal systems of rules and shared patterns of expected behavior. All of these mechanisms change the commodity subsector. Technology development is only one way in which such restructuring is accomplished. Others include market reorganization, government regulations and new ways of organizing work.

---

[20] Bureaucratic mechanisms are any form of vertical coordination in which a central authority or planning bureau makes production decisions and issues instructions. This might be either the state or the management of a large integrated firm. In contrast, market mechanisms coordinate production decisions on the basis of prices and sales (i.e. spot markets or forward contracts).

2.2.2.4 Performance

In subsector analysis there is an overriding emphasis on the identification of under-exploited economic opportunities, and barriers to improved performance or increased system productivity. Subsector performance is a multidimensional concept that is intrinsically normative. It refers to the ability of the subsector to contribute to national objectives. Because of its multidimensional nature, there may well be conflicts between incompatible objectives and alternative measures of performance. Improved performance, therefore, necessarily implies a tradeoff or compromise between objectives. For this reason, the task of prioritizing objectives and setting minimum performance standards is usually left to local policy makers. The task of the subsector analyst is to evaluate the likely impact of the existing structure and conduct of the subsector on alternative measures of performance and identify opportunities for change.

Subsector performance is generally evaluated in terms of coordination, efficiency, progressiveness, equity, employment and nutrition[21]. The effectiveness of market coordination refers to the extent to which existing institutional arrangements are able to match supply and demand at each level of the production/marketing system. Technical efficiency refers to the maximization of output per unit of input. In contrast, economic efficiency refers to minimization of the cost of producing a given quantity of value in production. The most economically efficient production technology may not be the most technically efficient, but it is the most profitable.

Equity refers to the allocation of returns to participants in the subsector in light of the distribution of investment, risk, and costs assumed, and of responsibilities undertaken. Progressiveness refers to the ability of the subsector to identify, develop and adopt improved technical, management and institutional innovations which enhance productivity. Other performance considerations include the level of employment creation, and the impact on nutritional status and food

---

[21] These performance objectives draw on concepts developed by Sosnick (1964), Marion (1976), French (1977), Helmberger, Campbell and Dobson (1981), Shaffer (1980) and Holtzman (1986).

security for a broad range of consumers, particularly those most likely to be nutritionally vulnerable.

2.2.3 Sources of Data and Analytical Tools

Subsector analysis synthesizes information from a broad range of primary and secondary sources including, formal surveys, informal interviews of key informants, case studies, international price and trade statistics, household budget surveys, census reports, national accounts and labor-force data. The subsector map is one main tool of this type of analysis[22].

2.2.3.1 The Subsector Map

A schematic map of the subsector summarizes the economic relationships between actors in the system. It traces the flows of products and services that direct raw materials to processors and through the distribution system to final consumers. It also describes the options available to different actors. In so doing, the subsector map serves as a base for displaying information and the focus for discussion. The subsector map for edible oils in Uganda is presented in Chapter Five.

The objective of the subsector map is to describe how the total production and distribution system fits together. In particular, it identifies the subsector's principal functions, participants and channels. The concept of function includes transformations in form, time and location that take place at various stages and the alternative technologies and scales of production that compete in performing each function. The participants are the alternative actors who perform each of these functions. The channels describe how products flow among participants, who buys what from whom, and how the network hangs together. The purpose of the subsector map is to capture the essential firm types and production distribution channels. The subsector map also

---

[22] This section relies heavily on the excellent step by step guide to subsector analysis presented in Boomgard et al. (1986, 1991).

helps in locating critical leverage points for change in the production system.

The next step is to elaborate on the basic subsector map using overlays. The process of assembling employment and volume overlays forces a juxtaposition of the available data in ways not usually attempted. Such overlays visually summarize information in a way that is easy to understand. The difficulties encountered in reconciling the numbers is useful for identifying areas requiring further data collection.

2.2.3.2 Consumption Analysis

A second major tool is the analysis of consumption studies (also called household budget studies). It is very difficult to estimate total small-firm market sales by aggregating up from a multitude of small businesses. Not only do these firms maintain sketchy records, but they often operate seasonally or part time. The use of consumption studies allows the analyst to estimate the size of national and regional markets based on population size and average expenditure per person[23].

Consumption studies also offer insights into future demand patterns. In the absence of time-series data, consumption studies provide a window into system dynamics. The key is to compare differences in consumption between rich and poor households. This comparison shows how households spend their additional income as earnings grow. Given projections of national income growth, these data can be used to forecast the absolute amount of sales growth in each domestic market. The consumption analysis for the edible oil subsector is presented in Chapter Three.

2.2.3.3 Partial Budgets

Basic enterprise budgets are extremely valuable for tracking the distribution of income throughout the system. These budgets trace price

---

[23] For examples of the application of these procedures see Boomgard et al. (1986, 1991).



mark-ups, costs, and value added throughout the subsector. They are obtained by collecting price and flow data at each stage of the production chain to construct composite budgets. By combining average input-output ratios with prices it is possible to arrive at standardized budgets for each category of participant. By revealing cost structures and sources of firm competitiveness, these budgets open the way for an understanding not only of current competitive pressures, but also the impact of macroeconomic changes (i.e., tariffs taxes, exchange rates, wages, agricultural income, and aggregate demand) on the profitability and growth of firms in the subsector.

For individual farmers, the returns to labor provide comparable insights into incentives and dynamics. Poor people have only their labor to sell. The returns to labor, therefore, suggest where the individual's best opportunities and incentives lie. In a similar fashion the cost to consumers is a key indicator of the competitiveness of alternative sources of supply.

2.2.4 Advantages and Disadvantages of the Approach

The subsector approach is most useful for describing the salient elements of the subsector, diagnosing the key constraints to improved performance, and prescribing policies and actions to overcome these constraints. Subsector analysis offers a framework for evaluating the dynamics of an industry and the prospects for cost effective intervention, yet it does not prejudge the nature of the recommended intervention. There are no standard blueprints or predetermined solutions. For example, subsector analysis can lead to the recommendation of projects involving technology, input supply, marketing, management assistance, or credit (Gemini, 1991).

The appropriate intervention will depend on the specific resource endowment and institutional context. The economic viability of alternative institutional arrangements, policies and technologies is analyzed to predict their probable effect on food system performance. The likely costs and benefits of these alternatives are then summarized for presentation to decision makers.



Long-term programs of food systems research can be costly. The incorporation of various rapid rural appraisal techniques is intended to reduce these costs by making optimal use of case studies and informal interviews. The resulting analysis is less costly and less time consuming than data intensive surveys.

The cost advantages of rapid reconnaissance procedures are offset by their time-bound nature. It is difficult to get accurate flow information on quantities and prices of inputs and outputs over time. The lack of statistical sampling procedures can make generalization to the larger population difficult or misleading. Similarly, rapid reconnaissance techniques may fail to identify key marketing or technological opportunities.

Holtzman (1986) recommended that subsector analysis would gain from more of a food policy analysis perspective, i.e., by incorporating more of the effects of macro-economic policies, international trade incentives, and examination of close substitutes in production and consumption. Recent work by Kristjanson et al. (1990) on the competitiveness of export crop production in Sub-Saharan Africa incorporates the tools of DRC analysis into the subsector perspective.

2.3 INTERNATIONAL COMPETITIVENESS AND DRC ANALYSIS

The theory of comparative advantage is generally attributed to Ricardo (1817). In his book "The Principles of Political Economy and Taxation" Ricardo expanded the optimization principle for firms into the arena of international trade. He showed that a country can achieve net welfare gains by concentrating its productive efforts on those goods and services for which it is a relatively efficient producer, and relying on trade for the balance of its needs[24]. Comparative advantage defines the limits to mutually beneficial trade.

---

[24] Morris (1989) points out, however, that the quality of labor required to produce a commodity is not constant over the entire range of production. As a result, specialization in production is usually less than complete, and each country will continue to produce a certain quantity of most goods.

A country need not be the lowest cost producer of a commodity to have a comparative advantage in its production. Although one nation may have an absolute disadvantage in production (i.e., it is an inefficient, high-cost producer in all cases) it may still benefit from trade. This will depend on whether the nation is more efficient than its trading partners in producing a certain commodity when the costs of production are measured in terms of its production alternatives or opportunity cost. The relative efficiency of production within each country is the key variable. The internal trade-offs in production between goods will determine which commodities have a comparative advantage.

Differences in relative productivity between nations result from dissimilar resource endowments and technologies. A nation's resource endowments will determine the comparative value of domestic resources such as land, labor, capital and water. The availability of alternative technologies determines the production possibilities and influences the rate of product transformation. International prices determine the value of the remainder of the tradable inputs and outputs.

Because it is not directly related to absolute production cost levels, a nation's comparative advantage is not always readily apparent to policy makers. Even when relative production costs are known, those of the other nations with whom they may trade are often not known. Relative production costs may also be changed by government policies or market failures. As a result, while comparative advantage is a useful concept it is difficult to measure. The Policy Analysis Matrix is a framework for applied analysis that builds on the concept of comparative advantage to provide policy makers with insights into the impact of the current policy environment on the incentives to produce and export a given commodity. What this analysis provides is a measure of the country's underlying ability to compete in production of a given commodity for exchange on the international market.

The definition of competitiveness used in the following analysis is similar to that applied by West (1993). Competitiveness is the ability to produce and deliver goods and services in the form and at a time, place and price which is at least as attractive to buyers in international markets as that offered by potential foreign suppliers, while earning at least the opportunity cost of resources employed. Many

factors enter into competitiveness besides just the underlying costs of production. While comparative advantage focusses on the relative costs at a point in time, efforts to improve competitiveness consider factors that can shift the economy to a higher production possibilities level. Such factors may include upgrading the quality of resources, capturing economies of scale, increasing the rate of innovation, and improving coordination systems. These factors help to explain how comparative advantage changes over time. They thus help to identify sources of economic growth for a nation.

The Policy Analysis Matrix seeks to identify those production activities in which a given country is relatively more efficient, and highlight the manner in which national economic policies can lead to a divergence between the incentives facing an individual producer and the best interest of the economy as a whole. This analysis framework generates quantitative indicators of the efficiency of using domestic resources to produce a given good for purposes of external trade. The coefficients indicate which activities are efficient earners or savers of foreign exchange. They compare the domestic cost of producing a commodity to the net foreign exchange earned from export or saved by import substitution. In this way they identify those areas in which public investment should be undertaken and private incentives promoted to enhance competitiveness.

From an efficiency perspective, if sufficient demand exists the national income will be enhanced by producing those goods in which the country is internationally competitive. It is important to note, however, that the DRC and other indicators generated by the PAM analysis do not consider the level of demand and whether increased output can be absorbed. They must, therefore, be supplemented with insights from the subsector analysis to give a more complete picture.

The Domestic Resource Cost Ratio is a common measure of competitiveness. This ratio is used to compare the relative efficiency of production of alternative commodities, regions, or technologies. Nations with the lowest opportunity cost have a cost advantage in terms of other producers. They can be internationally competitive given the current prices of tradable outputs and inputs prevailing in the international market. Their international competitiveness can be



attributed to both their higher productivity and their exchange rate. This implies at least one of the following conditions:

1) They use fewer traded inputs per unit of output.
2) They use fewer domestic inputs per unit of output.
3) Their domestic resources have lower opportunity costs.
4) The value of their domestic currency is low relative to other major currencies.

It is argued that the opportunity cost of foreign exchange is a good measure of efficiency because it indicates what the economy as a whole must give up in terms of domestic currency to obtain an additional unit of foreign exchange. The framework is also used to identify and measure the impact of specific government policies on the incentives to produce and trade.

2.3.1 Calculation of the Domestic Resource Cost Ratio

The domestic resource cost ratio compares the opportunity cost of domestic production to the value added that it generates. The numerator is the total cost of domestic resources and non-traded goods employed in the production of the commodity. The major domestic resources considered are land, labor and capital. The denominator is the net foreign exchange earned or saved excluding the costs of directly traded inputs. The denominator is also expressed in domestic currency. If the opportunity cost value of domestic resources used in production is less than the net foreign exchange the country gains or saves, the country can be competitive in its production. The DRC can be summarized as follows:[25]

---

[25] There are two common methods of calculating the DRC ratio. The difference between the Cordon and Balassa methods is outlined in Tsakok (1990 p. 118). The Cordon method results in a ratio which is indicative of varying levels of efficiency in domestic production. The Balassa method results in an implicit exchange rate between domestic currency and foreign exchange. This is a commodity-specific rate of exchange which is then compared to the shadow exchange rate. If the implicit rate is lower than the shadow exchange rate, the commodity has a comparative advantage. The Cordon method is the one most commonly used. Since this is also the approach used by the Bank of Uganda Agricultural Secretariat, it will be the definition of DRC referred to throughout the paper.



$$D\ R\ C\ ratio = \frac{domestic\ resources\ valued\ at\ their\ opportunity\ cost}{net\ foreign\ exchange\ earned/saved\ by\ producing\ the\ good}$$

Its calculation entails three major steps:

1) development of enterprise budgets
2) estimation of social (shadow) prices
3) calculation of the DRC ratio and other measures of the impact of government policies.

2.3.1.1 Development of Enterprise Budgets

The DRC ratio begins with the development of an enterprise budget or cost of production profile for each production possibility being compared. This may include comparisons between different crops, regions, or production technologies. DRC ratio calculation requires accurate accounting of all inputs and outputs.

When expressed in domestic market prices, these enterprise budgets reflect the profitability of different activities to local producers. This is referred to as individual or financial profitability as opposed to social profitability. The collection of domestic market prices is a necessary first step in the calculation of measures that quantify the effects of government policies by comparing financial profitability with social profitability.

These enterprise budgets are used to determine the opportunity cost of the primary factors of production (land, labor and capital). Consequently, budgets must be constructed for all reasonable production alternatives. Many studies focus too narrowly on one or two enterprises of immediate interest. Because they ignore viable production alternatives, these studies may incorrectly estimate the opportunity cost of primary factors of production and thus seriously over or under estimate the social value of primary factors such as land.

2.3.1.2 Estimation of Social (Shadow) Prices for Primary and Tradable Inputs

Probably the most familiar use of shadow prices is in project analysis. In the project context, shadow pricing techniques are used to identify the contribution of the proposed investment to the economic objectives of the government. Market prices are not used because they are influenced by existing government policies and market imperfections. These market prices include transfer payments between economic actors, rather than reflecting the total net cost to the economy as a whole. They are not the best estimate of the underlying economic value of the resource or commodity. Substantial work has been done on shadow pricing in the cost benefit project analysis literature[26].

In DRC analysis, shadow prices are used to better estimate the opportunity cost of the resource. The opportunity cost of a resource is what that resource could earn in its best alternative use. The analyst uses representative production systems to assess the economic alternatives that are foregone because resources are tied to production of specific commodities. (Tsakok, 1990 p. 109).

Shadow prices are determined by the class of the good. All inputs and outputs are classified as either primary factors or tradables. Primary factors are goods that are not normally traded internationally (usually land, labor, water and capital). Tradables are goods that can be traded internationally[27]. Composite goods include both a tradeable component and a primary factor component. For example, transport costs incurred in delivering a commodity to market include the cost of fuel and vehicles (tradables) plus labor costs (a primary factor). When such composite goods are used in production, it is necessary to decompose them into their respective tradeable and primary factor components.

---

[26] In particular see Gittinger (1982), Ward (1976) and McDiarmid (1977).

[27] Government policy may be one factor determining whether this good is actually traded. When certain policies, such as import restrictions, constrain trade of a good which would otherwise be imported or exported, the good should still be treated as potentially tradable.



A matrix of prices is then constructed. This matrix includes only economic (or shadow) prices[28] that represent the opportunity cost to the economy as a whole of the various inputs and outputs. These prices reflect the economic value of the goods and services in the absence of taxes, subsidies, import tariffs, price controls, and selected other government policies which embody transfer payments within the economy.

The shadow price of primary factors is their opportunity cost in the most socially profitable alternative use. In other words, the value of the non-traded domestic resources used in production is assessed in terms of alternatives foregone as determined from the enterprise budgets.

The value to the economy of a commodity that is traded on the international market is given by what the economy can earn by exporting it or must pay to import it. Foreign trade opportunities set the value of the commodity to the economy. For this reason, tradables are valued at their world market price equivalent, adjusted for transportation costs and exchange rate anomalies. Usually, since DRC analyses have long-term implications, the long-term international price trend is used.

When world reference prices are not available, social prices are estimated by taking domestic market prices and adjusting them to remove the influence of policy-induced disincentives to arrive at an equivalent of the international price. If the domestic market is relatively unaffected by macro policy, the market price can be used as an approximation of the social price because it reflects the product's economic value.

2.3.1.3 Estimation of the DRC Ratio

The estimation of social profitability is a straightforward procedure. Enterprise budgets are simply recalculated using social prices to calculate net social returns to each enterprise. Social prices reflect the scarcity value of the resources. The enterprise with the highest net social return represents the most profitable production

---

[28] Also referred to in the literature as social prices.



alternative in terms of contribution to national income. A comparison of individual and social profitability indicates the change in incomes and incentives at the farm level that has been caused by government policy and market failures.

The DRC ratio is a comprehensive measure of protection that encompasses input prices for the entire productive activity, including land, labor and capital. Thus, it provides an explicit indication of the ability of each production alternative to use domestic resources to generate or save foreign exchange. Furthermore, the DRC ratio is unit free. Unlike measures such as Net Present Value, the DRC ratio is unaffected by the scale of the proposed activity.

2.3.2 Interpretation of the DRC Ratio

A DRC ratio that is >0 and <1 indicates that the economy generates (or saves) foreign exchange by local production. The opportunity cost value of domestic resources used in production is less than the net foreign exchange the country gains or saves. This shows international competitiveness. A country can profitably produce such commodities for international trade.

A DRC ratio >1 indicates that the economy is using domestic resources that have a greater opportunity cost than the value of the net foreign exchange gained or saved. The country cannot competitively produce such commodities for export.

A DRC ratio equal to unity shows that the economy neither gains nor loses through production of this commodity. The value of the domestic resources used is just equal to the value of the foreign exchange earned. Finally, a negative DRC says that production of that commodity costs the economy more foreign exchange than the commodity is worth for export. Export of such commodities results in a foreign exchange loss to the economy and a waste of domestic resources.

2.3.3 The uses of DRC Analysis

When discrepancies exist between market and social prices, the interests of individuals and the nation can diverge. A crop may be

unprofitable to grow even though its production represents a very efficient use of the nation's resources. This is revealed by comparing private profitability with social profitability.

The most common use of the DRC measure is to identify those commodities whose export will generate the greatest benefit to the national economy. Social profitability measures are also likely to differ greatly between different technologies. Where alternative production technologies exist, it is important to evaluate them separately. This information can then be used to guide investment policies and choice of technology.

In an era of shrinking research budgets, increased pressure has been put on research administrators to ensure the cost-effectiveness of agricultural research expenditures. In the short run, national income can be increased through policies encouraging farmers to produce commodities that are the most efficient earners or savers of foreign exchange. Long-term welfare gains can be assured only if research resources are used to strengthen national competitiveness on the international markets. The DRC framework can be used by research managers to decide how to allocate resources between commodities, regions, and technologies.

Morris (1989) notes that the connection between DRC rankings and research resource allocation is not always obvious. Straight comparative advantage analysis only shows which commodities are currently the most efficient foreign exchange earners. But, through sensitivity analysis, DRC ratios can be used to estimate the productivity gains needed to alter existing rankings. This information can then be weighed against the probability of the likely costs of achieving such productivity gains through research. This information can be useful to policy makers and research administrators if presented in a manner that is understandable.

2.3.4 Difficulties with the Approach

The DRC is a summary of the relative efficiency of domestic production. Its computation tends to be complex and time consuming because the analyst must resolve a series of difficult valuation

questions regarding what major domestic resources to include, what opportunity costs to assign to them, what shadow exchange rate to apply to foreign currency, etc. This requires a broad understanding of the production structure, the major technologies used, and the alternative markets and trade options. Such issues span both macro policy and micro production factors.

The approach has extensive data requirements including both domestic and world market price data, global transportation rates and handling costs, government import and export policies, taxes, subsidies, etc. Secondary sources need to be carefully verified for accuracy and representativeness. Some government policies affect all enterprises equally, driving a wedge between social and private profitability but preserving the relative rankings. Others have a differential impact by commodity. Detailed enterprise budgets are required to make the distinction.

2.3.4.1 Predicting General Equilibrium Effects

One criticism directed at the DRC approach concerns the difficulty of predicting general-equilibrium effects, both on the input and output side. DRC analyses capture only a small slice of the total development process (Tsakok, 1990). DRCs are calculated on a commodity-by-commodity basis rather than looking at economy-wide effects. They are specific to the current technology, region, scale of production and level of demand in domestic, foreign and exchange rate markets for one commodity.

The DRC for an enterprise does not show how much incremental production can be absorbed by the economy before reference prices are affected. Comparative advantage calculations implicitly assume fixed factor prices, implying that changing patterns of production will have no effect on factor prices in the future. This is not necessarily realistic. Expanding the scale of production may raise costs per unit of output as less-productive soils are brought into production and labor markets tighten. Similarly the country may run into international demand constraints.

DRC ratios are average rather than marginal measures. They reflect techniques employed by the average farmer who may be collecting rents at efficiency prices. They, therefore, do not reflect how costs and returns will change as output is expanded at the margin. Additional information is needed to supplement DRCs. Both judgment and sensitivity analysis are needed to test the stability of its relative ranking in the face of likely price changes. Often DRC calculations are conducted as a first step in the identification of commodities with the greatest potential for export expansion. Specific ROR analysis and feasibility studies are then needed to analyze the expected returns to investment in increased production for export.

2.3.4.2 Comparative Advantage Versus Competitive Advantage

Critics also contend that world market prices themselves reflect the significant impact of the policies of major producing countries. For example, the USDA estimates that the world price of wheat has been maintained at 33% below the equilibrium level that would prevail without farm support and export promotion programs in the industrial countries (Morris, 1989). Rather than measuring relative efficiency in production, DRC analysis represents a measure of one country's ability to compete at current world prices. Critics argue, therefore, that it is a measure of competitive advantage, not comparative advantage. While this may be theoretically correct, it does not affect the usefulness of DRC analysis and the Policy Analysis Matrix for purposes of policy evaluation. If international market policies are expected to continue, the social price of tradables to smaller producer countries is correctly estimated by the long-term world reference price. The rankings therefore retain their validity.

2.3.5 The Application of DRC Analysis in Uganda

Under the pressure for structural adjustment, Uganda is implementing policy reforms designed to reduce state participation in agriculture, increase productivity, liberalize commodity trade and free up market forces to direct economic activity according to efficiency



considerations. In particular, The Rehabilitation and Development Plan emphasizes the need " . . .[t]o increase and diversify agricultural export so as to involve the majority of Ugandans in the generation of their country's wealth and also to reduce the country's dependence on a limited number of agricultural commodities" (Ministry of Planning and Economic Development, 1989). To carry out this objective, the Agricultural Secretariat of the Bank of Uganda was charged with the collection and analysis of data necessary to guide export policy. An Agricultural Secretariat report (1991 p. 2) states unequivocally that:

> To export more and profitably, Uganda's exports must be competitive in the regional and/or world markets. Unless the commodities have comparative advantage in the world market, Uganda cannot export. The analysis of comparative advantage and competitiveness of Uganda's tradeable agricultural commodities is therefore, *sine qua non* for export diversification and growth strategy.

The periodic cost of production and DRC analyses of the Agricultural Secretariat form an important data resource for the broader policy analysis conducted in this study.

2.3.6 Sensitivity Analysis

While the DRC ratio is only a "snapshot" measurement, it is still a useful tool. One excellent feature of the DRC framework is that it lends itself to sensitivity analysis. This is important, because technical coefficients used in constructing the enterprise budgets are generally averages calculated from a range of observed values, and shadow prices are estimated or projected with uncertainty. The use of sensitivity analysis reveals to what extent the DRC rankings will change if the technical coefficients or prices differ from expectations.

The robustness of the DRC results will depend on the enterprise substitution possibilities, technology and relative prices. Morris (1989) suggested that they are usually most sensitive to changes in world market prices, yields, exchange rate, and wage rate. Of all these changes, *ceteris paribus*, a change in the world market price will have a greater effect on the social profitability of an enterprise than a change of similar magnitude in any other parameter. It is, therefore,

important to taking international demand and supply conditions into consideration and to determine how the DRC rankings are likely to be affected by projected changes in the international price.

To the extent that improved management or production packages can increase yields above current levels, commodities that are not currently socially profitable to export may become so in the future. The extent of sensitivity to exchange rate will depend on the relative foreign exchange intensity of the enterprise. If relative foreign exchange intensity is low and fairly uniform across enterprises, it is unlikely to have any great impact on the comparative rankings although profitability may change.

2.4 DYNAMIC CONSIDERATIONS

In this study, the presentation of the DRC analysis is complemented with analysis of 1) developments in international commodity markets that are likely to affect future market opportunities for Uganda, 2) Ugandan micro-economic and agricultural-sector policies that affect the edible oil subsector and 3) the underlying production and marketing cost structure and microeconomic environment in which production decisions are made[29]. The issues addressed include: 1) the conditions necessary for edible oil production to be profitable and competitive given expected future world prices and market conditions; 2) the degree to which macroeconomic conditions and the policy environment in both Uganda and its neighbors affect Uganda's potential competitiveness; 3) the comparison of benefits to the national economy from edible oil production *vis-à-vis* competing food and cash crop alternatives.

2.5 ADVANTAGES OF THE ANALYTIC APPROACH

This approach to the analysis of the edible oil subsector in Uganda has several advantages. First it relies on the tools of sub-

---

[29] The analytical framework borrows from the methodology adopted by Kristjanson et al. in their recent study of "Export Crop Competitiveness: Strategies for Sub-Saharan Africa" (1990).



sector analysis to identify the primary functions, participants and channels in the subsector, and depict the internal institutional environment and domestic demand structure. Secondly it assesses the costs and benefits to the national economy of edible oil production for import substitution. Third, it incorporates international market factors to look ahead at future international demand and supply trends. Lastly, it permits a dynamic analysis through alteration of the underlying assumptions to test for their impact on the relative performance and competitiveness of domestic edible oil production if policies, technology, agricultural productivity or marketing systems can be improved. The result is a broad-based understanding of the key facets of the subsector and its potential for contribution to the Ugandan economy and food security.

CHAPTER THREE: THE DEMAND FOR EDIBLE OILS IN UGANDA

3.1 CURRENT EDIBLE OIL CONSUMPTION PATTERNS

This analysis of the edible oil subsector in Uganda begins with an examination of the existing consumption patterns and demand for fats and oils. Many factors affect the consumption decisions of households including the level of household cash income, the price of the commodity and its close substitutes and complements, the occupation of the head of the family, the education level, religious and cultural practices, and the household composition. While income is the variable that is most often analyzed, its influence is actually the result of several economic and socio-cultural factors that are so interwoven that they cannot be easily isolated and separately quantified. Consumption analysis is a primary tool for estimating the total national production and market potential for commodities that are produced by many small firms who keep poor records.

Several previous attempts have been made to estimate the demand for edible oils and fats in Uganda. These include Coles (1968), Laker-Ojok (1986), Recon International Ltd. (1990) and Bunker et al. (1991). These efforts were severely handicapped by the lack of sufficiently detailed data. Estimates ranged from 1.14 kg/capita (Coles 1968) to 1.35 kg/capita (Recon 1990).

3.1.1 Data Analysis

The raw data set related to edible oil and fats consumption from the recent Uganda National Household Budget Survey was obtained from the Statistics Department of the Ministry of Finance and Economic Planning. A stratified random sample of 4,598 households was interviewed in 1989-90 in this single-visit household budget survey. This data set constitutes a rich source of information for consumption analysis. The official report from the survey, compiled primarily for purposes of defining the market basket for the new Consumer Price Index, tabulates household expenditure by categories. This data is not very useful, however, because expenditures were not adjusted for inflation during the



eighteen-month data-collection period. During 1989 inflation was running at roughly 90% per annum. It fell to approximately 33% per annum in 1990.

For purposes of this analysis, expenditure information for each household was adjusted to real annual values. The quantity purchased was calculated based on the number of units purchased and unit size. Outliers and unspecified units were adjusted using the regional average price of the commodity to estimate quantity purchased. Total thirty-day household consumption, including home production, was converted to annual values and divided by household size to obtain per-capita consumption[30]. Weighted means were calculated using the weighting system provided by the Ministry of Finance to reflect the national population distribution[31]. Weighted average consumption by commodity, rural/urban classification, region and income group is presented in Table 3.1. The substantial regional variation in consumption is depicted visually in Figure 3.1.

Seven Districts in Northern and Eastern Uganda were omitted from the household budget survey due to political insecurity at the time of the survey. This omission introduces certain biases into our estimation of total national consumption since regional consumption patterns differ considerably. The bias is overcome in the estimation of total national demand by weighting the average consumption per region by the regional

---

[30] The Household Budget Survey was a one-visit survey. It only collected food expenditures for a single month. This is obviously far from ideal, especially given that consumption is so directly related to home production in Uganda and therefore is likely to be highly seasonal. Edible oils would have less seasonal variability in supply, but demand is likely to vary according to the time of year, with greater consumption during holiday seasons. This contributes to a higher proportion of apparently non-consuming households than is likely to exist in the population. The following results and projections should be interpreted with caution.

[31] The mean consumption estimates differ depending upon the weighting system used. Higher income and urban households are over-represented in the Household Budget Survey sampling frame. Urban and high income households consume more edible oils, and have fewer members in the household. Thus average per-capita consumption using unweighted data, or weighting by household exaggerates national average consumption. This analysis presents the average consumption when each household member (as opposed to household) is weighted to bring the sample in proportion to national total population.



Table 3.1 National Edible Oils and Fats Consumption

		Butter & Marg.	Refined Oil	Other Oil	Short-ening	Ghee & Lard	All Fats & Oils[a]
% of Households Consuming		5%	32%	4%	11%	14%	56%
AVERAGE PER CAPITA HOUSEHOLD CONSUMPTION (KG / PERSON)							
National	Uganda	0.17	0.87	0.08	0.64	0.33	2.09
Class	High Income	0.61	2.06	0.05	0.76	0.52	3.99
	Average Income	0.17	0.85	0.09	0.64	0.32	2.07
Strata	Rural	0.15	0.66	0.08	0.59	0.31	1.79
	Small Urban	0.31	2.11	0.11	1.03	0.23	3.79
	Large Urban	0.42	2.83	0.16	1.05	0.53	5.02
Region	Central	0.11	1.14	0.05	0.43	0.45	2.17
	East	0.44	0.81	0.03	1.17	0.06	2.51
	North	0.00	1.59	0.15	0.03	0.02	1.77
	West	0.12	0.36	0.16	0.69	0.48	1.81
ESTIMATED NATIONAL ANNUAL CONSUMPTION FOR 1990 IN METRIC TONS							
		Butter & Marg.	Refined Oil	Other Oil	Short-ening	Ghee & Lard	All Fats & Oils
Households		2,872	15,494	1,538	10,149	4,625	34,678
Restaurants[b]							231
Institutions[c]							3,186
Industrial (Bakeries Only. Not Soap.)							105
TOTAL[d]		3,164	17,068	1,694	11,180	5,094	38,200
%		8%	45%	4%	29%	13%	100%
Average per Capita Consumption in KG		0.19	1.02	0.10	0.67	0.31	2.29

[a] This category is the sum of all others. Discrepancies are due to rounding.

[b] Estimated from Household Budget Survey expenditures on restaurant food.

[c] Estimates of Institutional and Industrial Use based on Recon, 1990.

[d] Restaurant, institutional and industrial use are assumed to be divided among the various types of oils and fats in the same proportion as household use.

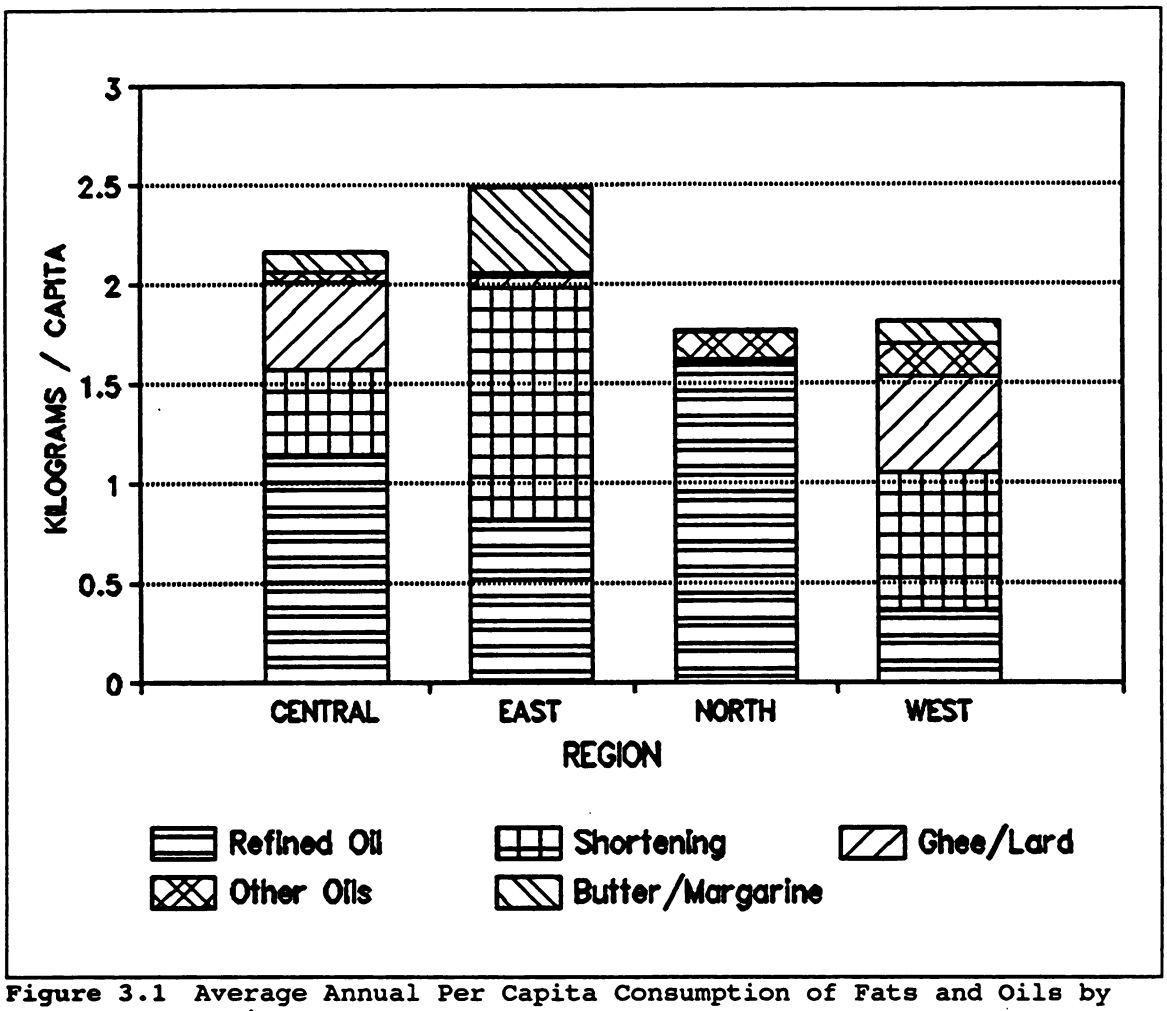


Figure 3.1 Average Annual Per Capita Consumption of Fats and Oils by Region

population as estimated in the 1991 population census[32].

The average annual consumption of 2.29 kg/person of edible oils and fats is substantially higher than previous estimates[33]. The difference in results can be attributed to the greater accuracy of using original quantity and price data. The earlier estimate by Bunker et al. was also based on the Household Budget Survey, but it simply converted unweighted nominal average per-capita expenditure into quantities using Kampala-based prices. This greatly underestimates total quantities,

---

[32] While it is fairly reasonable to assume that consumption in the Districts of Apach, Lira, Gulu and Kitgum would conform roughly to that in the surveyed districts for the Northern Region, this may not be the case for Moroto and Kotido, which are primarily pastoralist regions.

[33] This figure includes only edible uses for oils and fats. Fats and oils used for soap production have been excluded.



especially for locally produced ghee, lard, and unrefined oils, which are less expensive in the rural areas. An estimated consumption of 2.29 kg/person is still far below the world average of 15 kg/capita (Oil-world, 1993). Fats and oils consumption in Uganda ranks among the lowest in the world (World Bank, 1991a)[34].

3.1.2 Consumption Patterns

Ugandan consumption patterns contrast sharply with those in Kenya where most edible fats are consumed as hydrogenated vegetable shortening (commonly called "Kimbo" after the most popular Kenyan brand[35]). Kenyan edible oil and fats consumption averages 5.6 kg/capita per year (Zulberti 1988), of which 74% is shortening, 12% is margarine, 10% is refined oil and 4% is butter or ghee[36]. Per-capita consumption figures are likely to be greatly exaggerated, however, because they include substantial quantities of undocumented exports to Uganda.

On a national level, the largest category of fats consumed in Uganda is refined vegetable oil (45%). Consumption ranges from 0.3 kg/capita in the Western region to 1.6 kg/capita in the North. Vegetable shortening constitutes 30% of fats consumption, but sharp regional differences are observed. In the East, where imports from Kenya are readily available, shortening consumption averages 1.17 kg/capita, exceeding that of refined oil. Substantial consumption is also observed in western Uganda along the major trade routes to Rwanda and Zaire. In contrast, shortening consumption falls to less than 0.03 kg/capita in

---

[34] Estimates for other African countries are: 4.6 kg/cap - Zambia urban (VOPS NEWS, September 1992), 3.66 kg/cap - Tanzania (ibid), 3 kg/cap - Malawi (Hyman, 1993), 12.6 kg/cap Mali (Hyman,1991), 4.8 kg/cap - Zaire (Hyman, 1990) and 9.9 kg/cap - Cameroon (ibid). Estimation procedures vary, however, and may not be directly comparable.

[35] KIMBO was initially the abbreviation for the Kenya Industrial Management Board, the colonial regulatory body that collaborated with Unilever Ltd. of the UK in establishing the first vegetable oil refinery during World War II. Ironically, the initial raw material was semi-refined cottonseed oil from Uganda. The refined product was marketed under the brand name of Kimbo.

[36] Calculated from production figures from Zulberti (1989) and Kenyan Statistical Abstracts (1991). This estimation includes only fats and oils produced by formal sector manufacturers. No information is available concerning local oil and ghee production.



the Northern region. Similar patterns are observed for margarine and butter, which are largely imported from Kenya. These luxury goods disappear entirely from the consumption basket in the north.

Ghee and smaller quantities of lard form the third largest category of fats (13%). Consumption of these items is almost exclusively restricted to Western and Central Uganda where cattle keeping and ghee manufacture are traditional enterprises. Average ghee consumption in the Western region is .47 kg/capita.

The miscellaneous category "other oils" represents a significant level of consumption in the north, far exceeding shortening, butter, margarine and ghee combined. Consumption is also substantial in the west. In the West and Lake Victoria Islands, this category represents primarily traditional palm oil production. In the North, it is primarily sheanut butter. Unquantified amounts of locally produced sesame, soybean and groundnut oil may also be included in this category.

The growing quantities of cold-pressed sunflower oil appear to have fallen between categories in the survey. Undoubtedly some households included it with their reports of "refined oil," while others may have classified it with "other oils".

Two other factors are also important. Total fats and oils consumption increases with both income growth and urbanization, as illustrated in Figure 3.2. When this information is combined with information on the distribution of population in Uganda, it becomes evident that despite the fact that consumption is higher in urban areas, this is outweighed by the overwhelming proportion of the population which is rural. Eighty nine percent of Uganda's population is rural, as compared with 6% small urban and 5% large urban[37]. As a result, 69% of the demand for oil and 82% of the demand for shortening is in the rural areas, as seen in Figures 3.3 - 3.5.

What Figure 3.2 does not show is whether expenditure on edible oils increases proportionately with the rise in income. Income elasticity changes depending upon the income level and standard of

---

[37] The only large urban community is Kampala with a 1990 population of 774,241. Small urban is defined as any town or trading center with a population in excess of 5,000. The largest urban area after Kampala is Jinja, with a population of 65,169.

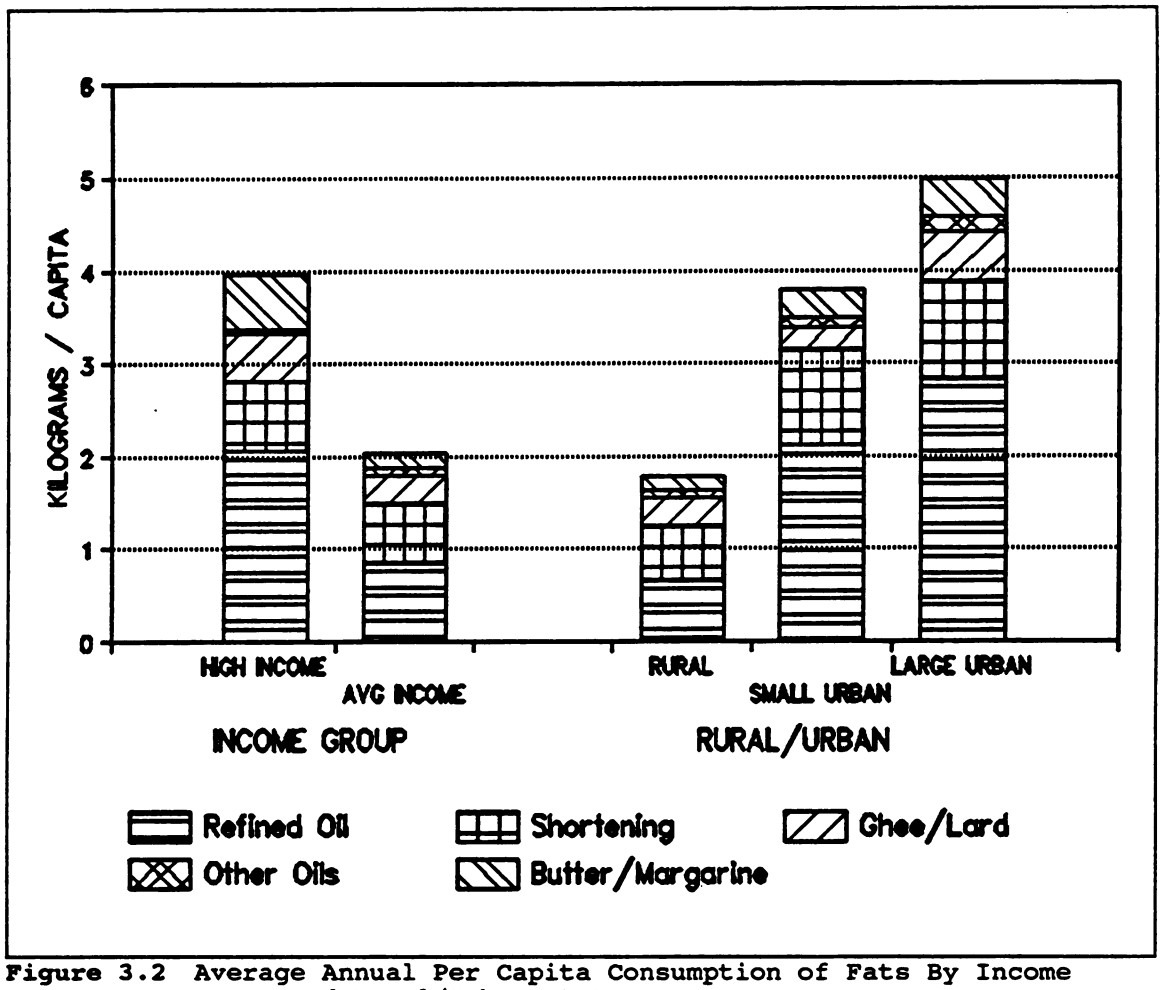
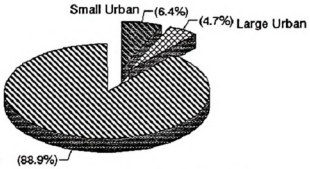


Figure 3.2 Average Annual Per Capita Consumption of Fats By Income Group and Rural/Urban Status

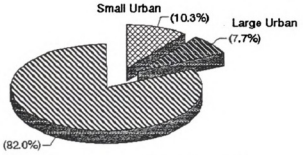
living of the consumers. Luxuries for the poor become necessities for the well-off. They may even become inferior goods for the very rich. This is reflected in the changing slope of the demand curve over the range of incomes.

The households in each region of Uganda were divided into four equal groups, or quartiles, based on total annual per-capita expenditure

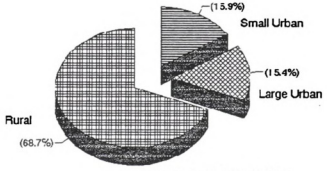




Population Distribution



Shortening Consumption



Refined Oil Consumption

Figures 3.3, 3.4, & 3.5



as a proxy for income[38]. The average per-capita proportion of annual expenditure spent on each of the fats and oils was then calculated by region. A similar process was followed for rural, small-urban and large-urban households. The results of this analysis are shown in Figures 3.6 and 3.7.

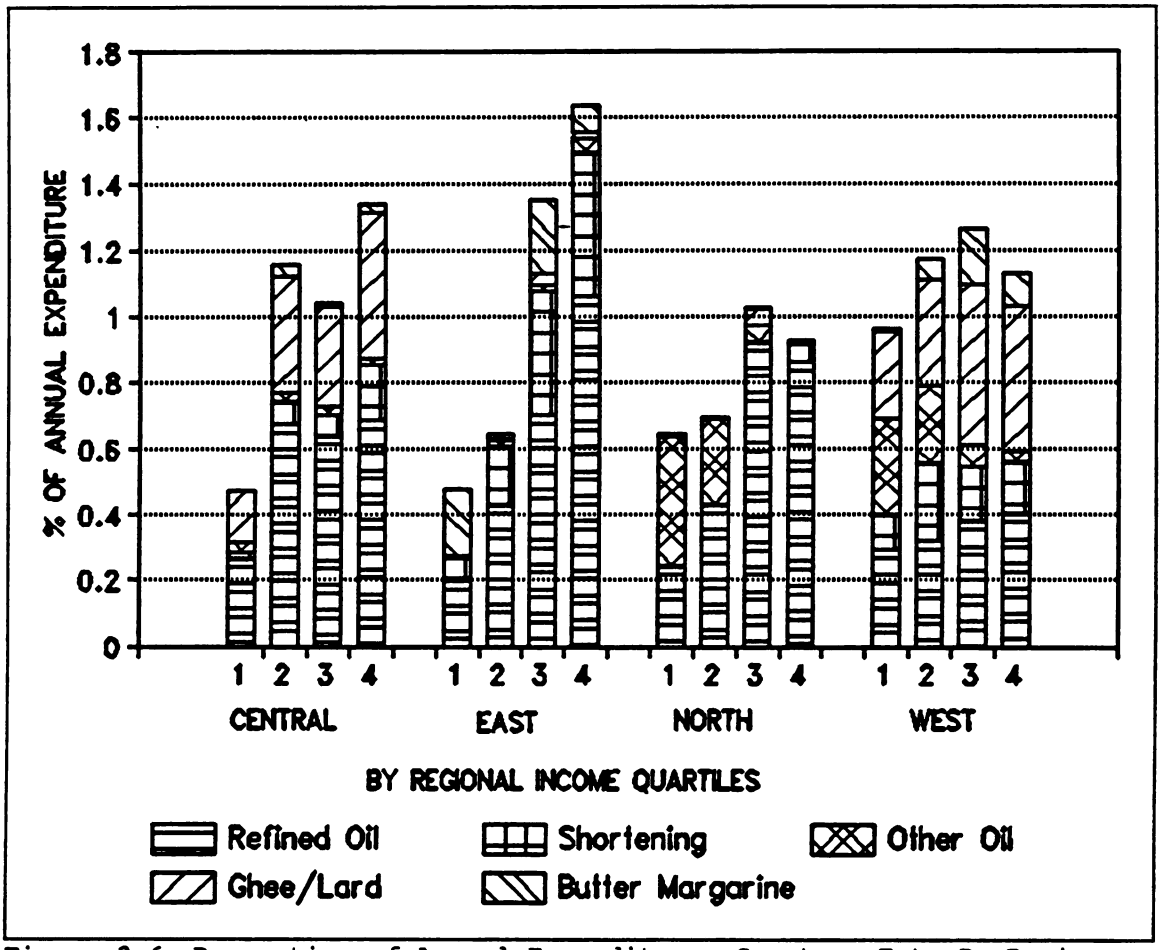


Figure 3.6 Proportion of Annual Expenditures Spent on Fats By Region

The demand for refined oil and shortening increases as income rises, not only in absolute quantity but as a relative proportion of total expenditure. These are both superior goods. For shortening, the

[38] Income data was not collected in the Uganda Household Budget Survey. Insufficient information was included in the data set which was given to the researcher to allow instrumental estimates of income based on assets, housing characteristics, etc.



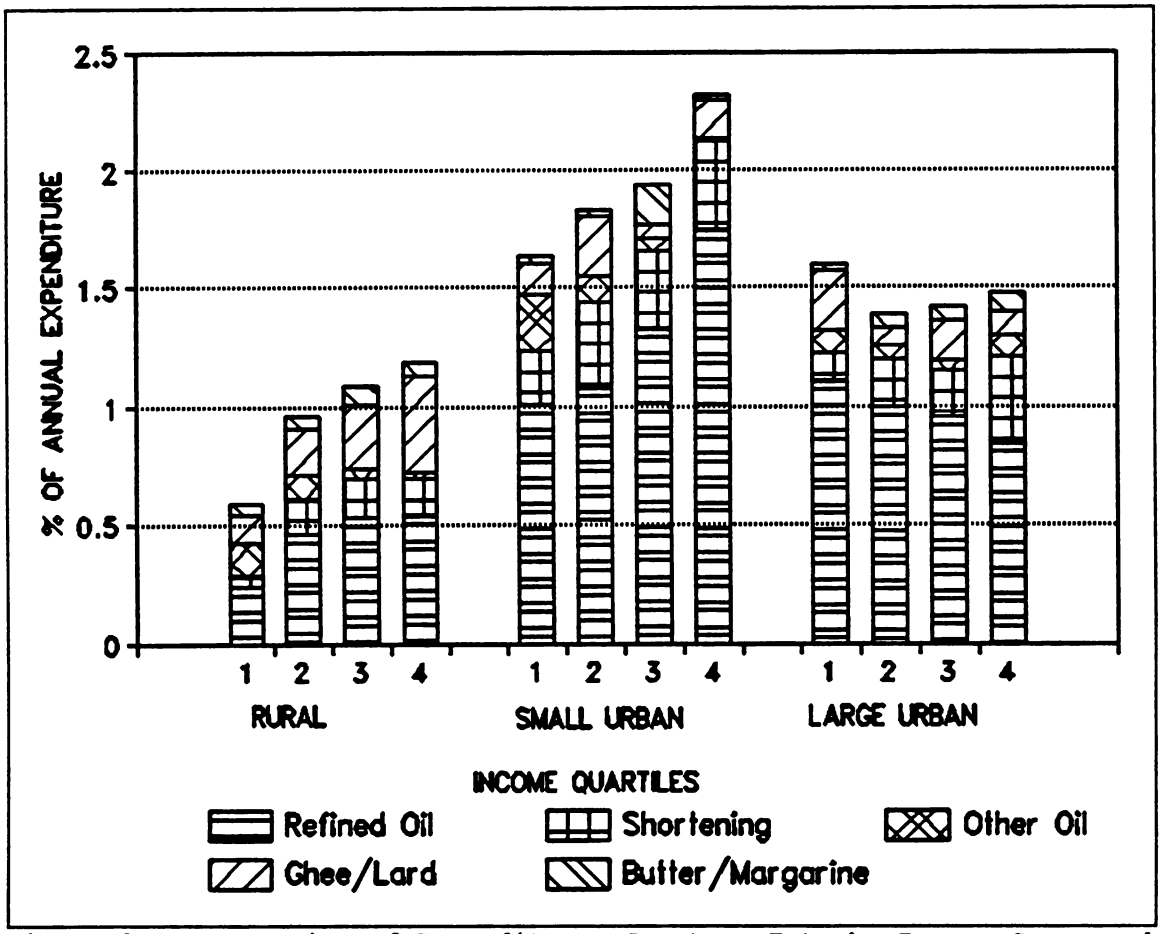


Figure 3.7 Proportion of Expenditures Spent on Fats by Income Group and Rural/Urban Status

pattern continues to hold in the large-urban areas. The relative expenditure for cooking oil falls in the large-urban centers as incomes increase. Given the concentration of the highest income households in the large-urban areas, this would indicate that the demand curve for refined oil has the expected "s" shaped Engel curve. Demand for refined oil hits an inflection point somewhere within the upper Ugandan income range, shifting from a superior to a normal good. This implies a positive income elasticity less than unity for the upper-income households in large-urban areas.

Ghee is a superior good for the rural population, but consumption trends are erratic among the urban population. Similarly, butter and margarine are superior goods in the rural and large-urban settings, but

erratic in the small-urban areas. Given that so many of Uganda's smaller towns have no electricity, this may be a function of availability, given a general lack of refrigeration capacity.

In contrast, other oils are clearly not a superior good. Relative consumption falls as income rises in both the rural and small-urban settings. Given the regional differences in tastes, in some regions other oil consumption even falls in absolute terms when incomes increase.

The Uganda data correspond well with information from other developing countries. Consumption trends in the past decade confirm that when calories per-capita derived from fats and oils are below 400 kcal/day, very small income increases can trigger very large increases in the daily intake of fats and oils. Household income is the main variable explaining changes in fat consumption over time. The FAO (1980) noted that:

> In the developing countries, which consume small amounts of fats and oils, the elasticity of demand is very great, but rapidly increasing populations and slow income growth have severely limited any improvement in per capita consumption. This is particularly evident in the African and Asian regions . . .. Therefore, in most developing countries, the potential for increased per capita consumption is enormous, although its realization will depend on higher incomes unless other measures to increase availability at low prices are instituted.

3.1.3 Package size and Product Differentiation

In Uganda package sizes for edible oils and fats range from small one gram cellophane packets to twenty liter jerrycans. Most Ugandan consumers purchase edible oils in very small quantities at any one time. The percentage of households (% HH) that bought fats and oils in 1989/90 in the various package sizes is shown in Table 3.2. This table also gives the percentage of total quantity of that commodity purchased (%QP) by package size.

Over 40% of the consumers purchase hydrogenated shortening in packages of less than a quarter of a kilo. These consumers account for less than 16% of total sales. More than half the shortening sold is packaged in 500g tins or paper packets. Margarine sales are split fairly evenly between half kilo and kilo tins, with each of these

Table 3.2 Distribution of Household Purchases and Total National Sales of Edible Oils and Fats by Package Size

Package Size	Shortening		Margarine		Butter		Refined Oil	
	% HH	% QP	% HH	% QP	% HH	% QP	% HH	% QP
<0.25 kg/lt[a]	40.9	15.9	36.4	19.0	24.6	59.7	43.0	38.8
0.25 kg Soda Btl.	2.2	0.8	1.8	1.1	48.1	24.1	26.4	22.2
0.5 kg/lt	52.6	57.8	51.0	39.3	22.5	13.0	15.4	11.7
0.75 kg/lt	0.3	23.0	NA	NA	NA	NA	6.4	6.4
1 kg/lt	3.7	2.2	10.1	39.0	4.9	3.1	6.7	13.3
> 1 kg/lt	0.3	0.3	0.8	1.5	0.0	0.0	2.1	7.6

% HH = Percentage of the sampled households who purchased this size package.
% QP = Percentage of total quantity purchased which was bought in this size of package.
[a] Units for Shortening, Margarine and Butter are expressing kg. Units for oil are expressed in Liters.
Source: Calculated from Household Budget Survey data collected by the Statistics Division, Ministry of Finance and Economic Development.

package sizes comprising about 40% of the total quantity sold. While more than 36% of the margarine consumers purchase it in packets of less than 250 gm, these consumers purchase less than 20% of the quantity sold. The statistics for butter are confusing. According to the data, nearly 60% of the butter is sold in packages of less than 250 gm. Fresh butter, whether from Kenya or Uganda, is only packaged in one kilo and half kilo sizes. There is some tinned butter imported from Kenya and this comes in 250g tins, but it is not believed to be widely available. It is likely that many consumers reporting expenditure on small quantities of butter have confused it with margarine, which does come in smaller packages.

Most of the refined cooking oil is imported in 20 liter or 3 liter plastic containers or tins. This oil is then retailed to consumers in small quantities, with consumers providing the containers. Common measurements range from a small dipper of 1-2 ml to a 750 ml whiskey bottle. Nearly 75% of all consumers purchase their oil in units of 280 ml (the standard returnable soda bottle) or less. The 3 liter

packages are primarily purchased by high income urban households, small institutions or restaurants and petty market traders who intend to retail in small quantities. Larger traders and big institutions buy in 20 liter jerrycans.

Until recently none of the locally produced unrefined oils were sold in retail sized packaging. Instead they, too, are retailed in small broken lots, with consumers providing the container. Ghee and lard are generally sold by the spoonful, although some urban retailers sell them by weight. As solids, they are easier to handle. Some producers, especially in the rural markets, 'package' their ghee in local gourds of varying sizes.

Fully refined oil is both deodorized and bleached, resulting in a homogeneous product. Indications are that Ugandan consumers are largely indifferent between types of refined oil. Few customers are aware of the distinction between saturated and unsaturated fats and its health implications. Even retailers are largely unaware that the "Pure Vegetable Oil" that they are selling is primarily coconut or palm oil. The American PL480 oil is also labeled simply as vegetable oil.

Most local processors do not label their product by the type of oil. In this way they can alternate between cottonseed, soybeans and sunflower depending on availability and use a single label. Often it is only by knowing the origin of a particular brand that one can identify its probable contents. Corn oil and olive oil are imported only for high income consumers.

Analysis of prices by size of container shows that on average, small units sell at a premium over larger containers. This is expected to cover the retailer's profit margins. The price standard deviations were very high, however, and the price differences between unit sizes were not statistically significant at the 10% level.

3.2 ANTICIPATED CONSUMPTION TRENDS

The next step in the analysis is to incorporate the information on regional consumption patterns and income elasticity for purposes of projecting future edible fats and oils consumption. The results of this analysis are presented in Table 3.3.

Two alternative scenarios are presented. In the first, edible fats consumption is projected, based on population growth. No real income growth is assumed. In this case, demand increases at 2.5% per annum[39] in direct proportion to the estimated population growth. In the second scenario, real per-capita income was projected to grow at 2% per annum, the average rate for the past 9 years[40]. Such a growth rate seems reasonable given Uganda's improved macroeconomic performance in recent years. The latest figures indicate that the real GDP grew at a rate of 7% in 1992/93 and that the underlying rate of inflation has fallen to 7.7% (Ministry of Finance and Economic Planning, 1993).

Engel curves were fitted, using data from the National Budget survey, in order to estimate the income elasticity of edible oil and fats consumption. The estimated income elasticities using alternative functional forms for the Engel curve are presented in Table 3.4.

Total annual expenditure was used as the only available proxy for income. The regression of expenditure on edible oils against total

Table 3.3 Projected National Oil and Fats Consumption, 1991 to 2005

Scenario	Year	All Fats & Oils MT	Refined Oil MT	Kimbo MT	Other Oil MT	Ghee & Lard MT	Butter & Margarine MT
No Income Growth, Population Effects Only	1991	38,200	17,068	11,180	1,694	5,095	3,164
	1995	42,166	18,839	12,340	1,870	5,624	3,492
	2000	47,706	21,315	13,962	2,116	6,363	3,951
	2005	53,975	24,116	15,797	2,394	7,199	4,470
2% Per Annum Real Income Growth	1991	38,200	17,068	11,180	1,694	5,095	3,164
	1995	47,064	21,007	14,095	1,975	6,149	3,837
	2000	61,121	27,233	18,831	2,394	7,780	4,883
	2005	79,421	35,306	25,158	2,900	9,843	6,214

Source: Projected using historical population growth rates and income elasticities calculated from Household Budget Survey data from the Ministry of Finance and Economic Planning.

[39] Based on the national average growth rate for the 1980-91 period as estimated by the 1991 census (Ministry of Finance and Economic Development, 1992).

[40] Based on per capita real GDP figures for 1984-1992 (Ministry of Finance and Economic Planning, Key Economic Indicators, April 1993).

household expenditure was undertaken using a variety of possible functional forms suggested by consumer demand theory. The estimated functions and their respective elasticities are presented in Table 3.4.

The best fit for all commodities except other oils was obtained with the expenditure dependent log log exponent functional form. This functional form has the advantage of allowing for substantial curvature of the demand function as incomes rise. Real per-capita expenditure on the commodity for consuming households was estimated as a function of the log of real total per-capita expenditure, the log of real total per-capita expenditure squared, and a series of additive dummy variables for location that incorporated both region and rural/urban status. This functional form not only gave a reasonable adjusted R squared, but gave elasticities greater than unity, which fits the visual inspection of the income quartile expenditure patterns. While the Adjusted R squared values may appear low by comparison with those normally obtained using time series analysis, they are within the expected range for cross-sectional data. All coefficients were significant at the 1% level, as were the F-statistics for the complete equations.

For other oils the adjusted R squared was very low with this functional form and the elasticity was greater than 2. This is a higher elasticity than any other commodity, in direct contradiction to the visual inspection of the income quartile expenditure patterns. For this reason, projections for other oils were based on the median income elasticity for the log log inverse functional form. The log of real per-capita expenditure on other oils for consuming households was estimated as a function of the log of real per-capita total expenditure, the inverse of real per-capita total expenditure, and the locational dummies. These coefficients were also all significant at the 1% level as was the F statistic for the complete equation.

The use of total expenditure as a proxy for income ignores the possibility of savings. This procedure does introduce certain biases since expenditure on a given commodity item may be correlated with total expenditure. Given the small proportion of expenditure on edible oils, this is not likely to be a serious complication. Additional demographic and asset information was not available to allow the use of a two-stage least squares procedure to instrument the income variable.

Table 3.4 Income Elasticity Estimation for Edible Oils and Fats

Functional Form	Commodity	Adjusted R Squared	Expenditure Elasticity		
			25%tile	median	75%tile
$X = a\ln Y + b(\ln Y)^2 + c_1D_1 + c_2D_2 + c_3D_3 + c_4D_4 + c_5D_5 + c_6D_6 + c_7D_7 + c_8D_8 + c_9D_9 + c_{10}D_{10} + c_{11}D_{11} + c_{12}D_{12}$ Consuming Households Only	Kimbo	0.46	1.34	1.69	1.21
	Butter / Margarine	0.51	-0.49	1.19	1.56
	Ghee/Lard	0.33	0.94	1.13	0.92
	Refined Oil	0.38	1.83	1.38	1.01
	Other Oil	0.14	2.63	2.95	2.64
	Oils & Fats	0.36	1.10	1.70	1.52
$X = a\ln Y + b\ln(1/Y) + c_1D_1 + c_2D_2 + c_3D_3 + c_4D_4 + c_5D_5 + c_6D_6 + c_7D_7 + c_8D_8 + c_9D_9 + c_{10}D_{10} + c_{11}D_{11} + c_{12}D_{12}$ Consuming Households Only	Kimbo	0.45	0.81	0.91	0.98
	Butter / Margarine	0.43	0.46	0.60	0.67
	Ghee/Lard	0.26	0.84	0.76	0.70
	Refined Oil	0.46	1.00	0.92	0.86
	Other Oil	0.38	0.64	0.69	0.73
	Oils & Fats	0.45	0.97	0.95	0.94

X = the per capita consumption of each commodity.
Y = total per capita expenditure as a proxy for income.
ln = the natural log.
$(\ln Y)^2$ = the square of the log of total per capita expenditure.
ln (1/Y) equals the log of the inverse of per capita expenditure.
D_1 through D_{12} are additive dummy variables representing region and rural urban status. They include: Central Kampala, Central Masaka, Central Other Urban, Eastern Rural, Eastern Jinja, Eastern Mbale, Eastern Other Urban, Northern Urban, Northern Rural, Western Rural, Western Mbarara, Western Other Urban.

Much more serious is the problem of having many zero consumption households in the data set. For many Ugandan households, fats and oils are only a periodic purchase. In the rural areas, fried foods are primarily prepared for special occasions. Because the Household Budget Survey was based on a single visit, many households did not purchase oil or fat during the one month recall period, even though they do consume oils and fats on irregular occasions throughout the year. Many functional forms used in Engel curve estimation are linearized using the natural log of expenditure as the dependent variable. These functional forms can be estimated using linear regression and still provide the necessary curvature to capture the changing elasticity of demand as incomes rise. By their very nature, non-consuming households are excluded from such an analysis because the log of zero is undefined. While the author recognizes that exclusion of these households introduces a self-selection bias into the analysis, this was considered the best available alternative[41]. More accurate estimations of the income elasticity will require a detailed, multi-visit consumption survey that is better able to capture the irregular consumption of low income households.

The importance of the income effects is illustrated in Figure 3.5. When a real income growth rate of 2% is incorporated with the estimated income elasticities, consumption increases rapidly. Not only is projected consumption with income effects nearly double that without by the year 2005, but the commodity proportions change. The proportion of refined oil remains relatively constant, but shortening consumption expands displacing some of the ghee, butter and other oils in the national market basket[42]. Therefore, if Uganda can maintain its average real per-capita income-growth rate, the demand for edible oils is likely to increase rapidly and to include a higher proportion of more

---

[41] The alternative of using another functional form and including these irregular consumers as non-consuming households results in a very poor fit. The income elasticities derived from the current analysis correspond well with the general conclusion from other studies that edible oils are very income elastic at low consumption levels.

[42] Shortening displaces ghee, butter and other oils only in a relative sense (as a percentage of total fats consumption), not in absolute terms. National butter and ghee consumption continue to expand in absolute terms.

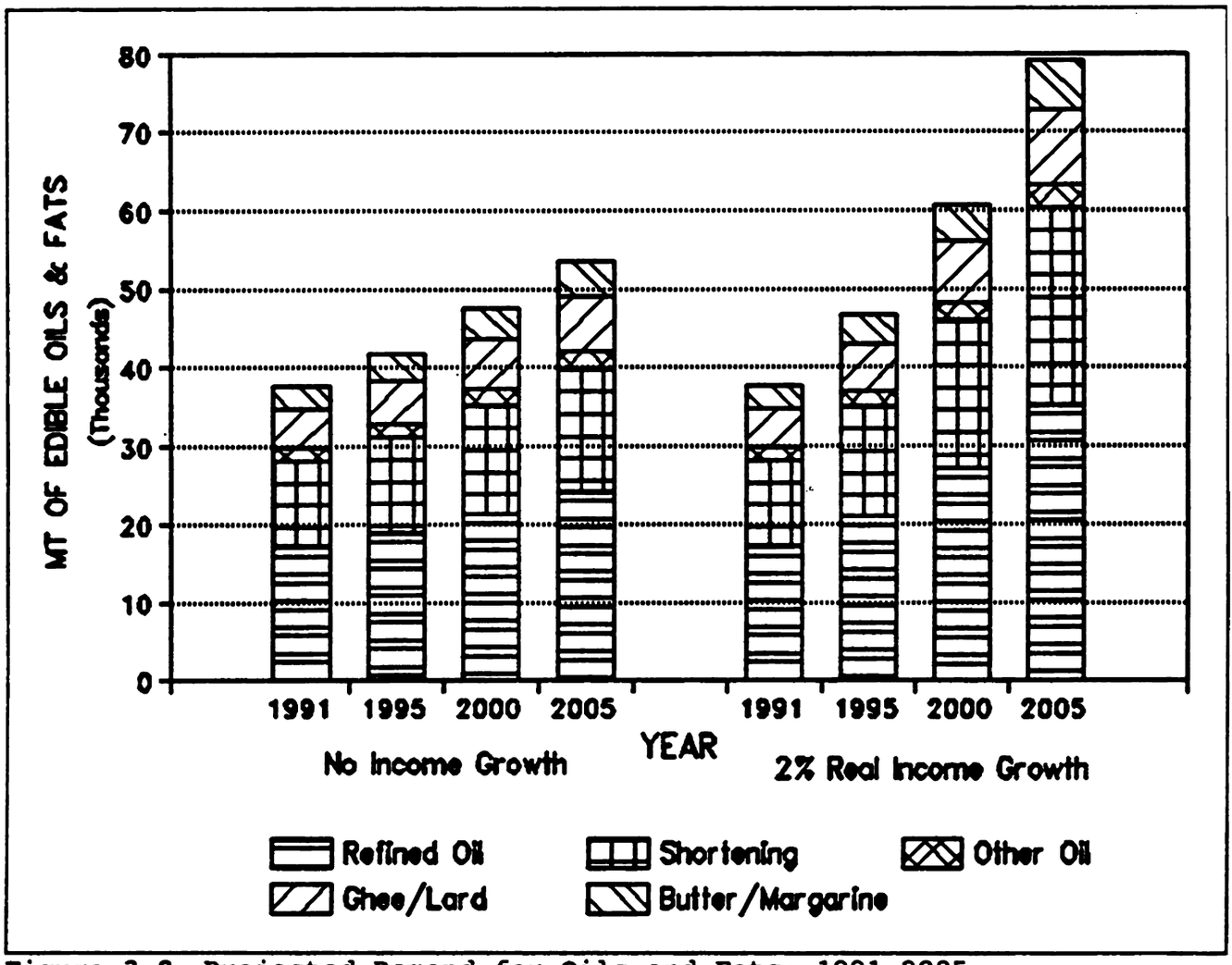


Figure 3.8 Projected Demand for Oils and Fats: 1991-2005

expensive hydrogenated vegetable shortening. This then has implications for the demand for foreign exchange to purchase growing quantities of imported refined and processed fats.

3.3 INTERNATIONAL PRODUCTION AND PRICE TRENDS FOR EDIBLE OILS

To assess the likely foreign exchange costs of Uganda's continued import dependence for oils and fats it is necessary to consider the current world market situation and likely future prices. World output and consumption of fats and oils have been increasing by nearly 1.2 million metric tons a year over the past decade. The most important increases in output have taken place in soybean, palm, rapeseed and sunflowerseed oils. Despite their need for increased domestic consumption and export earnings, developing countries have only just managed to maintain their share of total output. The US is by far the

largest exporter of fats and oils. While the largest importers continue to be Western Europe and Japan, imports into developing countries have been growing at a faster rate (over 7% a year) and now account for about one quarter of the world total.

Edible oils and protein oilcakes form a complex market in which substantial substitution takes place between commodities. Prices for the major oilseeds, meals and oils fluctuate greatly over time but generally move together. Meal is used primarily to provide protein and energy in animal feed rations. The availability of oils and meals varies as the mix of oilseed production changes over time in response to market forces, national policies and technological change. The international market for oilseeds and oil products is complicated because production includes both input-intensive annual crops and perennial tree crops that may require minimal inputs after establishment. The interplay between the demand for meal and oil also affects the ability of production to respond to shifting demand since farmers respond to the joint value of both oil and cake. For example, the shift to increased production of palm oil has affected the supply of meal since there is no associated output of meal from this commodity. This has resulted in oil prices declining relative to those for meal[43]. When meal prices are high relative to oil, this favors prices of high meal-content seeds such as soybeans. When oil prices are high relative to meal, the price of high oil-content seeds, such as sunflower, rises.

Growth in meal demand has been most rapid in the developed countries, followed by the rapidly developing economies of Southeast Asia and the former Soviet Union. World vegetable oil consumption has grown most rapidly in the developing countries, where high rates of population growth or rising incomes are spurring increased consumption.

World oilseed production has grown at an average annual rate of 3.8% during the 20 year period between 1969 and 1989 (Kristjanson et al., 1990). Production increased most rapidly for rapeseed and palm kernel, exceeding 9% per annum. Sunflowerseed follows with a growth rate just over 5% per annum. Soybeans, historically the dominant oilseed,

---

[43] EC policies favoring expansion of high oil-content oilseeds have further exacerbated this shift (Kristjanson, 1990).



increased at slightly less than the average rate for all oilseeds. Groundnut production increased at only 1.9% per annum followed, by sesame and castor seed.

World meal production increased at an average rate of 4.6% in the same twenty year period[44]. World vegetable oil production increased even faster, at a rate of 4.8% with palm, palm kernel, rapeseed and sunflower seed gaining in relative importance.

Production of oilseeds is driven by the demand for meal and oil. The one major exception is cottonseed, which is a byproduct whose supply is determined by the supply and demand for cotton lint.

Agricultural policy is a major factor in world oilseed production. In the 1980's the European Economic Community adopted policies that favored oilseed production relative to grains. Production of rapeseed, sunflowerseed, and soybeans expanded rapidly in response. The Economic Community has emerged as a significant producer of oilseeds and protein meals. In contrast, the United States, under the Food Security Act of 1985, made production of major grains and cotton more attractive than oilseeds. As a result, soybean and sunflower production declined and output shifted elsewhere. The US lost world market share for oilseeds and products while soybean planting in South America expanded in response to the improved market opportunities. In China and India, restrictive import policies have spurred production at higher than world market prices while keeping per-capita consumption well below free-market levels. In India only the State Trading Corporation is allowed to import oilseeds and oilseed products. After 1989, Indian prices for groundnut, cottonseed and rapeseed oil were 150%, 193% and 253% of the cost of imports, respectively. The area planted to oilseeds has not changed significantly in response to the higher prices. Production remains highly dependent on weather, and no real breakthroughs in yields have been achieved (World Bank, 1991).

Market-oriented policies in Malaysia and Indonesia have encouraged expansion in oil palm production. Malaysian agricultural

---

[44] This excludes corn gluten feed and meal which expanded at an annual rate of 6.6% during this period in response to American agricultural policies stimulating sweetener and alcohol production based on corn..

policy in the last decade has stressed the need to raise rural incomes rather than emphasizing food self-sufficiency. Technological change has been the primary engine behind the dramatic growth of palm and palm kernel oil production. The process began when Cote d'Ivoire, Nigeria, Malaysia and Indonesia borrowed the basic breeding strategy for the higher-oil-content hybrid oil palm developed by a Belgian research team at INEAC in Zaire in the 1930s, adapting them to local conditions (Eicher, 1991). Malaysia developed a system of taxing agricultural exports to finance its agricultural research programs, paying excellent salaries to its senior agricultural scientists to avoid the problem of brain drain that has plagued African nations. Public and private research and market development are well coordinated. Biotechnology research to enhance productivity is combined with "downstream" market research. Examples include the development of margarine, shortening and cocoa butter substitutes for specific market niches, the use of methyl esters of crude palm oil as a diesel substitute for vehicles, and the treatment of oil palm logs for use as firewood (PORIM, 1985).

The world market for edible oils is being flooded with palm oil because of the rapid vegetative propagation of high-yielding oil palm clones (Bijman et al., 1986; James, 1984). The main tissue production units pioneering this work are based in France, England and the US. The estimated world demand for oil palm is 100 million clonal trees per annum. The larger micropropagation facilities in Europe such as Unifield Ltd., have current production capacities in the region of 1-2 million oil palm plantlets per annum. While there are small production facilities based in Malaysia, India, and Cote d'Ivoire, it is likely that much of this technology will be tightly controlled by the multinational companies to recoup their high research and development costs (Farrington, 1990). Malaysian oil producers have profited from the increased production, as has Unilever, the sponsor of the research, while coconut producers in the Philippines have seen their market collapse.

In 1982, production of palm oil rose 18% over the previous year. Malaysian oil increased by 600,000 mt during the same year (23%). Frank Fehr and Co. (1983) reported that one factor responsible for the meteoric rise of Malaysian palm oil was the introduction of a weevil



that burrows deeply into the palm flowers and dramatically increases the number of fertilized blossoms. This in turn increases the number of palm kernels and fruits per bunch. In 1982, Malaysian palm kernel production exceeded 1981 production by 93,000 mt.

The efficiency of palm oil production, as reflected in its costs of production, was demonstrated by Tan Bock Thiam (1987). He found that the long run cost of production in the major producing countries ranges from 205.1 to 242.0 US$/mt. In the short run production costs are only 116.4 to 147.5 US$/mt. These long-run costs are low compared to minimum world market prices experienced to date. Kristjanson et al. (1990) asserted that the cost of harvesting and processing oil palm is so low that world vegetable oil prices "could never fall enough to cause fresh fruit bunches to be left unharvested."

New plantings of oil palm will continue to come into production through to the end of the decade. The World Bank (1991) projected that world palm oil production would continue to increase at 6% per annum in the period between 1989 and 1995. Production in Malaysia and Indonesia was expected to grow by 8.4 percent in this period, expanding their share of world output. By far the greatest growth is projected for Latin America, where palm oil output is expected to grow at 14% per annum, more than doubling African production by 1995.

The structural changes in the market during the past decade have brought an increased competitiveness to world markets. Edible oil prices tend to be highly correlated and have declined over the past 20 years, as illustrated in Figure 3.6. The World Bank (1991) predicts that these forces will continue to be reflected in a downtrend in real prices over the long term. With demand in the Western world leveling off and foreign currency shortages limiting imports in many developing countries, prices are likely to continue to be depressed. Production may eventually fall in response to low prices but the supply response is limited by the fixed cost nature of perennial crops.

The World Bank (1991, p.186) notes that: "A salient feature of the vegetable oil market is its remarkable price volatility, extraordinary even by the capricious standards of primary product markets." In the past, this volatility has been largely the result of the disproportionate share of production concentrated in the American



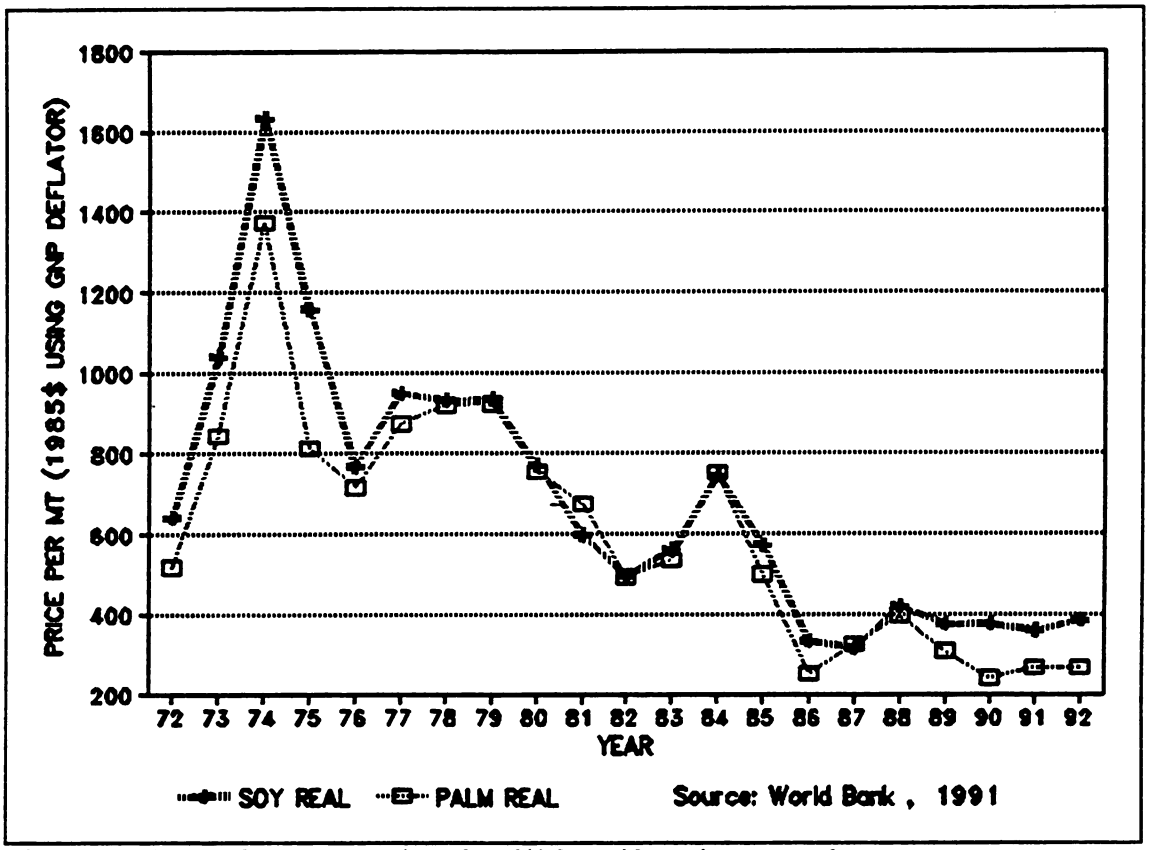


Figure 3.9 Real International Edible Oil Price Trends

corn belt. Weather and policy changes affecting the US soybean crop and the level of government stockpiles quickly radiated out, affecting world prices for all oils and meals.

Even though production is increasingly diversifying into Latin America, Southeast Asia and Europe, other forces continue to make the market unstable. Farmers growing annual oilseeds respond to price incentives which result from a combination of both meal and oil prices. Since the demand for meal is a function of the livestock market while oil is used primarily for human consumption, market conditions for the two products can be very different. Different combinations of meal and oil prices can result in the same commodity price for the underlying oilseed, causing unexpected results in the international market.

In contrast, the ability of oil palm and coconut producers to respond to short-term price incentives, is limited by the long-term nature of their production decisions. The majority of the production costs for tree crops are fixed and unavoidable. Decisions which result



in today's production of palm oil were made over a decade ago. Tree-crop oil production is unresponsive to short-term gluts in the international oil market caused by factors affecting the annual oilseeds.

The high degree of substitution among oils and meals, the joint nature of meals and oils production from annual oilseeds, and the fixed nature of perennial vegetable oils production interact, causing the severe instability in international oil prices. While real prices are likely to continue to fall, the extreme volatility of oil prices will only gradually lessen as production diversifies further. This volatility introduces considerable price risk for both producers and consumers. Countries that rely on oil and oilseeds exports for a large part of their foreign exchange earnings face great uncertainty regarding income and debt management. Importing countries face similar problems in anticipating their total foreign currency expenditure. This price instability has been important in spurring recent proposals for policy change in Kenya (Zulberti et al., 1992).

3.4 PROJECTED COSTS OF CONTINUED IMPORTATION

3.4.1 World Market Price Projections

The first step in projecting the cost of continued edible oil import dependence in Uganda is the projection of world market prices. World Bank (1991) price projections are used as the base-case scenario. High and low price ranges are then estimated for purposes of sensitivity analysis.

A look at historical price patterns indicates that, for the 1980-1990 period, variations of 30% above and below the ten-year average price encompass most prices[45] realized during this period. This, therefore, is the degree of variation around the price level projected for 1995 used for purposes of sensitivity analysis. The resulting world market price estimates are given in Table 3.5.

---

[45] I.e., two standard deviations.



Table 3.5 World Market Price Projections for Edible Oils

Year	World Bank Price Projection		Base-Case Scenario Estimate	Sensitivity Analysis Range	
	Palm	Soy	All Oils[a]	Minimum[b]	Maximum[c]
1995	408	515	450	315	585
2000	425	575	475	332	618
2005	450	634	510	357	663

[a] Assuming 1/4 soy oil and 3/4 palm oil.
[b] Minimum = base - 30%
[c] Maximum = base + 30%

3.4.2 Factors Affecting the Costs of Imported Edible Oil Products in Uganda

World market prices for edible oils must be adjusted to reflect local conditions. Uganda is a landlocked country. Most goods imported by Uganda are sent by sea freight to the port of Mombasa and then proceed overland by either rail or truck. The ease and cost of transportation is dependent upon the political relations with neighboring Kenya and on Kenyan customs and clearing procedures. The Kenya-Uganda border has been closed several times in recent years, resulting in unpredictable shortages of consumer goods in Uganda. The cost of shipping is, therefore, an important factor affecting the final price of imported edible oils in Uganda.

In addition, world market prices also must be adjusted to reflect differences in quality and packaging. Information from major Ugandan importers of edible oils indicates that the CIF Kampala price of refined palm oil from Singapore averages at least twice the world market price of bulk palm oil in Rotterdam. This price differential reflects the costs of refining and packaging in three liter containers plus freight and port charges. Similarly, the C&F Kampala cost of American soybean oil averaged 220% of the European world market price in 1992. This information is used to adjust the projected foreign exchange costs of a



ton of edible oil assuming 1/4 American soybean oil and 3/4 palm oil from Singapore.

Projections concerning the future cost of hydrogenated shortening imports from Kenya are complicated by shifts in Kenyan price and tax policy, the porous nature of the Uganda/Kenya border and the large volumes of currency regularly exchanged on the parallel market. These factors are discussed in greater detail in the section on wholesale and retail markets in Chapter Five. Historical averages for the past ten years suggest that the US$ retail price of shortening in Kenya averages 3.13 times the world market price for palm oil in Europe. The ratio fluctuates widely due to lags in the adjustment of government price regulations. The ratio of Kenyan to world market prices hit a low of 199% in 1984 followed by a high of 488% in 1986.

Statistics on Ugandan prices for shortening are only available for the 1987-1992 period and only at the retail level. When expressed in US$ at the open market rate, Ugandan prices show a much higher correlation with world market palm oil prices than do Kenyan prices[46] indicating the higher degree of substitution between shortening and refined oils in Uganda. Retail shortening prices in Uganda average more than five times the world market price for palm oil. The markup over retail prices in Kenya ranges from 43 to 98% depending upon factors in the parallel currency market and the enforcement of Ugandan import duties and taxes. Uganda Associated Industries[47] estimates that the actual cost of freight and insurance is only about 4.5% of the ex-factory price of the shortening. This would put the CIF cost of shortening in Uganda at 3.27 times the world market price of palm oil. This is the ratio used in projecting the hard currency cost of continued import dependence for shortening.

---

[46] Pearson's R of .97 as compared with only .72 for Kenya, although both are significant at the 1% level.

[47] UAI is the official Ugandan agent of East African Industries, the largest Kenyan shortening manufacturer.



3.4.3 Projected Costs of Importation

The projected foreign exchange cost of complete import dependence for refined oil and hydrogenated shortening is obtained by combining the earlier estimates of projected edible oil demand with the price projection scenarios. The results are presented in Figure 3.7. These projections illustrate the high foreign exchange value of the edible fats and oils that are likely to be consumed in Uganda by the end of this century. Given the high variability of world market prices for edible oils over the past ten years, the range of projections is necessarily wide. It is, however, indicative of the substantial cost of import dependence. By the year 2000, the value of processed edible oil consumption in Uganda will probably reach a total of over 29 million dollars, and is more likely to be roughly $54 million. With continued 2.5% population growth, 2% per annum income growth and the upper range of potential world market prices, it could even reach a staggering $70 million. Given that Uganda's total export earnings in 1992 barely exceeded $173 million[48] (Ministry of Finance and Economic Planning, 1993) this represents a substantial hard currency outlay for a single consumer item.

Consumer price response is likely to reduce this figure somewhat. While these figures look astronomical compared to current Ugandan import statistics for oils and fats, this is largely a function of gross underreporting. In 1987, Kenya, which brings in large quantities of bulk palm oil for further processing and hydrogenation, imported 126,000 metric tons of vegetable oils and fats valued at US$45 million. In Kenya oils and fats imports consume more foreign exchange than any other agricultural commodity. While Uganda has only 73% of Kenya's population, the higher cost of shipment plus the added value of finished products as opposed to semirefined oils will be offsetting factors.

If domestic production could meet national demand, the hard currency savings through edible oil production could possibly exceed the

---

[48] Total imports including those financed through external loans or grants and private foreign exchange are estimated at $512 million. Private enterprise cash basis imports generally represent less than 1/3 of total imports but figures for 1992 are not yet available.



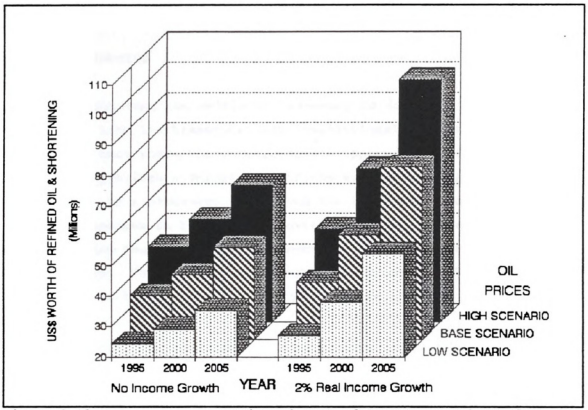


Figure 3.10 Projected Cost of Import Dependence for Shortening and Refined Oil

earnings of any of Uganda's non-coffee exports[49]. The question is whether domestic self sufficiency is a realistic possibility. This is the subject of analysis in the remaining chapters.

[49] In 1992, cotton, usually the number two export, earned only $US 8.2 million. Figures for non-traditional exports are not yet available for 1992. In 1991 only one non-traditional export, sesame, exceeded $10 million.



CHAPTER FOUR: HISTORY AND INSTITUTIONAL CONTEXT

4.1 INTRODUCTION

To understand the edible oil industry in Uganda, it is necessary to place it into its historical and institutional context. These are the factors that shape the incentives and opportunities for production. The chapter provides a description of the evolution of Ugandan institutions as a necessary foundation for later analysis of the organizational responses to the institutional opportunity set of the 1980s. Three distinct phases in the development of the subsector are identified and discussed. The specific organizational structures that have evolved in response to these changing opportunities are analyzed in Chapter Five.

4.2 THE UGANDAN INSTITUTIONAL CONTEXT

The key issues in Uganda's institutional development between 1894 and 1984 that are of relevance to the edible oil subsector include: land tenure, coercion, market control, patronage, subsidization of information and inputs, security of property, corruption and the growth of the parallel market[50].

4.2.1 Land Tenure

Existing systems of land tenure in Uganda discourage long-term investment in agriculture. This is of particular importance when it comes to investment in the production of slow-maturing perennial crops such as oil palm and shea trees. It also affects farmers' willingness to invest in fertility-enhancing inputs and fixed assets.

The 1900 Buganda Agreement gave freehold title of large tracts of land to the members of the loyal chiefly hierarchy in Buganda. All land not so allocated was reserved as Crown Land. In 1927 a law was passed

---

[50] The following analysis is largely drawn from an earlier work by the author (see Laker-Ojok 1992b).



that restricted the development of an independent landlord class. The amount of rents and tithes owed to the landlords was limited and use-rights were guaranteed to the existing tenant. Freehold no longer meant the right to dispossess existing squatters or to sell land. Crown Land was held by free peasant cultivators who were *de facto* proprietors as long as their smallholding was in customary use.

This system of guaranteed customary tenure was overturned by the 1975 Land Reform Decree. This decree "turned every peasant from a customary tenant into a tenant-at-will who could summarily be evicted in the name of development" (Mamdani, 1990, p. 453). If one had assets or political connections, long-term (49 or 99 year) lease-hold could now be obtained at the discretion of the Uganda Land Commission. The only official requirements were payment of survey and land inspection fees, proof of intention to make permanent land improvements and payment of reparations to existing tenants at levels set by the government valuer. The change of rules did little to reassure farmers that their land tenure was secure.

Incentives for long-term investment and fertility-enhancing inputs were further constrained by the low returns to agriculture. Government dependence on export taxes had led to negative terms of trade for the agricultural sector. As a result, rather than encouraging long-term productive investment, the decree fueled land speculation as a means to obtain credit. Long-term leases on tracts of land were used as collateral for credit that was then diverted into more lucrative short-term investments in speculative trade and transport services.

4.2.2 Coercion and the Subsistence Economy.

The success of Colonial agricultural policy rested on taxation and forced labor. Ugandan peasants were forced into the cash economy by the passage of the hut tax, the poll tax and subsequent land taxes. Baganda collaborators imposed as chiefs throughout the country, were given powers to exact labor and tribute. In addition, farmers were required to plant a minimum of 1/4 acre of cotton and a famine reserve of cassava. Coercion rather than market incentives led the export economy.

The Ugandan economy was built on the back of subsistence production. Wages and prices were predicated on the assumption that they did not have to cover the full cost of the "reproduction of labor." Wages were set at levels barely sufficient to pay taxes and feed the laborer during the period of his employment. The responsibility of providing the basic needs of the family fell primarily on women's production outside the cash economy. Social norms developed reinforcing the ideal of household self-sufficiency. The primary control of cash crop revenues in male hands reinforced women's preferences for food production to ensure family welfare. As a result, the mass market base in Uganda for food and consumer items is very limited.

4.2.3 Competition, Marketing and Price Control

It is often assumed that the creation of marketing boards in Africa is a recent phenomenon, fueled by the desire of nationalist governments to promote industrialization and provide cheap urban food at the expense of the rural majority. This is not so in Uganda. Throughout its rule, the British colonial state consistently interfered with the competitive marketing of export crops.

Interventions included: 1) limiting cotton purchasing privileges to "established" ginning firms and their buyers (1913), 2) limiting the number of licensed ginneries (1922), 3) granting monopoly cotton purchasing privileges within a 5 mile radius of the ginneries, 4) establishment of regional ginners' associations that could set the cotton price for the entire province (1929), 5) imposing a legal ban on movement of cotton between association areas (1933), and 6) setting a government floor price that quickly became the maximum price under the influence of the associations (1933) (Mamdani, 1976).

Smallholder coffee production developed much later than cotton and the Department of Agriculture took measures to organize coffee processing and marketing along monopoly lines from the very outset. In 1930 the coffee grading ordinance limited the number of licensed coffee factories, forcing the marketing of coffee into the hands of established firms. In 1932 A. Baumann & Co. (the Lever Brothers' agent in Uganda) secured an exclusive contract for the buying and curing of all arabica

coffee in Uganda. The ordinance was extended to cover robusta coffee in 1936 (Mamdani, 1976, pp. 105-109.)

Government intervention in both cotton and coffee marketing was designed to protect European processors from competition from Asian and African firms who might bid up prices and undercut the established European owned firms, which had higher management costs. The government regulation kept producer prices from rising to their free market level. On the other hand, prices could not be allowed to fall to a level that would threaten the supply of cotton to the British industrial economy. The vested interests of the European expatriates were off-balanced by the interests of British industry.

In 1943 the Uganda Protectorate negotiated long-term contracts to sell the entire Ugandan coffee crop to the U.K. Ministry of Food. The Ministry of Supply (U.K.) and the Government of India bought the entire cotton crop. "To make this procedure possible the government had to take control of marketing and . . . secured control over the prices paid to the growers" (Wrigley, 1959, p.69). This was the beginning of formal marketing boards in Uganda.

Rising commodity prices due to wartime shortages led to another institutional innovation. Government feared that if the full price rise was passed on to the farmers it would result in massive inflation given the shortage of available consumer goods. Temporary expediency led to the retention of massive savings, which were later justified as a price stabilization measure and turned into a permanent feature of official policy. Between 1943-53 Ugandan farmers "contributed" £ 30 million to price assistance funds, £22 million to development projects and £30 million in additional export duties. The colonial government skimmed off over 40% of the total value of exports for more than a decade (Hazelwood, 1957). This set a precedent for the state's increasing dependence on the taxation of exports to generate revenue.

This history of government market intervention helps explain the steps taken to create cooperatively owned marketing capacity in the wake of the 1945 and 1949 peasant uprisings in Buganda. The 1946, Cooperative Societies Ordinance empowered government to register, control and regulate this upsurge of grass roots organizations. Existing monopolistic ordinances created a complete cooperative monopoly in cotton ginning

after independence and a virtual monopoly in coffee curing. These processing monopolies were subject to control by the national marketing boards, which retained all real decision making power.

Cottonseed has historically been the major raw material for the edible oil subsector. The institutional structure of the cooperatives affects their efficiency, the incentives to farmers to produce cotton, and therefore the flow of raw materials for crushing.

4.2.4 Subsidization of Information and Inputs

The government of the Uganda Protectorate had a direct interest in the success of the export-agriculture sector. Not only was its development critical to the creation of local fiscal autonomy, but strong vested interests in the U.K. required the guaranteed availability of adequate quantities of high quality raw materials.

The introduction of cotton has been attributed to the chance cooperation between British industrial interests and the early missionaries. The introduction of various cotton varieties by competing firms initially led to considerable variability in cotton quality. Intense competition over the available supply led to indiscriminate buying irrespective of quality. The lack of market grades and price differentials encouraged further quality deterioration. The threat to quality led to direct government intervention. All varieties except American Upland were banned. Farmers were only allowed to plant seed distributed by the government. Two government seed farms were established. Growers were compelled by law to uproot and burn all stalks before a certain date each year. Hand gins were outlawed under the pretext that they caused unnecessary breakage of the staple and threatened the reputation of Ugandan cotton.

In 1910 the Department of Agriculture was created. Its mandate was 1) to promote expansion of export crop production and 2) to maintain and improve the quality of export crops. The major concern of research was to ensure product characteristics desired by the international market (cotton staple length and coffee cherry size and uniformity) rather than to enhance farmers' yields or income. Enforcement of the cotton rules was the responsibility of the chiefs. Law and taxes rather

than market incentives were the mechanisms employed. Government controlled the multiplication and distribution of cottonseed and coffee cuttings to ensure uniform quality without the need for quality price differentials.

A Research Division with the objective of increasing smallholder productivity (as opposed to the earlier focus on acreage and quality) was only belatedly founded in 1937. Research efforts emphasized soil conservation and crop rotation, but law enforcement remained the main means of promoting research findings. It was not until the peasant unrest of the late 1940s that the introduction of productivity-enhancing technology became a central issue. In 1949 the Cotton Research Corporation decided to open its regional research station at Namulonge. The research focus shifted toward formulation of extension recommendations regarding pest control, fertilizer use, and agronomic practices. A broad-based extension service was created to subsidize farmers' access to information. Prices, however, were constrained by the need for government revenue collection. To encourage adoption, government relied on "supply push" rather than "demand pull" mechanisms. Subsidization of agricultural inputs, credit and mechanization services to encourage adoption became the cornerstone of government agricultural policy for the next 35 years. During the post independence period most of these subsidies were donor financed.

From a political perspective, subsidies have an advantage over increased prices because they lend themselves more easily to the politics of patronage. Subsidies are easier to ration. A highly publicized subsidy program can be implemented in such a way that only a few larger and more influential farmers actually benefit, while still creating jobs for the growing educated class. The local politician is able to present himself as a champion of the farmers with less total expenditure. Such clearly defined projects were easier to sell to donors and postponed the difficult task of designing alternative taxation mechanisms.

At the time of independence, in 1962, Uganda had a well-integrated research system. Cottonseed was multiplied by the research stations and distributed free to farmers through the cooperative marketing unions. Input distribution was facilitated by a USAID-

financed credit scheme that gave in-kind credit to cooperative members. Loans were then recovered directly from the farmer's sales of cotton and coffee to the cooperative unions. Subsidies on inputs, ranging as high as 82% on some items (Carr, 1982, p.52), greatly encouraged adoption of pesticides in the production of cotton.

During the Amin years, the cooperative credit scheme disintegrated due to shortages of foreign exchange. By the end of the Amin regime, agricultural inputs of any kind were in extremely short supply. The collapse brought on by the economics of patronage and Magendo[51] had diverted the available foreign exchange into more profitable alternatives. The history of subsidized inputs and mistrust of the commercial sector has undermined the potential for private-sector seed production and input distribution[52].

4.2.5 Patronage

Patronage, as a mode of operation in Ugandan public life, has its roots in both the feudal court hierarchy of the southern kingdoms, and the paternalistic, personalistic manner of British indirect rule. From the initial decision to use Baganda chiefs as interim administrators throughout the country, with the power to demand labor or cash tribute and to intercede for their constituents, the two-way channel of loyalty and favors was established. Nor was this mode of operation reserved only for the African population. Vested interests, including planters, ginners, and the Asian castes, all sought special dispensations from the Crown through the hierarchy of their charismatic leadership, to the Governor of the Protectorate and on to the Colonial Secretary. By independence, the tradition of patronage channels through which powerful

---

[51] "Magendo" is defined by Green (1981, p.ii) as "the illegal or bordering illegal economic system or sector. Analogous to 'black market', 'parallel market' but - as used in East Africa - implies a stronger and more pervasive sector. Also activity carried out in the sector or adjective applying to something pertaining to it, eg. magendo transport, food magendo."

[52] For a detailed discussion of the issue of the organization of agricultural input supply in Uganda see Laker-Ojok 1992.

leaders secured benefits for their constituents on a personalistic basis was deeply entrenched.

Leonard's (1984, pp. 6-7) description of African patronage structures applies very well to Uganda.

> The great egalitarianism of pre-colonial African society and the relatively meritocratic character of upward mobility in the late colonial and independence periods have resulted in African leaders and managers who have large numbers of poor relatives and strong ties to disadvantaged rural communities. The values of the social exchange systems that peasant communities employed to insure themselves against risk are still strong (Hyden, 1983; Scott, 1976). Consequently Africans are unusual among the world's elites in the extent of their patronage obligations to poorer peoples and the strength of the moral pressures which they feel obligated to fulfill them. For these reasons and for selfish ones that are far more universal, state organizations in Africa are extensively used to pursue informal, personal goals of their managers rather than the collective ones that are formally proclaimed.

Patronage mechanisms were important in the development of the early Ugandan commercial networks. Most trade and manufacturing was held in "Asian" hands. Kinship, caste, and religion were the basis for expansion of commercial empires. Kinsman were recruited to run businesses. Informal social pressure guaranteed repayment of the extensive credit links from Asian financial institutions and manufacturers. By 1954, nearly 80% of the Indian holders of trading licenses in Uganda came from just three groups, who represented their interests to the government through religiously oriented caste associations (Mamdani, 1976).

These kinship networks were very effective in reducing transaction costs for the Asian businesses. Repeated dealings with trusted extended family members reduced the costs of information and negotiation, while enforcement was guaranteed by the closed nature of the community and the heavy social sanctions it could impose. Without these informal institutions, African efforts to break into commerce and manufacturing were handicapped by the lack of access to crucial sources of supply and credit. Changes were needed in the rules of the game if the African business class were ever to gain the opportunity to develop.

The political party was the primary channel for African patronage in the early post-independence era. Obote's "Move to the Left" in 1970,



however, opened up new opportunities. Mamdani (1976, p. 273) argues that,

> [T]he result of the nationalizations was the creation of an economic bureaucracy. Positions within it, located in particular parastatals, became its most important sources of material gain . . . An "unofficial" market burgeoned in the distribution of commodities by parastatals, while bribes rivaled salaries as important sources of income for individual bureaucrats.

4.2.6 Expulsion of the Asian Community and the Rise of Magendo

Expectations expanded faster than the economy in the early independence period, accelerating the push for Africanization of the civil service and for changes in economic structures that favored Asian business interests. The need to make room for upward mobility led first to Obote's deportation of the immigrant Kenyan working class and later to Amin's infamous expulsion of the Asian community in 1972.

The Asian expulsion created an immense reservoir of assets for distribution and resulted in short-term windfall profits. It failed, however, to break the Asian strangle-hold on essential credit and wholesale distribution links. In addition, the state productive sector was badly weakened by the loss of Asian managing agents.

The Ugandan economy fell into a vicious downward spiral. It became necessary to pay "license fees" to officials to secure government subsidized credit and officially priced foreign exchange. The lack of direct wholesale and credit linkages meant that luxury imports were purchased in Kenya at full retail price including taxes. These high-cost imports, smuggled into Uganda and sold on the parallel market, fed a rising cost of living. Low farmgate prices, corruption and mismanagement in the cooperative sector led to falling exports. Coffee smuggling and lack of customs duties eroded the Ugandan balance of payments. Easy credit, budgetary deterioration, the cutting off of foreign assistance, and rising military spending all fed the inflationary spiral. Sticky official prices on parastatal manufactured goods plus the lack of official foreign exchange for essential spares and raw materials further exacerbated the slump in domestic production. Falling official government salaries forced even lower level civil servants to

"chase lines"[53]. Increasingly the government became dependent on the black-market economy instead of vice versa.

The 1979 overthrow of the Amin government didn't break the downward cycle. Donors hesitated to rush in with urgently needed external resources. Rising insecurity and the black-market fed on each other. Magendo moved from the realm of marginal black market activity to a "dominant sub-mode of production" (Green, 1981) that controlled commerce (importation, wholesale and retail), transportation, and food marketing. Resources were channeled away from the productive sector and into short-term speculation. The logic of magendo underlay and fed on government interference in all aspects of the market economy. Price controls, subsidies, monopoly marketing mechanisms, vastly overvalued exchange rates, poor budgetary control mechanisms, low level fiscal accountability, weak taxation capacity, and unregulated printing of money combined to result in the massive corruption and hyperinflation of the second Obote regime.[54]

4.2.7 Resulting Institutional Legacy

Structural adjustment is grounded on the assumption that market solutions are more efficient than bureaucratic solutions. This assumption needs to be examined in light of the institutional framework that structures the opportunity set of the economic players. It is important to note that Uganda has never had an open market system. Its underlying institutions have evolved under conditions of fundamental bureaucratic intervention throughout the economy. The basic institutions that facilitate low information costs and impartial enforcement of contracts in market economies have not evolved in Uganda.

---

[53] To "chase lines" means to use one's position to establish a set of services for which one can extract payment. This may include selling "free" government forms and documents, intentional obfuscation and slowness to encourage people to by-pass the system for a fee, use of insider information to make personal business deals, selling allocations of subsidized goods, etc. Vast amounts of energy and creativity were diverted from the productive economy into these essentially redistributive "lines."

[54] See Green, 1981 for an excellent analysis of the development and internal structure of the magendo economy. See also the Commonwealth Team of Experts, 1979.

The institutional legacy that existed at the time of the Museveni take-over in 1986 can be summarized as follows:

1. An ideological commitment to state intervention in the productive sector to achieve national objectives and "prevent exploitation of the masses by private entrepreneurs."
2. The pervasive influence of patronage as an accepted mode of operation, leading to a lack of purposive rationality within formal institutions and the absence of informal sanctions for control.
3. Very thin markets resulting from the heavy reliance of the formal sectors of the economy on subsidization from the informal/subsistence base of most economic actors.
4. Insufficient security of property rights to encourage long-term investment in production.

These characteristics permeated interactions at every level of the economy, from macro policy, through private-sector markets to farm production decisions. Distrust of private market solutions shaped the attitude of government toward farmers and traders. The assumption had always been that farmers need to be told what to do and traders need to be prevented from exploiting the peasants. Policy makers set objectives and farmers are ordered to comply. This position was taken to extremes under Amin's double production programs, and resulted in a massive flight of farmers away from controlled export markets and into subsistence or informal market sectors.

The use of official position to fulfill personal objectives became entrenched in Ugandan organizations in the 1972-85 period. Organizations became loose coalitions of individuals primarily seeking to achieve personal goals (and by extension, those of the constituencies vital to the continuation of one's privileged position). The efficiency of public institutions suffered from a basic free-rider problem. It was irrational for a civil servant to refrain from petty corruption, because such behavior would only reduce personal resources without changing the system. Similarly, the refusal to pay a bribe generally just resulted in considerable inconvenience and expense, without any impact on the general problem.

The shift to a reliance on market solutions is complicated by the thinness of Ugandan markets. Between 1971 and 1989, there was a 90% fall in real cash incomes in the formal sector. This forced most salaried employees to rely on supplemental subsistence or informal-sector sources for survival (Chew, 1990). This development further eroded formal-sector incentive structures and increased the power of those who subvert formal organizational objectives. Widespread recognition that institutions did not pay a living wage legitimized petty corruption.

Lastly, the insecurity of property had a devastating impact on the incentives for long-term investment. Land tenure is in total confusion. While long-term leases of public land are theoretically possible, one must have excellent connections or make a massive investment of time and cash to secure them. Even then, lease holders are subject to the unpredictable rulings of local Resistance Committees regarding compensation of squatters etc. Customary tenure and the weakness of the rural land market mean that most farmers have no physical collateral on which long-term production credit could be based. Credit institutions will only accept urban properties and fixed assets as collateral because there is no established market for rural productive assets.

The commercial and manufacturing sectors were effectively wiped out by the 1972 Asian expulsion. The firms that filled the vacuum were dependent on black-market or retail-priced sources of supply. They did not create viable supply or distribution networks. The Asian community has been understandably slow to claim and rehabilitate their former properties after 20 years of degeneration. Many African businesses are still dependent on the extraction of value from unclaimed Asian properties. These businesses have not generated sufficient savings to replace the Asian assets if they are returned nor are they efficient enough to compete effectively in the long-run. The fundamental insecurity of person and property has led to a heavy discounting of the future.

The macro-economic indicators clearly bear evidence of the impact of these institutional and structural forces (Ministry of Planning and Economic Development, 1990). In 1970 non-monetary GDP was 30% of total GDP. In 1988 it was 46%. Between 1972 and 1986 GDP fell by 11 percent



and per-capita GDP plummeted by more than 40%. Total government revenue in 1970 was 16.8 percent of GDP; by the 1986/87 it had fallen to 5.1 percent. (When export taxes on coffee are excluded the ratio was only 3.4%.)

4.3 THE HISTORY OF THE EDIBLE OIL INDUSTRY IN UGANDA

4.3.1 The Colonial Period

Cottonseed is a byproduct from the production of cotton lint and as such the incentives for its production are irretrievably linked to those for lint. Initially cottonseed was valued only for planting and the balance above planting needs appears to have been burnt. Although cotton was introduced as early as 1903 (Mamdani, 1976), the earliest oil mill in Uganda is believed to date from 1929. A 1938 Commission of Enquiry into the Cotton Industry listed the following constraints to the development of edible oil processing (Coles 1968 p.5).

a) the small scale of operations
b) the competition with sesame oil
c) the variable prices for oil
d) the cost of freight and packaging
e) the lack of a market for cake
f) the need to delint the seed before crushing.

The sudden demand for oil to feed the military forces stationed in Africa during World War II led to a rapid expansion in oil pressing. The Industrial Investigation Committee of 1944 reports the existence of five licensed and five unlicensed oil mills. Included among these were three that were to become the biggest firms in Uganda in the 1960s.

Post-independence government intervention in the edible oil industry is grounded in the colonial legacy discussed above. As early as 1943, under pressure of the war effort, the Controlled Produce Regulations required licensing of all mills. The Control of Industries Committee was charged with controlling the erection of new mills and the allocation of oilseeds for crushing. Sale of oil and cake was conducted

by the government. In 1946, oil mill construction was decontrolled, while the allocation and sale of seeds, oil and cake remained in the hands of the Vegetable Oilseeds Controller. This regulation was evidently the result of the negotiations with Lever Brothers concerning the construction of an oil mill in Uganda[55]. The government justified maintaining control over the allocation of seed by the need to ensure availability for the Ministry of Supply in Great Britain and the need to limit seed and oil prices in the post war period (Coles, 1968).

Investment in oil milling at this time was very profitable. The market for oil was guaranteed by government. In 1947, the official ex-factory price to millers was calculated on the assumption of an average of only 16 gallons of oil per ton of cottonseed crushed. Coles (1968, p.7) points out that these same millers averaged 32 gallons of oil per ton of seed in 1965 with essentially the same technology and cotton varieties.

As a result, when the ban on new construction was lifted in 1946, twelve new oil milling firms entered the industry, only to have the Vegetable Oil Controller refuse them seeds. Raw materials were allocated to only the 13 mills operating before decontrol. The Controller argued that it would be uneconomical for many firms to each crush a small quantity of seed. By 1948 investment in oil milling was again legally limited to the replacement of existing machinery. The industry was not fully decontrolled until 1953.

Created in 1949, Lint Marketing Board (LMB) was mandated to purchase all ginned cotton for auction sale to local exporters. By law, all seed extracted was the property of LMB, which was responsible for seed dressing and free distribution to farmers. Market pricing for cottonseed began in 1953 when the LMB established the cottonseed auction. The auction system sparked a period of intense competition for the available raw materials. Attempts at controlling bids through a pooling agreement among processors were only successful in the first year of the auction. Cottonseed prices soared. Seed sales provided a major source of revenues for LMB. Profits over the cost of transport

---

[55] The largest proportion of hydrogenated cooking fats in Uganda today is supplied by a Unilever subsidiary in Kenya which processes only imported palm oil.

helped to offset heavy LMB lint trading losses in many years. It is generally accepted that large-scale oil processors withstood price competition by offsetting losses against profits from other activities. The combination of excess capacity and stiff price competition for raw materials resulted in many bankruptcies. The number of firms crushing cottonseed fell from a high of 35 in 1955 to 11 in 1958; rose to a new high of 34 in 1962 before beginning its last precipitous decline.

Payment for seed delivery from the ginnery to the mill was the responsibility of LMB. There was no pressure for mills to locate close to production and ginning. Early mills were located in the south where cotton production was first introduced. They did not relocate when cotton was superseded by coffee and moved north. If the mills had been responsible for the cost of transportation, they would likely have found it more economical to move to the cotton production areas.

By 1965-66 the 18 operating mills owned 127 expellers with a reported average capacity of 1,630 tons per expeller per year. This represents an industry capacity of 209,500 tons of seed, excluding the nearly 35,000 tons of capacity in non-operational firms (Coles, 1969 p.11). The industry was characterized by a considerable degree of concentration. The four firms with a capacity over 15,000 tons per year were referred to as the Big Four. Together they had a capacity of 107,500 tons or 51% of the national capacity. While the industry as a whole was operating at only 67% of capacity, the Big Four averaged 92% of capacity, resulting in a utilized capacity of 99,000 tons. The combined production of the Big Four, therefore, accounted for 71% of total production in 1965.

The explanation for the Big Four's large market share lies in the economics of oil refining in the 1960s. In 1965, only six firms had the capacity to double refine oil. Of these, only two also had hydrogenation plants. The other firms only semi-refined their oil. It was neutralized but not deodorized or bleached[56]. The semi-refined oil was

---

[56] Neutralization is the process of adding an alkali solution, usually caustic soda, to the oil to reduce the free fatty acid content to below .05%. The residue, called soapstock, is separated by gravity or centrifuge and is used in the manufacture of soap. Neutralization can be done either as a batch or a continuous process. Most Ugandan mills are equipped for batch refining. This is less costly to install,

sold at a discount to low-income consumers or to larger firms for further refining.

Coles (1968) demonstrates that given the high price of cottonseed in the 1960-65 period, the value of semi-refined oil and cake was insufficient to cover processing costs. In contrast, production of double-refined oil yielded good returns. Coles contends that the millers with double-refining capacity deliberately bid up cottonseed prices to undermine the competition and ensure their market share.

In 1966 the double-refining capacity in Uganda was around 30,000 tons of oil. This is sufficient to refine the oil from 200,000 tons of cottonseed assuming an extraction rate of 14%. In 1970-71, the peak year, only 126,572 tons of cottonseed were crushed in Uganda. Clearly, even at its peak, Uganda's edible oil industry suffered from excess capacity, a problem exacerbated by the prohibition on cottonseed imports.

Technically, this excess capacity could have been used to crush soybeans, groundnuts or sesame, but this proved uneconomical. These oilseeds are highly prized for direct consumption by Ugandan consumers and the going price for edible oil made crushing unprofitable. Two firms experimented with crushing sunflower, but it was not readily available and no effort was made to promote its production.

These mills were owned by Asian family businesses. These firms also engaged in soap manufacture (6), grain milling (7), groundnut shelling (6), tin manufacture (2), cotton ginning (11), sugar plantations (3), and oil pressing in Tanzania (2). A number were also involved in produce buying and coffee, sisal or tea plantations. Thus oil milling was embedded among other diversified interests. The existing overcapacity held out little promise for future development. For many firms, oil milling activities continued only because losses were covered out of the profits from other activities.

---

but has higher operating costs per unit of throughput. Bleaching removes the coloring pigment in the oil by treating the neutralized oil with bleaching earth and activated carbon. Winterization is the process of cooling the oil and filtering out large crystals that would make the oil cloudy. Finally, oil is deodorized by injecting it with steam under vacuum and holding it at high temperatures for a specified period. Each of these refining procedures results in some oil loss (Brown, 1991).

4.3.2 Independence Before Amin

Little information is available on the industry between 1965 and 1972[57]. Several significant trends contributed to the increasing fragility of the industry. One of these is the rising commitment to Africanization of the economy, especially with respect to the cotton industry. Eleven of the 18 functioning oil milling firms were also engaged in cotton ginning in 1965. Initially cotton ginning was entirely dominated by Asian firms. In 1934, colonial intervention limited competition among ginneries. The country was divided into zones, and movement of cotton between zones was prohibited. The Government allocated each ginnery a specific share or "quota" of the total available crop.

In 1949, serious riots broke out, initiated by the Uganda African Farmers Union. A major objective of the Union was to break the expatriate monopoly on cotton and coffee processing. The pressure was so great that government was forced to act. To increase the appearance of African participation, the government promoted co-operative formation. The 1952 Acquisition of Ginneries Ordinance authorized credit for the acquisition of 40 ginneries and allocated quotas for co-operatives to process 25% of the crop. The rigid government pricing structure, which was set up to guarantee positive net returns to even inefficient ginneries, inflated the market price for ginneries. Unions were generally unable to raise the necessary one-third of the purchase price. By 1962 the co-operatives controlled only 14 ginneries (Brett, 1970).

At independence, the Obote government announced its intention to move rapidly toward a co-operative monopoly. Two commissions of enquiry were appointed to investigate the ginning industry (1962 and 1966). Both stressed the importance of competition to ensure efficiency in marketing and maintenance of quality standards. The government ignored the recommendations. The quotas of existing co-operative ginneries were increased and Unions were provided with 90% loans to purchase additional ginneries. By 1969 cooperatives had achieved a 100% monopoly on cotton

---

[57] One additional double-refining plant and one soap factory were added during this period.

ginning. It is unknown whether the particular ginneries owned by oil crushing firms were sold or merely became redundant. By 1969, however, firms could no longer subsidize oil losses out of ginnery profits.

In Uganda, cooperatives have historically operated much like parastatal organizations. While the state gave cooperatives a monopoly on cotton processing, it retained real control over the cooperative movement. Despite the rhetoric of democratic control, members had very little power. The Ministry reserved the right to register unions and societies, to approve or change society bylaws, to approve appointments, to replace managers, to suspend annual general meetings, to set prices and processing margins, to mandate salaries and benefits, to control credit and crop finance, to approve member bonuses, to audit or appoint auditing companies, to supervise elections and to comment on annual financial plans.

Protected by its monopoly position in the market, cooperative management has had little vested interest in operating efficiently. Under existing incentive structures, managers had nothing to gain by controlling operating costs or maximizing union profits. Cooperatives have not been allowed to go out of business no matter how inefficiently they functioned, and no matter how bankrupt and indebted they might be. Nor have they been forced to sell off assets to clear their obligations. Political interference, patronage and personal exploitation of community assets permeate the cooperatives. Cooperatives have been plagued by entrenched Management Committees, embezzlement and fraud, rising overheads, poor financial performance, unwise management decisions, and a serious lack of liquidity. Increasingly, unions have resorted to buying cotton and coffee from farmers on credit. Members then have to wait for months, or years to collect their money.[58] As the British Cotton Grower's Association (1993 p.4) reports, "In December 1992, one-fourth of all farmers that had ever grown cotton still held unpaid receipts for seed cotton delivered during previous seasons."

---

[58] For a detailed discussion of the history of Uganda cooperatives and the rising incidence of mismanagement, see: Brett, 1970a; Brett, 1970b; Opio-Odongo, 1985; and Young, Crawford et al., 1981.

Members had no alternative. If the Union didn't prepare the accounts and call the annual general meeting (AGM) there was little the membership could do. By the late 1980s, many Unions had not held an AGM for more than five years and audited accounts were just as far in arrears. Each union held a legal monopoly in its geographic area. With prices fixed by government, and member bonuses non-existent, switching cooperatives would make little difference anyway. The farmer's only alternative was to stop production. The extent to which farmers have done exactly that is illustrated in Figure 4.1 using data provided by the LMB.

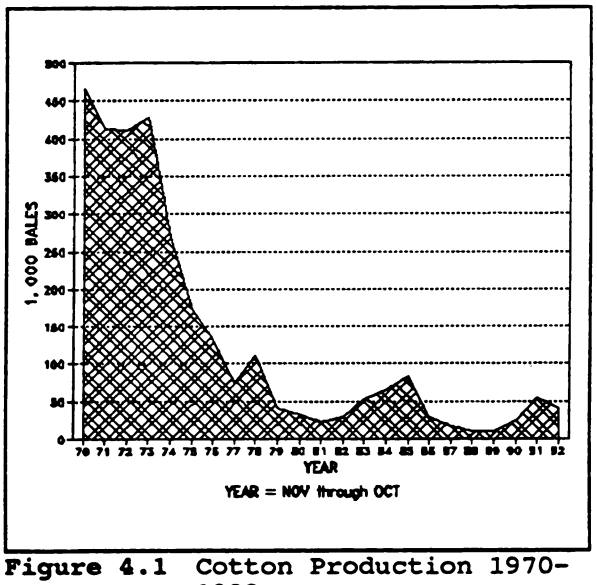


Figure 4.1 Cotton Production 1970-1992

The British Cotton Grower's Association (BCGA) report (1993) is quick to assert that many other factors outside the cooperative sector's control contributed to the decline. These factors include the collapse of the Cotton Research Corporation, the disruptions of the 1979 Tanzanian invasion and subsequent political instability, and the severe currency and economic destabilization of the 1980s.

The debt situation of the unions highlights the members' loss of control over decision making. In response to the large production volumes of the early 1970s, the state decided that a large-scale rehabilitation of ginnery capacity was required. It committed the cotton marketing unions to massive debt obligations to the African Development Bank (and later the World Bank/IDA) for ginnery rehabilitation, usually without consultation. This rehabilitation has dragged on for more than 15 years and been characterized by tremendous waste and needless expense. Ginneries that were functional at the start of the rehabilitation were rendered useless and have been out of operation for years. While no official exchange rate has been determined to convert the principal and accrued interest into shillings, the loan terms indicate that current exchange rates will be used. By the end of 1992,



outstanding Cooperative Union indebtedness for ginnery rehabilitation and crop finance totaled $44,497,000 (BCGA, 1993).

The early independence period also saw an expansion in the role of the Lint Marketing Board. In 1970, President Obote, in a radio broadcast, decreed that all exports and imports would henceforth be handled solely by parastatal bodies. All unsold cotton was to be exported directly by the LMB. The LMB had not been forewarned of this development, and proved totally unprepared to handle its newly appointed responsibilities (LMB Annual Report, 1971).

4.3.3 Nationalization and Decline

After the Amin coup of 1971, the Ugandan government came into increasing conflict with the Asian community. In protest over the high price of cottonseed and low fixed price of oil, the industry organized a tight association. It succeeded in convincing the Ministry of Commerce to ban cottonseed exports, thus eliminating Kenyan competitors. Members also attempted to collude on bidding in the seed auctions. Government responded to the fall in auction bids by cancelling all auctions and fixing the minimum seed price at SHs 600/= per ton.

The millers protested that the low price for oil set by the Uganda government meant that even "The Big Four" were operating at a loss. The free market in Kenya rapidly became more lucrative. Oil exports soared. As the LMB Annual Report for 1971 states, this resulted in "an unexplained shortage of edible cottonseed oil." In response, the government banned private export.

The final dramatic action was the announcement of the expulsion of non-citizen Asians, effective August 4, 1972. Immediately after the announcement, the banks froze the financial assets of the Asian firms. Many millers refused to collect contracted seed or didn't pay for seed delivered. By the close of October 1972, over 11,000 tons of seed were still in Union stores and 3,720 tons remained uncrushed at the now silent mills (LMB 1974).

To add to the headaches of the LMB, eight out of eleven locally based cotton exporting firms were owned by non-citizen Asians. This put a final stop to the local cotton export auctions. Later in the year,

even the three remaining firms were forbidden to conduct business. Thus the LMB was forced to become the sole exporter and shipper of Ugandan cotton almost overnight.

The industry at this time was in a state of confusion. Many mills were reallocated to Uganda citizens by the Departed Asians' Property Board. Then on August 4th 1974, the second anniversary of the declaration of "Economic War," President Amin made a radio announcement. It stated that with immediate effect the LMB was to occupy and run 17 oil mills. The 18th mill, Madhvani Sugar Works, was already in government hands[59].

After the first year, production at LMB mills dropped off dramatically. LMB lacked trained managers. Spare parts replacement became an acute problem. The inability to purchase spares and raw materials was blamed on the lack of foreign exchange. Three mills were closed down in 1974/75. That same year 57.6 million Shs from the cotton price assistance fund was used by LMB without authorization to finance their milling losses.

By 1977 only nine oil mills and seven soap factories were functioning, and these were operating at a heavy loss. LMB losses in 1977/78 for edible oil alone hit ten million shillings (US$1.3 million) (LMB Annual Report, 1978). Burdened with low capacity utilization, low fixed ex-factory price and a nearly 50% sales tax, it is no wonder LMB lost money and suffered from a shortage of capital for maintenance and raw materials.

Figure 4.2 illustrates the drastic decline in production and efficiency after the LMB take-over. LMB itself estimates an expected extraction rate of 12.6%. Only in the first year of its operation did LMB's mills achieve this target, and in five of the 13 years of its operation the extraction rate averaged less than 6%. The Crown Agents (1983) cotton subsector study draws the conclusion that for reasons largely external to its own control, LMB lacked the capital, foreign exchange, managerial capacity and raw material supply necessary

---

[59] As usual LMB had not been informed of the pending nationalization.



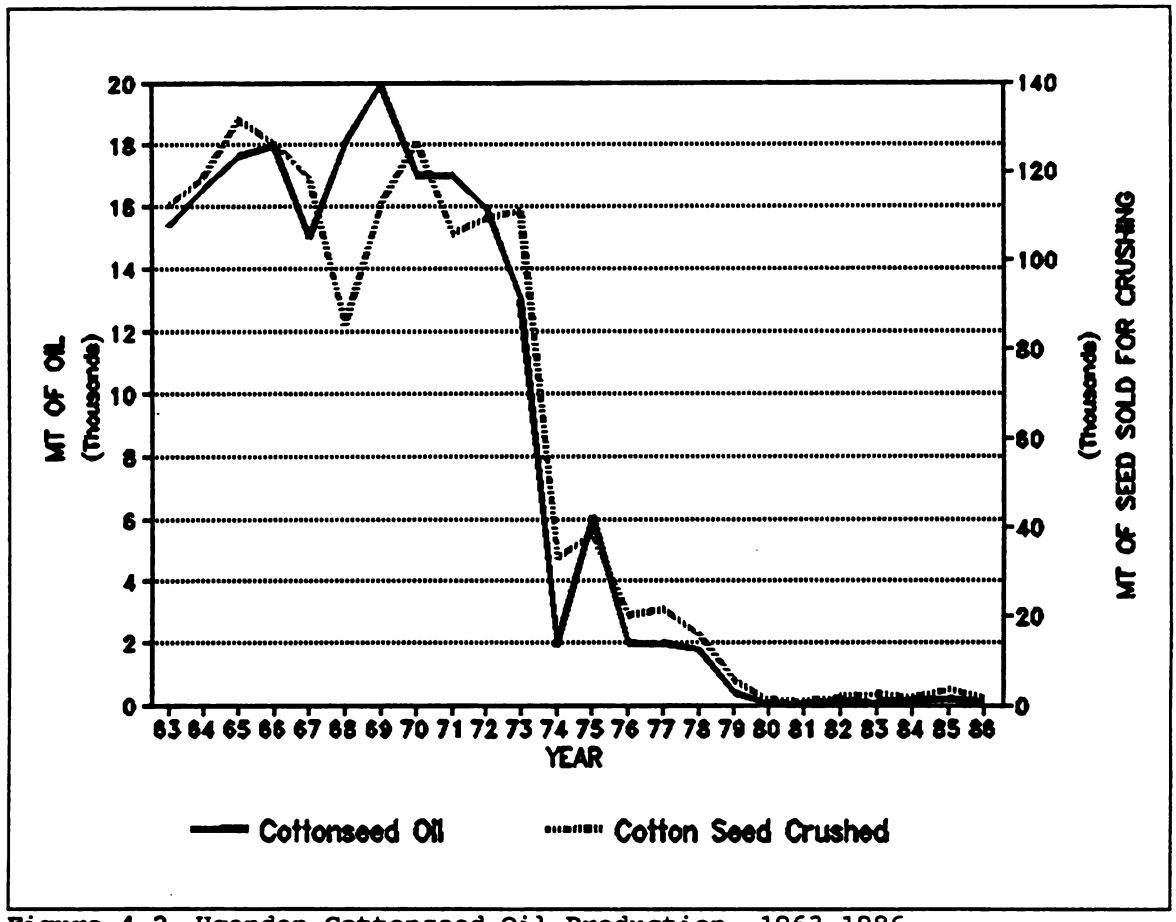


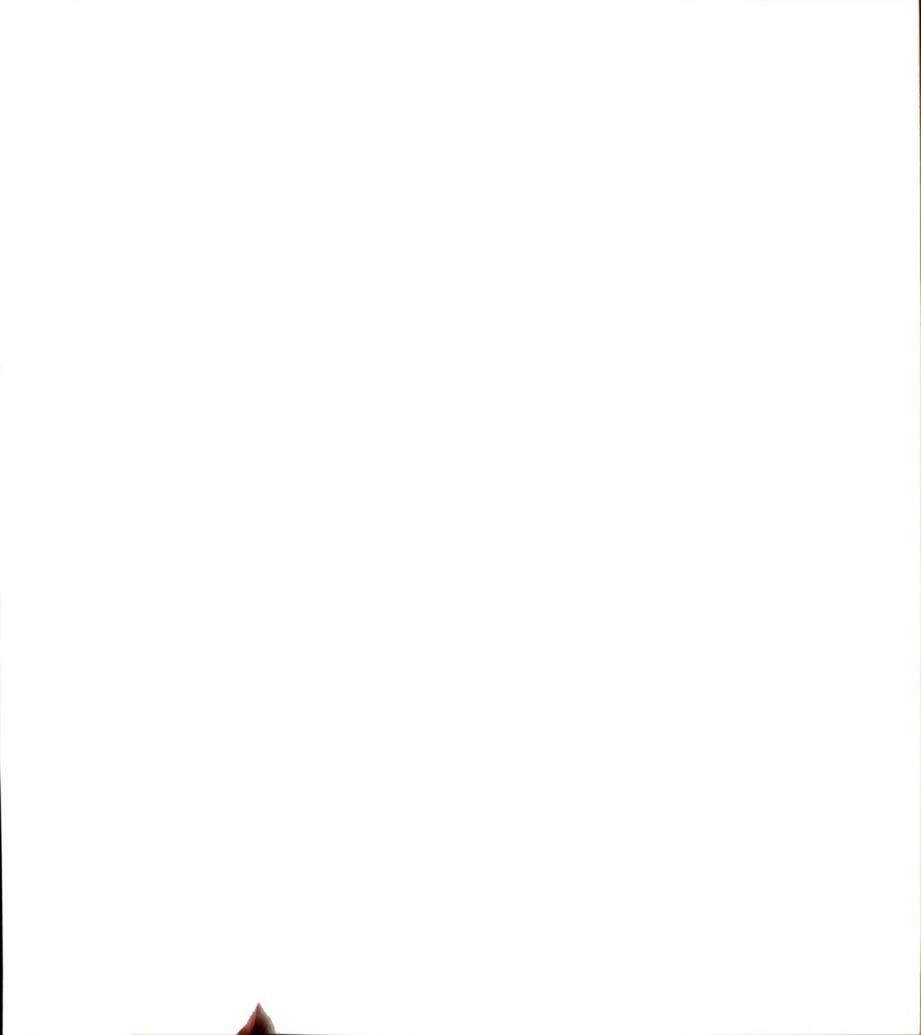
Figure 4.2 Ugandan Cottonseed Oil Production, 1963-1986

to function with even a modicum of efficiency in the production of edible oils.

One major problem has been the ownership of the mills. In 1979, the Obote government decreed that returning Asians could reclaim their properties. Of the Asian oil milling interests only the Madhvani Group made an immediate claim[60]. Even so, by 1986 LMB was operating only six oil mills. The others were either non-operational or had been reallocated by the Ministry of Co-operatives and Marketing or by various Presidents. For many mills, ownership changed hands several times over the period. Under such circumstances, management focussed on the extraction of value and made no investment.

---

[60] The Madhvani Group owned the Kakira sugar factory and oil mill. The Kakira Sugar Works oil mill, which was reclaimed in 1980, was the largest of the "Big Four."



In 1983, it was proposed that the Edible Oil and Soap Industries Ltd. (EOSIL), which had been administering the mills for LMB since 1976, be made an independent, self-accounting entity but sharing the same Board of Directors as LMB. Initial capital contribution was to come from the Ministry of Co-operatives and Marketing and the Ministry of Finance. The matter went to the Attorney General's Chambers but the company was not registered until 1987/88. Once constituted, EOSIL made many vain attempts to secure donor financing to rehabilitate the oil mills under its control. Price controls on oil produced by EOSIL mills were finally lifted, but the issue of the ownership of the assets remained unresolved. Oil production continued to decline, and soap manufacture, based on imported tallow, became the main source of revenue. Finally, under increasing donor pressure for a speedy resolution of the problem of the former Asian assets, EOSIL was wound up in December 1991, leaving behind an immense backlog of debt. By 1993 most former Asian owners had applied for return of their mills,[61] but only one was in production.

4.3.4 The Introduction of Sunflower

Cultivated sunflower, Helianthus annus L., is indigenous to North America. It is assumed to have been introduced in Uganda by the early missionaries as part of their experimentation with the adaptation of various crops to local conditions. Official interest in the crop did not develop until the 1940s. By 1947 Uganda had established its first trial and seed increase plots in the western region (Ankole and Kigezi Districts). Sunflower spread gradually northward through Toro and West Nile. Seeds from Serere research station were also taken into Acholi District in the mid-1940s. The earliest report of commercial sunflower production and marketing is in 1950, when 51 tons were sold in Kigezi and 31 tons in West Nile. Exports reached a peak of 292 mt in 1960, fell off during the 1960s and rose to a second peak of 262 mt in 1969

[61] A final deadline of October 1993 has been set for receipt of any outstanding applications for the return of Asian properties.

before petering out altogether after 1972. More recent export figures are not available.[62] No exports were recorded between 1974 and 1979.

4.3.5 A Resurrection of Interest

A resurgence of interest in sunflower production was fueled by the experiment in sunflower oil processing by the Catholic Church in Kitgum and Gulu Districts. The idea was introduced in Kitgum District in 1978. A small Chinese oil expeller was imported with some Kenyan seed. Two used Italian presses, each with a capacity of producing 300 liters/hr, were imported in 1983. One, for Kitgum, was purchased by a farmers' group with the support of a loan from the Diocese under the directorship of the Bishop. The other was directly owned and managed by the Gulu Diocese. Five tons of Kenyan short-term seed was imported in August of 1983. Oil expelling began in April 1984. During the peak processing period, August through February, the mill operated 24 hours a day, running three shifts. A second mill was obtained for Gulu in 1985.

Initially the Gulu mill was run on a service basis. The mission retained the cake and approximately 25% of the oil as its pressing fee. Thus for every 100 kg of black or striped seed brought for pressing, the farmer received a chit for 16 liters of oil. For white seed the ratio was 14 liters per 100 kg of seed[63]. If supplies were sufficient, farmers collected the oil immediately. If not, they had to return later. The Gulu mill gained a wide reputation. With cooking oil in short supply throughout the country, eager customers were usually waiting at the mill for a chance to buy. Some of these were consumers. Others were traders intending to sell the oil either locally or in Kampala.

---

[62] Source: East African Customs and Excise, Annual Trade Reports, 1958-79. Publication of export and import figures ceased in the 1979 and has not resumed.

[63] No accurate testing of oil content or extraction rates was ever conducted by the mill. Records are kept of the oil produced, but not of the quantity of seed crushed. The mission estimates the extraction rate for black or striped seed to be 27% and 18% for white seed, but this is probably an overestimation.

By August, 1986, the time lag between delivery of seed and collection of oil had become considerable. The policy was changed, offering farmers the choice of cash or in-kind payment. Given the high transaction costs involved in repeated trips to collect the oil, farmers usually opted for the 4,500/= per liter offered. This was the equivalent of 720/= per kg of black seeded sunflower[64]. The mission, in turn, sold oil to all comers at 5,000/= per liter.

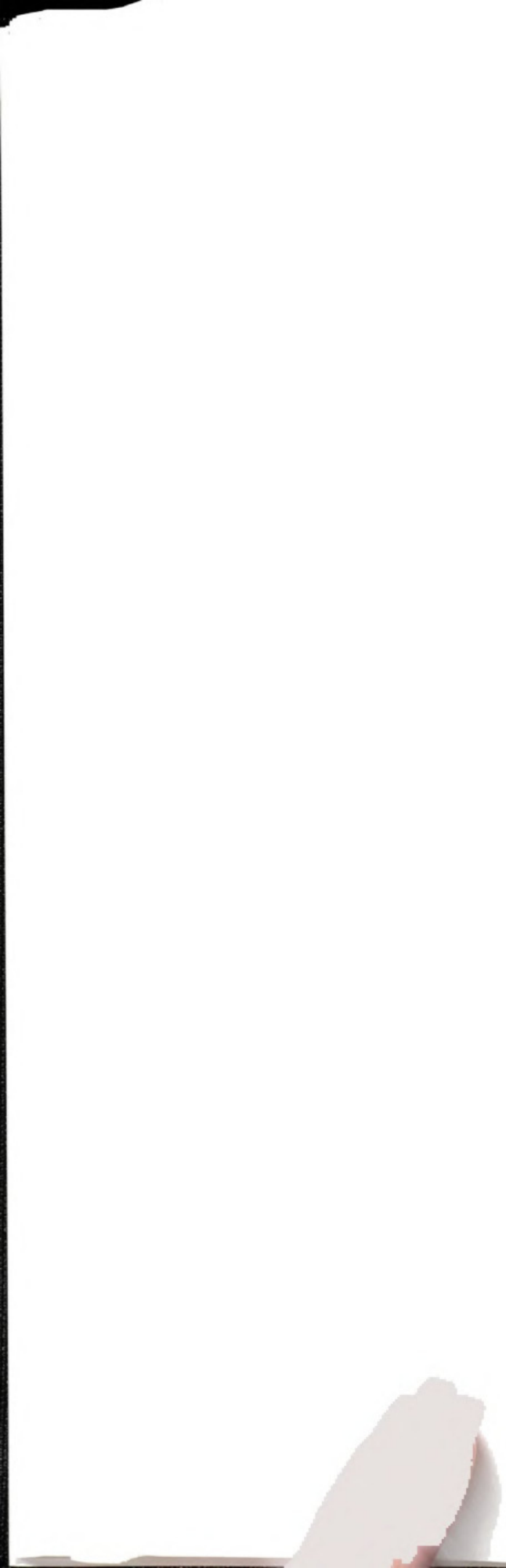
Usually farmers were interested in producing sunflower as a cash crop. While some retained a small quantity of oil for household use, the high urban demand and lucrative prices made sunflower oil too dear a commodity for most rural households. For home consumption in the rural areas groundnuts and sesame remained the preferred sources of fat in the diet.

The mission farm was in the business not only of pressing oil, but also of producing sunflower, and wholesaling seed, oil and cake. Some oil was retained for institutional use, and the cake was mixed with the residues from the rice mill as feed for mission livestock. The remainder of the oil was packaged in 20 liter containers (commonly called jerrycans) and sold to large-scale buyers (i.e., hotels, hospitals, schools and wholesalers) mostly in the Kampala area. Most cake was sold under contract to the Uganda Feed Industries in Jinja.

The Catholic church succeeded in promoting sunflower production in Northern Uganda by filling the role of "channel captain." It not only provided a processing facility, but ensured that the necessary seed was available, provided production information and a ready market through their parishes. Farmers responded enthusiastically, expanding production even in remote areas. It is difficult to assess the economic profitability of the sunflower mill, however, embedded as it is within the fixed costs of the diversified activities of the Diocese, which is in turn subsidized by volunteer labor, donations etc.

---

[64] This is in sharp contrast to the cash price of seed offered to farmers in the rural areas. In 1985 the rural Catholic parishes bought seed directly from the farmers at a price of only 40/= per kg. They assembled the seed and transported it to the Gulu mill. Since the oil from one kg of black or striped seed was at that time worth approximately 300/=, this was a very profitable enterprise for the parishes. The price difference was more than enough to cover the cost of transportation from even the most remote parishes.



4.3.6 Donor-Led Trends

The example of Gulu Diocese sparked the interest of both the donor community and private entrepreneurs looking for business investment opportunities. Since 1984, 70 small to medium expellers have been purchased for installation in Uganda under the management of approximately 45 separate firms or organizations. Over 90% of these have been either donated by various NGOs or purchased with loan funds financed by bi-lateral or multi-lateral donors.

Donor financing has also been instrumental in supporting agricultural research. Before 1991, no improved sunflower variety had ever been presented to the release committee for consideration[65]. Most farmers were planting seed retained from ornamental or confectionery varieties of Russian or Kenyan origin. The oil content of these seeds varied from 10 to 30%. The white seeded varieties have the lowest oil content, followed by the striped and black varieties, respectively. All have hard, thick shells. Sunflower varieties with thin seed coats are preferred for crushing because they cause less damage to the screw presses (Buker and Denton, 1991).

In 1988, a National Sunflower Program was launched at Namulonge Research Station with the support of the Manpower for Agricultural Development Project (MFAD) funded by USAID. Serere Research Station in Soroti had previously been the center for sunflower research, but germplasm collections were largely lost during the long period of turbulence and political instability. In early 1988 researchers replenished the germ plasm stocks with a collection of some 70 varieties, mostly hybrids, obtained from Kenya. That same year, sunflower variety trials to identify the most promising of the imported hybrids were initiated. Four high-potential hybrids, with an average on-station yield of about 2,000 kg/ha, were recommended for importation. Yields of at least 1,300 kg/ha and an oil content of 50% were achieved under farmer management. The parent material for one of these hybrids was obtained, and research on hybrid sunflower production was begun at Namulonge Research Station.

---

[65] The Ministry of Agriculture did not begin to monitor national sunflower area and yields until 1989 and it was not included in the 1990 Agricultural Census.

Research results on hybrids may be presented for release application by the end of 1993. There are, however, serious questions concerning the ability of the Uganda Seed Scheme to handle hybrid seed multiplication.

Despite the potential returns to hybrid development, the research system was under pressure to identify an open-pollinated variety for introduction as a short-term solution to the shortage of sunflower seed in Uganda. Trials were carried out on several Peredovicks of Russian origin and the Australian variety Sunfola. While both the Peredovicks and Sunfola varied in height and maturity, Sunfola was identified as more promising. Reselection efforts were undertaken by the MFAD long-term technical consultant for sunflower. The objective was to develop a stable variety that could be distributed to farmers within two years.

During 1989 and 1990 progeny selection and multi-locational on-station trials were conducted. In 1990 more than 1,000 kgs of re-selected Sunfola were harvested at Namulonge Research Station and distributed to farmers through various project efforts. In 1991 a seed multiplication scheme run by the South Bukedi Cooperative Union in Tororo was financed.

The reselected Sunfola was renamed New Sunfola and recommended for release in October 1991. There are indications that it may have a 10-20% yield advantage over existing striped varieties, and more importantly, a 25% higher oil content. Its thin shell and high oil content make it preferred for crushing. It commands at least a 25% price premium on the market.

Currently, the most promising open-pollinated variety in the pipeline is a breeding line called Record 11-17 of Tanzanian origin, which realized high yields and a more than 40% oil content in multi-locational trials. Record could be a highly promising variety if its variability can be reduced. It yields 800-1,000 kg/ha on farmers' fields compared to Sunfola's 700 kg/ha and is more resistant to bird damage. Recurrent selection of the Record variety is underway to increase uniformity in yield, maturity period, height, head size, disease resistance, and seedling vigor. Researchers hope to present a reselected variety of Record for release in 1994.

Donor interest in edible oil processing in recent years has been greatly influenced by a successful project in Tanzania, implemented by Appropriate Technology International (ATI). This project supports the production and promotion of a manual oil press. Originally designed by Carl Bielenberg in 1985, this press has undergone several design modifications to improve its efficiency, and ease of operation. By 1992 nearly 800 of these presses had been produced in Tanzania (Hyman, 1993). One key factor in the adoption of this press is the availability of high-oil-content, soft-shelled sunflower varieties for crushing. There is a synergistic interaction between variety adoption and investment in manual crushing technology. The importance of high oil content becomes immediately obvious to farmers who try to use the manual press. The existence of rural crushing capacity increases farmers' options for home oil consumption and local sale. This enhanced flexibility helps to break marketing bottlenecks and encourages expanded production.

In 1988, the Experiment in International Living (EIL)[66] began a similar project in Uganda with funds provided by USAID. Initially the project concentrated primarily on the testing of alternative small oil expellers. The Bielenberg ram press was identified as the most appropriate for rural Uganda because of its low procurement and operating costs. The ram press design was modified, and fabrication by local manufacturers begun with EIL assistance. Individuals and groups interested in procuring the presses were required to have at least 25 acres of sunflower planted before they could qualify for credit. EIL project staff instructed farmers on sunflower production practices and provided high-oil-content seed (originally a Peredovick obtained from the Kagando Hospital Rural Development Project, later Sunfola from Namulonge Research Station).

While there have been complaints from some ram press owners about the difficulty of operating the press and the low profit margins when using hired labor, there is no question that the press promotion project has had a major impact on the availability of high-oil-content seed and has encouraged sunflower production. The small electrical expellers and

---

[66] EIL has since changed its name to World Learning. For purposes of consistency, however, the original name will be maintained throughout this document.

the large-scale oil mills are all operating at less than capacity due to lack of raw materials. These commercial operations compete with the ram presses for the available sunflower. Manual press technology can fill an important niche in the market in isolated areas but it will only be viable if its efficiency and ease of operation can be improved. Fortunately, the new ram press models developed in Tanzania are easier to operate and have proven widely acceptable to women. If the effort to replicate this improvement in Uganda is successful, it will be a major step forward.

In the 1991 PL480 agreement between USAID and the Government of Uganda, 40% of the revenues generated by the sale of surplus US edible oil were committed to promotion of the edible oil industry[67]. As part of this effort, the Cooperative Agriculture and Agribusiness Support project (CAAS) is supporting the provision of extension advice and high-oil-content seed to various processors. This is being accomplished through a grant for imported seed as a short-term measure, combined with the financing of hybrid sunflower seed multiplication by staff from Namulonge Research Station and the multiplication of Sunfola seed by large-scale outgrowers.

These donor efforts have stimulated interest in sunflower production. The impact of the seed distribution programs on the adoption of improved sunflower varieties in Uganda is summarized in Table 4.1. The area planted to sunflower is estimated to have increased from less than 5,000 ha in the early 1980s to approximately 38,000 ha in 1991 (Laker-Ojok, 1993a).

---

[67] The bulk of the PL 480 funds set aside to support the edible oil industry were originally earmarked for construction of three high capacity oil mills to be run by Cooperative Unions. Detailed feasibility studies, however, pin-pointed the operating capital and managerial constraints of these Unions (Oryokot and Read, 1990; Bunker et al., 1991). More recently, a proposal was launched to import 15 small expellers for distribution to Cooperative Societies on a lease-to-own basis (Kruse and Burgess, 1992). Recent information concerning the considerable capacity of existing small expellers and constraints on raw material supply, however, has raised questions about the viability of this option as well.

Table 4.1 Improved Sunflower Variety Adoption in Uganda

SEED SOURCE	1990 Qty KG [b]	1990 Area HA	1991 Qty KG	1991 Area HA	1992 Qty KG	1992 Area HA	1993 Qty KG	1993 Area HA
SUNFOLA								
CARRIED FORWARD	0	0	1,348	214	15,809	3,274	23,500	4,562
ON-FARM TRIALS	48	12	20	5	64	16	0	0
NAMULONGE	0	0	10,000	1,667	0	0	0	0
EIL	1,300	202	2,941	1,012	6,627	1,105	0	0
CAAS	0	0	0	0	1,000	167	51,000	10,000
GTZ	0	0	1,500	375	0	0	0	0
TOTAL SUN-FOLA	1,348	214	15,809	3,274	23,500	4,562	74,500	14,562
HYBRID SUNFLOWER[c]								
MUKWANO	0	0	2,500	625	1,000	250	0	0
CAAS	0	0	0	0	1,000	250	2,000	500
TOTAL HY-BRID	0	0	2,500	625	2,000	500	2,000	500

[b] Estimates are based on personal interviews and project reports. The quantity of seed required to plant a hectare varies depending upon the planting recommendations of each agency. Some recommend using higher seed rates and then thinning to the desired plant population. If seed quality is uncertain, this is a very reasonable recommendation. The assumption is made that once the improved seed has been planted, at least an equivalent area will be planted the following year from retained seed from that field. This is a conservative assumption given that farmers know that Sunfola is an open pollinated variety and only 4-6 kg of seed are required per ha.

[c] All hybrid seed is produced by Namulonge Research Station but has been distributed through different channels. No hybrid seed is assumed carried forward even though this may not be true.

CHAPTER FIVE: THE STRUCTURE OF THE EDIBLE OIL SUBSECTOR

5.1 INTRODUCTION

Chapter Five uses the subsector map to analyze the specific organizational structures that have evolved in response to the changing institutional context described in Chapter Four. The first section provides an overview of subsector mapping conventions. The edible oil subsector map for Uganda is then presented. This map provides a framework for summarizing the structure of the subsector, organizing data and focusing discussion. The principal functions, participants and channels are identified and the linkages between the various components are illustrated. A summary overlay presents the data on the number of firms, employees and production capacity. A discussion of the final product markets for edible oils and fats follows. Finally, the likely impact of recent changes in the institutional and policy environment is discussed.

5.2 MAPPING CONVENTIONS

The map follows standardized mapping practices as outlined in Development Alternatives Inc. (1991)[68]. The map lists the various functions that are performed by the subsector along the left hand side, starting with raw materials at the bottom and ending with final consumers at the top. Various final product markets are listed across the top of the map. The functions and markets form a grid onto which the subsector participants are mapped.

Rectangles represent the different participants. A particular box refers to all those participants of a given firm type as identified by such characteristics as size, technology, and number of functions. Vertical integration is shown by drawing enterprise boundaries across several functions. The height of the rectangle indicates how many functions the firm performs. Arrows describe the product flows between

---

[68] These conventions differ significantly from those adopted by Zulberti (1988) and Zulberti and Lugogo (1989b) to describe the edible oils subsector in Kenya. The standardized subsector mapping procedures produce a simpler and more transparent picture of the edible oil subsector.

participants. In Uganda most goods are exchanged through market sales; hence the use of solid arrows. Dashed arrows would indicate contract sales.

The vertical dimensions of the grid represent alternative channels in the subsector. Each major path through the production/distribution system defines a channel of product transformation. Some channels may be separate from raw material through to final product. Others cross over or share sections at various stages. Each channel differs systematically with respect to its strengths, weaknesses and costs of production. The channel concept highlights the importance of vertical relationships between groups of participants within the subsector.

5.3 THE UGANDAN EDIBLE OIL SUBSECTOR MAP

The structure of the edible oil subsector in Uganda is depicted in Figures 5.1 through 5.7. It is a surprisingly complex structure given the small size of the subsector, with seven clearly defined channels. The general subsector map is presented in Figure 5.1. The major defining characteristic of the different channels is the technology and organizational structure at the processing level. These factors then shape the choice of raw material and the nature of the final product. For ease of explanation, the various channels are diagrammed separately in Figures 5.2 to 5.6 as part of the detailed discussion in the following sections. An overlay map summarizing the number of participants, production capacity, oil production in 1992/93 and employment levels for each channel is then presented in Figure 5.7.

Channel 1 represents those households that produce traditional oils and oilcakes for home consumption or sale in the market. This channel is a fully integrated channel. Households potentially fulfill all functions from initial raw material production or gathering through processing to final consumption and sale.

Channel 2 is composed of individuals or small groups that own a manual ram press for producing sunflower oil. Most of these groups grow sunflower. In addition, some process sunflower on a consignment basis. Often the groups sell a portion of their sunflower to the larger millers.

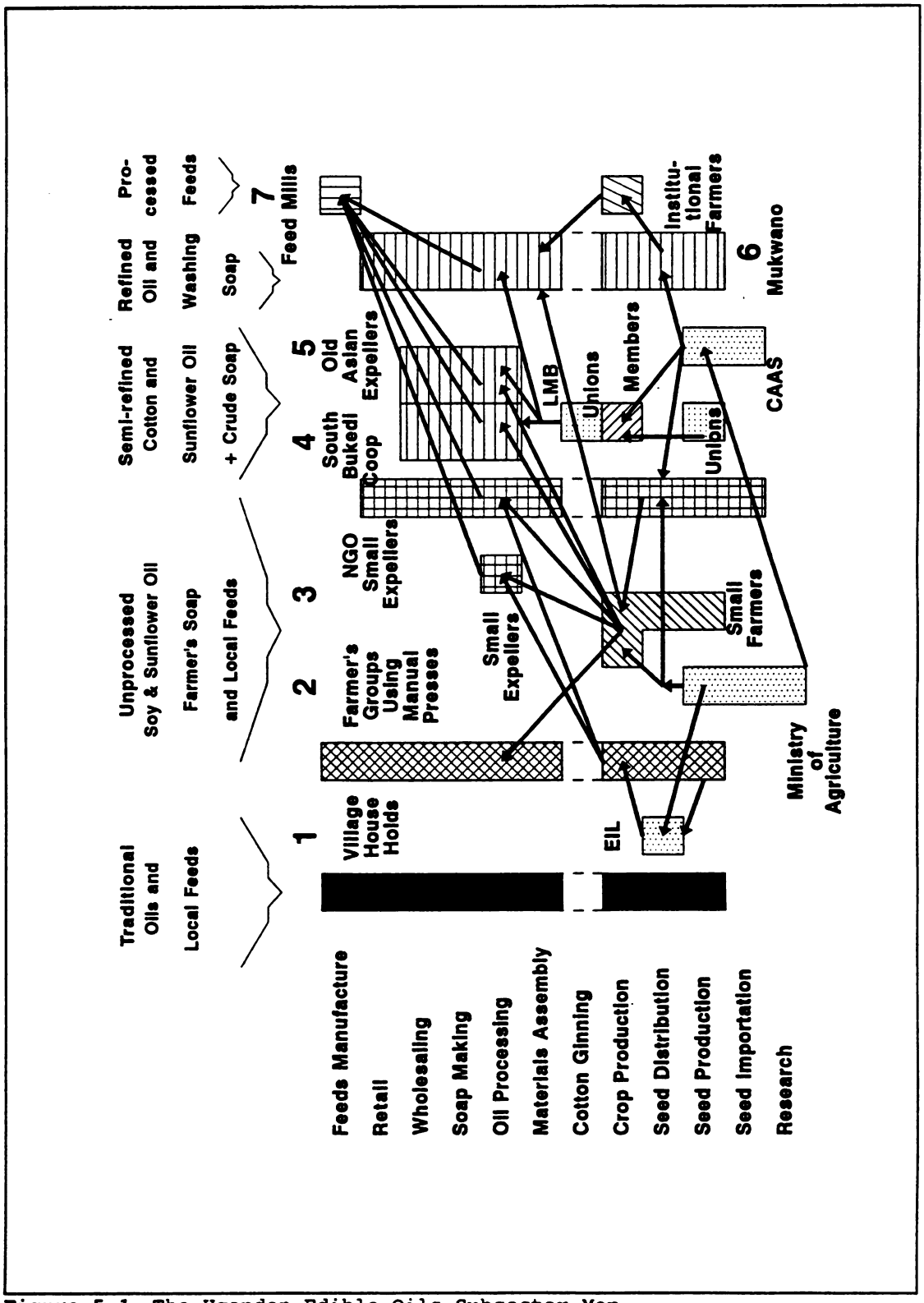


Figure 5.1 The Ugandan Edible Oils Subsector Map



Channel 3 represents the small expellers. Settling and filtration are used to clarify the cold pressed oil. Most of these mills have no refining capacity[69]. This channel is sub-divided based on differences in organizational structure between the privately owned small expellers and those that are owned and operated by a Non-Governmental Organization (NGO). The primary difference between the two is the extent of resources available to them and their degree of vertical integration.

Channels 4, 5, and 6 are larger-scale industrial processors. Channel 4 is the cooperative sector. The organization of the industry is in a state of flux under pressure from the donors for privatization of the Ugandan economy. In 1993 only one cooperative union was involved in edible oil production. Originally intended for processing cottonseed, the shortage of raw materials has forced the plant to begin promoting and processing sunflower.

Channel 5 consists of the processing plants that were originally built by the Asians in the 1940s. They were nationalized after the expulsion of the Asians by Amin in 1972 but are being returned to their original owners.

Channel 6 includes a single large-scale processing firm, Mukwano Industries, which added an edible oil plant to its existing soap industry in 1991. Mukwano plays an important role as channel captain, setting the standard for both input and output prices for the smaller firms. It processes sunflower, sesame, soybean and cottonseed. The two largest Asian owned firms are trying to rehabilitate their earlier plants, including sizeable hydrogenation and soap production capacity. If these rehabilitated plants come on line, they will join Mukwano in Channel 6.

The final channel in the subsector is the feeds channel. None of the large oil processors has gone into animal feeds manufacture. The

---

[69] The Indian technology imported under the USAID funded Rehabilitation of Productive Enterprises Credit Program is the exception to this statement. These 10 mt/day plants have facilities for simple neutralization of oil. With cottonseed oil, it is necessary to add caustic soda to neutralize the free fatty acids in the oil which make it unfit for human consumption. These plants do not have facilities to deodorize and bleach the oil they produce.

feed subsector is dominated by a parastatal firm, which faces stiff competition from the smaller feed mills. There is excess capacity in the industry. Furthermore, oilcakes comprise only a minor portion of the feed mix, and demand is insufficient to utilize the supply of cake generated in the oil milling process.

5.3.1 Channel One: The Traditional Oil Producers

Channel 1 is the simplest and most clearly defined channel (Figure 5.2). It represents those households that use traditional methods to produce oils and oilcakes for home consumption or sale in the market. These households produce a variety of oils using very simple processes[70]. For vegetable oils this generally involves grinding or cracking and boiling to separate the oil from the plant tissues in which it is bound. The primary traditional oils are palm oil, shea butter, ghee and, to a lesser extent, sesame oil.

Channel 1 is a fully integrated channel. These households fulfill all functions from raw materials production or gathering through processing to final consumption and sale. Oilcakes and residues are either discarded or used as local animal feeds. A share of the final product is generally sold to traders, who bulk the oil and transport it to neighboring areas. For palm oil in particular, there are traders who specialize in its transportation and wholesaling.

Most participants in the sector are involved on a very limited part-time basis. Traditional production and processing methods require minimal investment, although the production of palm oil and ghee may involve a greater degree of specialization than does shea butter and sesame oil.

The two most common traditional vegetable oils, palm oil and shea butter, are derived from perennial crops. Shea trees grow wild on the drier margins of the savannahs of northern Uganda where oil palms cannot

---

[70] The regional distribution of the production and consumption of these various products was discussed in Chapter 3.

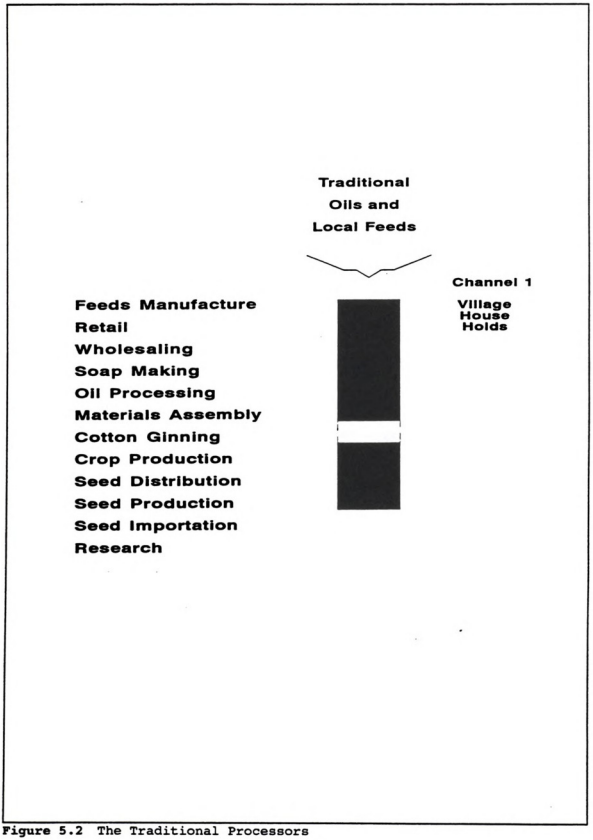


Figure 5.2 The Traditional Processors

grow[71]. These trees take 10 to 15 years to begin production and up to 25 years to reach full productive maturity. Average production is between 15-20 kg of fresh fruit per tree. An average of one tree in three is productive each year (Tropical Products Institute, 1971). The yield of fresh fruits can reach 3,500 kg/ha but weight is mostly in the pulp and shell with final yields of shea butter about 300 kg/ha[72]. No figures are available regarding shea tree populations or production in Uganda. While a few shea trees may have been intentionally planted or protected in homesteads, most grow on common land, subjected to the threat of grass fires. The wood is also collected as firewood and for curing tobacco. Because of increasing population pressure, the number of harvestable trees has been declining. The primary harvest period is during April and May. Shea butter is used as an extender for chocolate (Hyman, 1991) and, if properly prepared, international prices are high. Since shea butter is more valuable as an ingredient in food processing, if commercially processed it would probably be exported rather than sold for domestic consumption.

An annual total of approximately 500 mt of shea butter is produced and consumed each year, mostly for home consumption. While a few women carry out regular extraction of shea butter for sale in the local markets, it is a necessarily seasonal activity, and production levels are limited by the labor-intensive nature of the extraction process and the availability of raw materials. The annual profits of an average market producer are estimated at $80 per year (Ahimbisibwe et al., 1988). The returns to labor are probably lower than the current daily casual labor rate. Shea butter extraction, however, has the flexibility of being an activity that women can carry out at home amid the demands of their domestic activities.

Oil palm can produce more edible oil per unit area of land than any other commercially grown oil producing plant. In Uganda, oil palms, primarily of the less productive thick-shelled dura type, grow on the

---

[71] Northern Uganda constitutes the southern limits of the sheanut production belt. The principal producing Districts include Soroti, Kumi, Kitgum, Gulu, Lira, Apach, Arua, Nebbi and Moyo.

[72] Fifty kg of fresh nuts give about 20 kg of dry kernels, which yield roughly 4kg of shea butter (Tropical Products Institute, 1971).

Lake Victoria Islands and in the semi-humid forests on the western slopes of the Rwenzori Mountains near the Zaire Border. Most of the oil palms in Western Uganda grow wild on common land and in the forest reserves. Under such poor growing conditions, palms usually require at least five years to produce harvestable fruit and ten to thirteen additional years to reach peak productivity (Wood, 1987). The palm fruits are collected, and sold to households and informal-sector processors who convert them into oil, using casual labor. Individual households rely primarily on a simple process of boiling the fruits, pounding to remove the kernels, and reboiling to release the oil, which is skimmed from the top. The more commercial processors use a locally produced manual extraction technology adapted from Zaire.

According to the data from the Household Budget Survey, an estimated 900 mt of palm oil may be produced in Uganda annually using these traditional methods. There is no improved palm oil processing facility. Approximately 8-10 metric tons of palm fruit bunches can be harvested per hectare under poor growing conditions[73]. With efficient extraction methods the oil yields from the thinner-shelled Tenera variety is approximately 20% (FAO 1988). The traditional extraction rates are much lower. Unfortunately, the four existing hybrid palm plantations, which were established in 1972/73 by the Ministry of Agriculture, have not kept adequate production records. Researchers at the palm plantations report yields of about one ton of oil per hectare per annum (Enger et al., 1989). This could possibly be doubled with more timely harvest and more efficient processing including extraction of oil from the kernel, which is currently discarded as waste.

The surplus oil is sold to traders who assemble the crude red palm oil and transport it from the isolated region in which it is produced. It is retailed by shopkeepers and market venders in the towns and trading centers of western Uganda and eastern Zaire, where it is favored as a traditional cooking medium.

---

[73] Maximum yields of about 30 mt of fruit bunches per hectare can be obtained under extremely good management, but this requires heavy fertilization (Wood, 1987). None of the palm plantations in Uganda has ever been fertilized. Furthermore, most of the wild palms are of the lower-producing dura type.



There are several factors that limit the potential for commercial palm oil production in Uganda. Palm fruits must be processed immediately after harvest to prevent a buildup of undesirable free fatty acids in the oil. This requires concentrated production near a modern processing plant. Existing economies of scale require an annual throughput of 3,000 mt per annum to justify the investment. According to the FAO (1988), the best location for oil palm in Uganda is on Bugala Island in Lake Victoria[74]. Land is available for a 300 ha nucleus estate and an outgrowers scheme with roughly 1,000 small farmers, each with 100 palms. The high additional capital investment involved in establishing the necessary road network and shipping facilities is prohibitive given current interest rates (23%) and the five-year lag between investment and initial production of oil. Major government or donor financing would, therefore, have to be availed. Outgrowers will hesitate to plant oil palms before the nucleus estate is in full production. This could result in considerable over-capacity in the first few years of operation.

Bunker et al. (1991) raise an additional concern for the problems of environmental degradation caused by current commercial palm oil processing techniques. Ten metric tons of water are required to process and sterilize one metric ton of palm oil[75]. The waste water contains large quantities of carbohydrates, and smaller quantities of toxic solids, oils, sugars, fats and proteins. These effluents, while largely non-toxic, "destroy soil fertility and poison swamps and lakes" (Bunker, 1991). The cost of installing and operating waste water treatment facilities is very high. Malaysia is now requiring water treatment in all palm oil facilities, but only after thousands of hectares of land has been contaminated. The potential building of a commercial palm oil facility on the islands of Lake Victoria raises serious questions about the impact on Uganda's important fishing industry.

---

[74] The FAO report suggests that in this area a yield of 20 mt/ha/yr could be achieved under good management, resulting in an oil yield of about 4 mt/ha/yr of palm oil.

[75] A plant of the size proposed for Bugala would produce 10 mt of oil per day, and would require over 30,000 mt of water annually.

The establishment of a large palm oil processing facility would completely change the structure of the entire edible oil subsector, but it looks unlikely in the near future. Traditional oil extraction techniques have very limited potential for expansion, largely due to constraints in the supply of raw materials from common land sources. For this reason, they are not analyzed in any detail[76] in the following chapters.

Ghee production is carried out by traditional cattle keepers in Central, Western and Northeastern Uganda[77]. Milk contains up to 5 percent fat in liquid emulsion. That fat can be separated using a fermentation process. Traditional ghee is made from fresh whole raw milk boiled in metal pans to sterilize and assist in cream separation. Cream and milk solids are skimmed off and placed in a gourd or container. The remaining milk is stored in a covered container until it begins to ferment and the curds separate from the whey. These curds are then mixed with the cream from the first separation and churned vigorously by hand. After settling the whey is again poured off. This process is repeated 3-4 times until the resulting ghee is semi-solid. It is then placed in a covered container for 1-3 days to mature. At this point it is either sold or refined by melting and then cooling. This heating process pasteurizes the fat and removes the last of the whey (Bunker et al, 1991).

Ghee production in Uganda could be improved by the use of sterilizable containers and by controlling the fermentation and churning process. The equipment required to produce ghee under more controlled and hygienic conditions is estimated by Bunker et al. (1991) to cost about $5,800. At current prices, ghee cannot viably compete with the Uganda Dairy Corporation for surplus milk. The additional investment to

---

[76] For a discussion of the steps and costs of traditional production for sheanut butter, sesame oil and ghee in Uganda see Ahimbisibwe and Msemakweli (1988). For an analysis of palm oil production potential and constraints see the FAO report "Palm Oil Production in Uganda" (1988).

[77] While cattle keeping is common in other areas of the country as well, the herds are generally smaller. Most of the milk in these areas is consumed fresh and ghee production is not well established.



improve the hygienic conditions for ghee production would further reduce the profitability of ghee production.

Industrial manufacturing of ghee is uneconomic because of the uncertain market for skim milk in Uganda and the high cost of installing a pasteurization facility. The smallest pasteurization plant available costs about $2 million for a 10,000 liter per day plant. Ghee is currently only produced when no other use for milk is available. Uganda Dairy Corporation reports that it only processes ghee when some of the fresh milk accidentally turns sour. Most of the ghee it produces is sold to employees.

This analysis assumes that all ghee consumed in Uganda is locally produced. Based on the Household Budget Survey, it is estimated that over 4,600 mt of ghee is produced annually[78]. Potential expansion is dependent on changes in the livestock industry and is therefore largely unrelated to the rest of the analysis. Traditional ghee production is expected to stagnate as the modern beef and dairy industries expand and marketing facilities for fresh milk improve.

5.3.2 Channel Two: Ram Press Processors

Channel 2 (Figure 5.3) is also quite vertically integrated. It is composed of individuals and small groups that own a manual ram press for the production of oil from sunflower. As discussed earlier, the ram press technology is being promoted by EIL[79] with support from USAID. An ATI project to promote production and utilization of ram press technology has also just recently been approved for financing by USAID and DANIDA and will begin operation in late 1993.

The technology works best with softer-shelled high-oil-content varieties. EIL has been instrumental in procuring and distributing

---

[78] It is possible, however, that some of what was reported as ghee or lard consumption was actually hydrogenated shortening. This confusion could be caused by translation difficulties. Uganda has over 12 major languages, and enumerators were bound to encounter households which spoke a language in which they were less than fluent.

[79] While EIL has recently changed its name to World Learning, it will continue to be referred to throughout this report at EIL since that is the name by which it is known in the existing secondary literature.

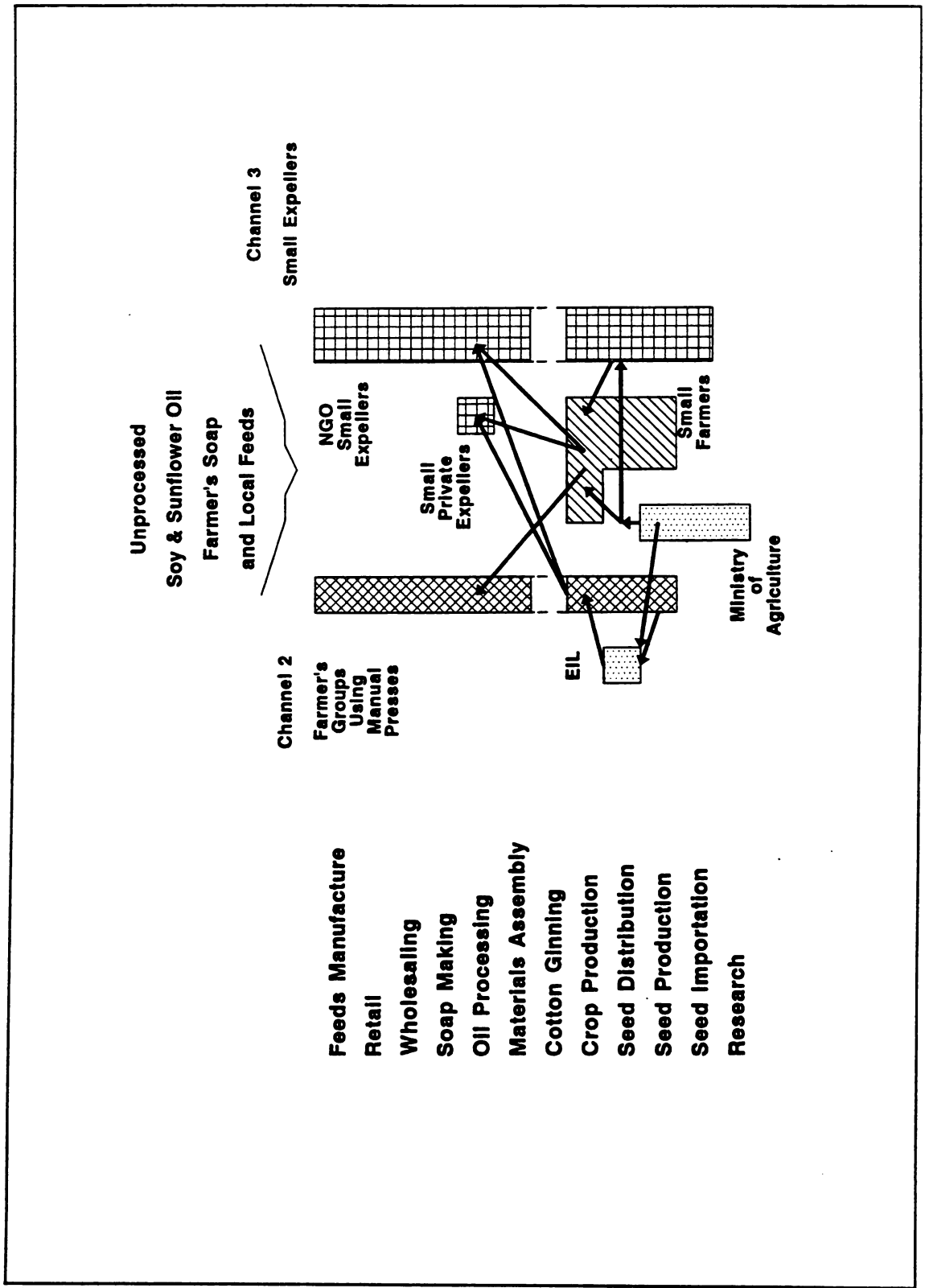


Figure 5.3 The Intermediate Technology Processors



high-oil-content open-pollinated seed to interested farmers. More than 11 tons of seed have been distributed since 1990. These farmers' groups grow most of their sunflower. In addition, some buy sunflower from other farmers. Others do consignment crushing for non-members. In the latter case, a service fee is charged in either cash or oil. Often the groups sell part of their sunflower to the larger millers, retaining only a portion for pressing. Such groups have a greater awareness of the usefulness of the cake for supplemental animal feeding, but much is still wasted.

As of the beginning of 1993, 61 of the manual oil presses had been sold by EIL[80]. Of these, 51 were sold to groups or companies and only 10 were sold to individuals. Complete information concerning the amount of sunflower these presses processed in 1992 is not available. Based on the 20 owners who submitted their processing returns for the first three quarters of 1992, the average active press processed approximately 3.73 mt of sunflower in 1992 with an oil extraction rate of 23.8%[81]. This resulted in an average production of 890 liters per press. If this rate were matched by all the existing presses, annual production would have exceeded 50 mt. It is likely, however, that the non-reporting press owners are the least active processors. If it is assumed that 50% of the presses are essentially inactive and the remaining 20 produce at half the rate of the reporting groups, the estimate would fall to approximately 25.5 mt of oil produced by this channel in 1992. Based on interviews with 20 ram press owners, conducted in Sept./Oct. 1991, the latter seems a more realistic estimate. The costs of production for this technology are discussed in Chapter Nine.

---

[80] Information for this section obtained from Rugumayo and Kalyabara, "World Learning Inc. Quarterly Narrative Reports" various issues.

[81] In reporting extraction rates, most processors operate under the assumption that a liter equals one kilo. If they obtain 20 liters out of 100 kg, therefore, they would report an extraction rate of 20%. A liter of oil actually weighs .924 kg on average. This is the conversion rate used throughout this report whenever units are expressed in metric tons.

5.3.3 Channel Three: Small Expellers

Channel 3 (Figure 5.3) is the most heterogeneous and dynamic channel. It is characterized by the use of small and "mini" expellers for processing sunflower and soybean oil[82]. For purposes of this study, small mills are defined as those with a capacity of at least one ton per day. They usually include one or more expellers of 1 to 2 mt/day capacity. These mills use expellers with the same capacity as those used in the larger industrial establishments. The main difference is in the number of expellers installed in a single location. These mills have a much greater potential for economic viability than the mini mills with less than one ton capacity. Most of these expellers come from Italy, Japan, China and India. The Italian expellers are often reconditioned secondhand machines. Only one was obtained from Germany. By June 1993 there were 20 such mills in the country but 3 of these had not yet been installed[83]. Six more are in transit.

The smaller mills, rated at 40 kg/hr, come from the UK and Germany. Twenty-one mini mills have been installed. An additional 23 are confirmed but not yet installed[84]. Some small mills use filter presses, but most mini mills rely on settling tanks to clarify the oil. Only 5 of the small mills have refining capacity[85], and these are not

---

[82] The five 10 mt capacity mills financed by USAID under the Rehabilitation of Productive Enterprises line of credit can also crush cottonseed because they have neutralizing capacity. Only one of these mills has been installed to date.

[83] The information in this section is based on as complete a census of all mills in Uganda as possible. Nearly all of the mills have been visited at least once. The most active were interviewed two or three times. Given the dynamism of the sector, new mills are being ordered all the time. For this reason, these figures are expected to change considerably in the next few years.

[84] Unlike earlier reports, which have included long lists of firms licensed for the production of edible oil which have never operated a mill and have no firm intention to do so at the present time, these figures include only those mills whose operation could be physically verified or for which we had confirmation from the financing agency that firm orders had actually been placed. The list of mills is included as Appendix 1.

[85] These are the medium scale Indian technology imported under the USAID funded Rehabilitation of Productive Enterprises Credit Program. These 10 mt/day plants have facilities for simple neutralization of oil. These plants do not have facilities to deodorize and bleach, however.

yet on line. The expellers at these mills are Indian and are rated at 10mt/day capacity.

The small-expeller channel can be subdivided based on differences in ownership and organizational structure. There are twenty privately owned mills, eighteen that are owned and operated by Non-Governmental Organizations (NGO), four belonging to small groups or cooperative societies, and four belonging to educational institutions. By NGO, we refer to any non-profit, voluntary or charitable organization whose objectives are oriented primarily toward development promotion rather than business. The NGO managed mills in Uganda have been financed by both religious and secular organizations[86].

One major difference created by the organizational structure is in the extent of resources available and the degree of vertical integration. The private expellers often experience severe capital constraints and limit their activities exclusively to the processing and sale of oil. Their raw materials are usually bought on a cash basis direct from farmers or from rural assemblers. Many mills post buying agents in the rural areas during the harvest season, but the quantity of raw material they can stock is limited by the available working capital, forcing long periods of idle time between seasons.

In contrast, the established NGOs have more resources and usually try to integrate backward into raw material production, promotion, and seed supply. These organizations sometimes carry out seed multiplication or purchase seed from the Uganda Seed Scheme[87]. In addition, some seed is imported directly from Kenya. Most religious organizations both produce sunflower and purchase it from small farmers. Some NGOs have specific members to whom they offer seed, tractor hire services, credit

---

Their oil would therefore be considered "semi-refined".

[86] Mills that were financed by an NGO but are being run as a private organization for the profit of an individual entrepreneur or company are considered to be private. Some of the privately owned mills were initially purchased with either a loan or grant from an NGO or donor project. The distinction is in the nature of the ownership, control of the proceeds, and the incentive structure that it creates, rather than in the source of capital for machinery purchase.

[87] In fact, NGOs have become the largest customers of the seed scheme, which suffers from severe marketing problems. For a detailed discussion of this issue see Laker-Ojok (1992).

and extension advice. Some provide transportation from farmgate to the mill. Most engage in retail sales to constituents besides selling wholesale to traders and institutions. Some have educational or health institutions that buy the oil at subsidized prices.

The smaller NGO sponsored mills have proven to be the least viable. These are usually small-capacity mills, donated to a religious or farmers' organization to generate income for the organization and provide a service to local farmers. Often the organization's capital investment is minimal. Little thought is given to the incentive structure required to ensure proper management.

Unfortunately, most of these mills are donated without consideration of the need for adequate operating capital, spare parts, technical expertise and business acumen. Working capital is generally assumed to form the group's share of the matching funds. The groups do not have the cash necessary to buy up a large stock of raw materials at harvest. This leads to low capacity utilization. Technical expertise is lacking. Seed cleaning and sorting to remove stones, nails etc. is inadequate, and most have no decortication facilities. The resulting excessive wear on key components, especially the worm screw, cage bars and choke ring, results in low extraction rates and frequent breakdowns. No-one in the organization has a personal interest in assuring maintenance. Within a short time the machine is abandoned as un-economical. At the time of this report, six of the mini NGO mills, two mini private mills and two small NGO mills are believed to have been dormant for more than a year. Several others have operated only briefly in the last 12 months. The eight mini-mills soon to be installed by groups funded by the Economic Development Fund and the seven mini-mills being brought in for the World Vision Orphans Project in Gulu District are likely to suffer a similar fate unless important lessons are learned from the bad experiences of others.

The small and mini expellers are estimated to have produced over 206 mt of oil in 1991. This is a considerable increase over the 90 mt estimated for 1989/90 by Recon (1990). In 1992/93 this channel produced at least 545 mt, reflecting the increasing number of mills and the increased capacity utilization of several larger mills. This still represents a very small fraction of the 91 mt/day total installed

capacity for this channel. The growth in installed capacity and number of mills since 1980 is illustrated in Figure 5.4.

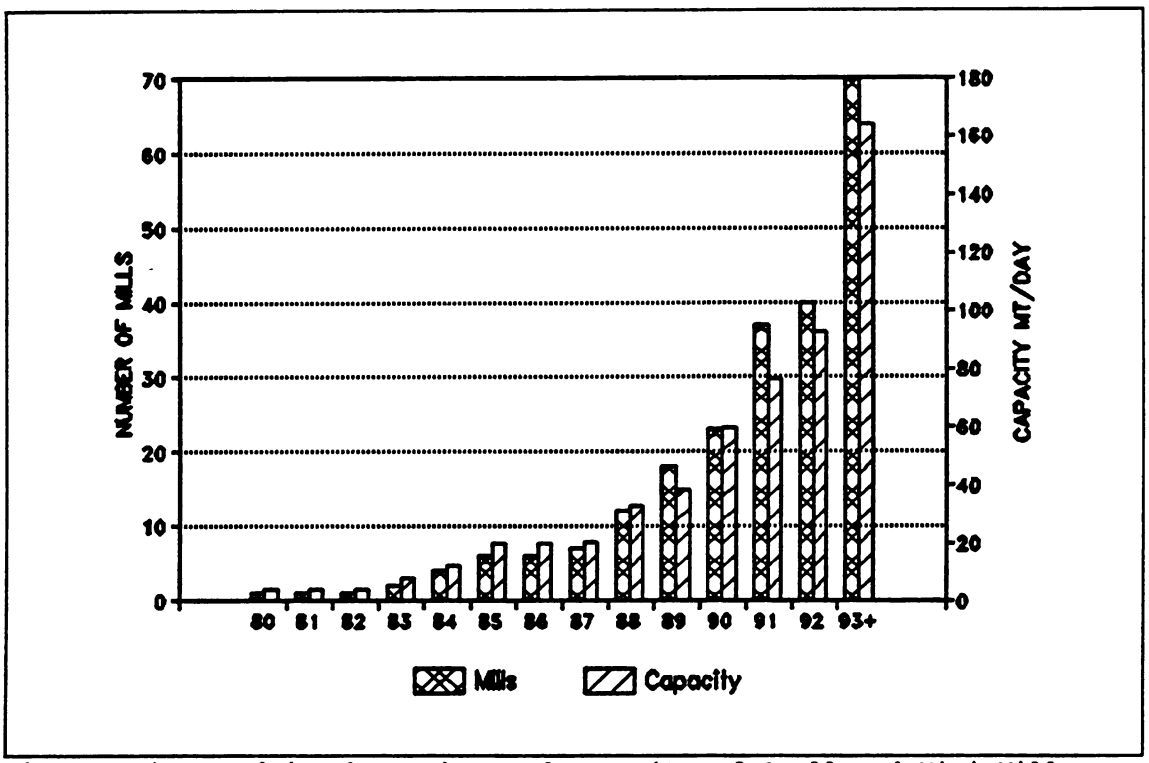


Figure 5.4 Trend in the Number and Capacity of Small and Mini Mills

Most small and mini mills run a single shift and close down for extended periods due to lack of raw materials. The combined employment of the small mills is approximately 175 to 200 persons. Most of these are casual laborers, employed only during the production period. Employees of NGOs and religious establishments may be full-time laborers who are reassigned to other duties during the downtime. The mini mills employ between 40 and 60 persons, mostly casual labor.

Most of the small and mini mills process only sunflower. Two of the mills in Jinja specialize in soybean milling on contract for the animal feeds industry. Two of the mini mills crush groundnuts, largely because the Komet expellers are too small and too slow to process sunflower effectively. One newly-installed milling complex, located in Kampala, is crushing sesame since its recent price decline. Lastly, the five Indian complexes being imported under USAID can process either cottonseed or sunflower depending on availability.

5.3.4 Channel Four: Cooperative Processors

Channels 4, 5, and 6 are larger scale industrial processors. These channels are all illustrated in Figure 5.5. These mills were designed to crush cottonseed and have been hurt by the decline of cotton. Since 1971, cotton production has fallen dramatically from an average of 383,000 bales per year in the 1960s to 35,000 bales per year in the 1980s (Figure 4.1 in the previous chapter). This is largely due to gross mismanagement of the cotton cooperatives, which monopolized cotton processing and marketing. Despite major efforts at ginnery rehabilitation and promises of attractive prices, the inherent managerial weakness and financial crises in the cooperative sector have discouraged farmers from returning to cotton production. While production has increased marginally, a full-scale structural reorganization will be required if the sector is to revive.

Channel 4 is the cooperative sector. Cooperatives became involved in edible oils because of their long-standing position as monopsony processors of cotton. The organization of the industry is in transition as a result of donor pressure for privatization.

By law[88], approved varieties of cottonseed had to be distributed free of charge to cooperative members through their cooperative union and primary society. LMB was charged with the responsibility for cottonseed dressing and distribution. After harvest, cotton was purchased at the primary society level at a nationally fixed price. It was then taken to the Union for ginning. The ginning process removed the seed from the fibers. The baled cotton lint was sold at a fixed price markup to the LMB. In 1985, ownership of the cottonseed was transferred to the Unions, but they had no right to dispose of seed without LMB permission. LMB determined what proportion was to be retained for dressing and distribution to farmers as planting seed in the following year. The balance was allocated by the LMB to processors

---

[88] The system of cotton marketing and seed distribution is currently in a state of flux. Amendments to the laws mentioned in this paragraph were presented to the National Resistance Council in 1993, but had not yet been passed when this report was written.

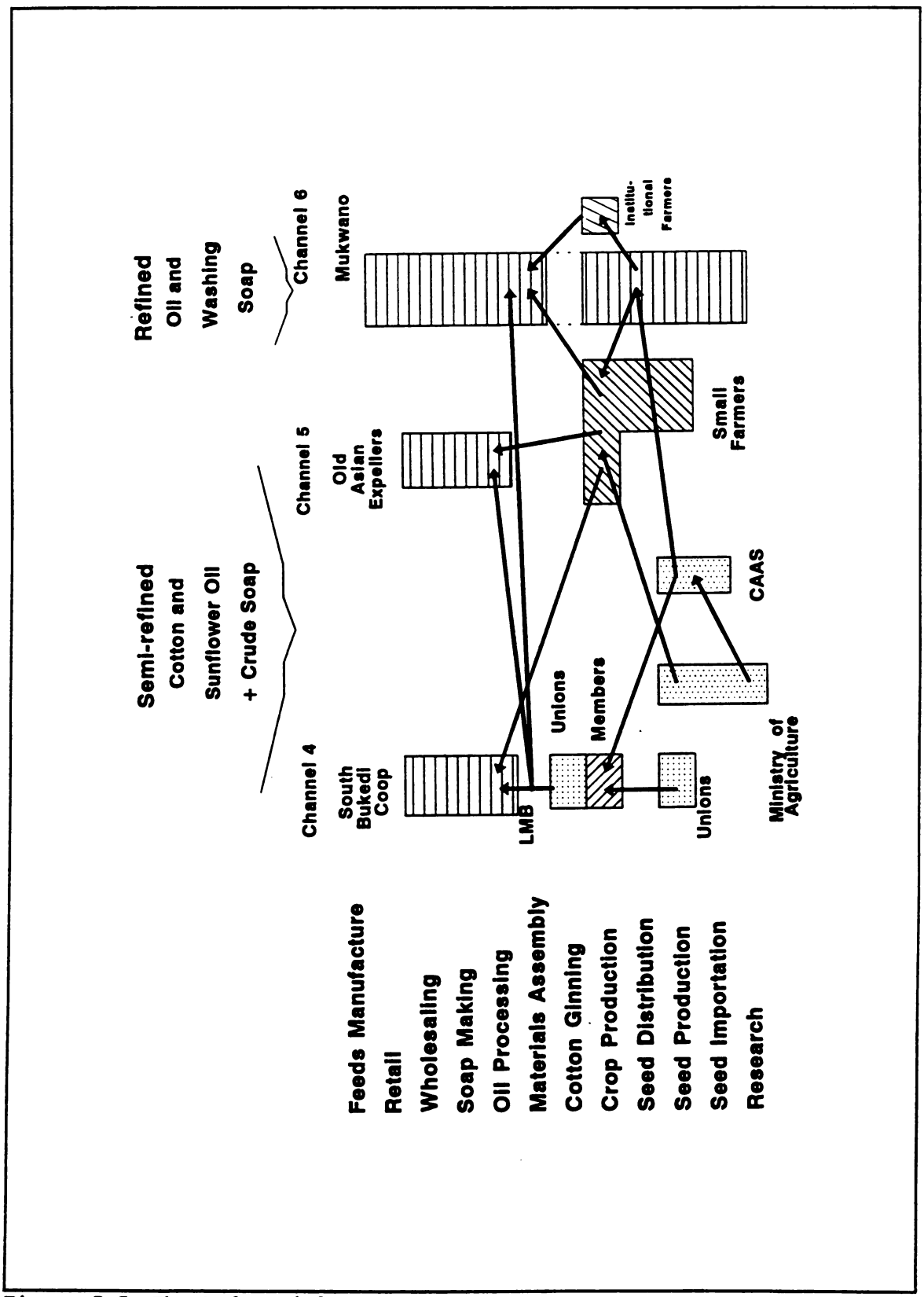


Figure 5.5 The Industrial Processors

for crushing and the Union was paid accordingly[89]. If the Union owed LMB for crop finance, seed sales were deducted from the debt.

Only the South Bukedi Cooperative Union in Tororo has invested in oil-milling capacity.[90] The 30 mt/day facility was supplied in a barter trade deal with the East Germans and commissioned in November 1988. The mill was originally intended for processing the union's cottonseed. LMB control over seed for planting has led to conflict with South Bukedi, however. In 1991 total cottonseed available in the District after local planting needs were filled was 2,500 tons. But planting needs in other Districts take priority. LMB paid the Union USh 50,000/= per ton for its cottonseed, which was of higher quality than that available in other areas. This seed was distributed free to other Unions for planting. To buy poorer quality cottonseed for crushing, South Bukedi had to pay USh 55,000/= per ton and compete with other millers who had better access to capital and transport. In the end, South Bukedi had only 400 tons to crush that year. The shortage of cottonseed has forced the plant to begin promotion and processing of sunflower to improve capacity utilization. This sunflower promotion has been carried out with the assistance of the CAAS project. CAAS both imports sunflower seed and finances seed multiplication. This seed is sold to members who, in turn, are expected to sell their sunflower back to the Union for processing. Despite these efforts, production remains far below capacity.

The Union has been unable to ensure farmers cash on delivery of sunflower. Farmers have been disgruntled by both the price of sunflower

---

[89] After 1974, when the majority of the mills came under LMB control, this became essentially an internal allocation exercise. LMB and later EOSIL were under considerable pressure to keep all of the mills operating in order to provide employment. For this reason, even after seed supply fell to such levels that it could have been more efficiently crushed at a single mill, six or seven mills were kept operating at extremely low levels of capacity utilization.

[90] In the past, several former Asian owned mills were allocated to Cooperative Unions. They were never well-managed. Apparently, the original owners have applied for the return of these mills. While two are still in Cooperative hands at the time of this study, they are likely to revert to their original owners in the near future. The Small to Medium Expeller Channel includes only one mill owned by a primary society. One other cooperative society had purchased a small mill, but found it to be unprofitable and sold the equipment to a private firm. Six more are scheduled for installation in the near future.

and delays in payment. Many have defected and sold their sunflower on the open market. In 1992, the sixteen tons of sunflower purchased by the Union was insufficient to run the plant for a single day. The Union management decided to sell its sunflower to Mukwano, its largest private-sector competitor.

While the plant has excellent refining equipment, the lack of operating capital limits the extent of the refining done by the Union to basic filtration and neutralization. The oil is not deodorized or bleached. The process of neutralizing cottonseed oil results in the production of soap stock. The mill does not include a modern soap plant. Soap making by the Union is limited to a small quantity of very poor quality "farmer's soap."

During the period of June 1992 through May 1993 the Union produced 84.5 mt of oil. This is the best annual production to date, but still leaves the plant running at less than 10% of capacity. The Nyakesi mill also suffers from poor management and over staffing. The mill could easily operate with 15 laborers. During December 1988, it ran two shifts and has retained the full crew of 30 laborers ever since, although the plant runs only a single shift for a few days each year. Maintenance is very poor and spare parts for the Eastern Bloc technology are difficult to obtain. In its recent analysis of the Cotton Industry, the British Cotton Growing Association (1993) noted: "The serious lack of management, processing and engineering skills means that South Bukedi Cooperative Union could find itself still paying (barter) for an oil mill and refinery that has become inoperative."

5.3.5 Channel Five: Departed Asian Properties

Channel 5 includes seventeen edible oil processing plants that were originally built by the Asians in the 1940s and 50s. They were nationalized after the expulsion of the Asians by Amin in 1972[91]. Many

---

[91] Coles (1968) reports that by 1965 there were 36 edible oil processing firms in Uganda, but only 18 were in production. Of the eighteen firms that LMB was ordered to take possession of in 1972, one apparently only produced soap and did not have an oil mill. These are the seventeen firms discussed in this section. The fate of the other 18 firms that were not allocated to LMB is completely unknown. It has been

of them have changed hands several times. Their production history with its dramatic decline in output following nationalization was illustrated in Figure 4.1. These mills are currently being returned to their original owners. For this reason, they constitute an unpredictable set of participants in the subsector.

These mills were originally built to process the large quantities of cottonseed being generated during the boom period. They also produced small quantities of groundnut and sesame oil when market prices allowed. Six of these firms were equipped with double-refining capacity and two had hydrogenation plants. Most of the mills suffered from a lack of maintenance during the period of parastatal management. Four appear to have been destroyed and five others have not operated for over ten years. Those that are operational have been producing semi-refined oil during the period under LMB/EOSIL management. Some also process small quantities of sunflower seed purchased from farmers.

The mills can be divided into two groups, according to their installed capacity: (i) high-capacity mills, with a production capacity of over 20,000 tons per annum; and (ii) medium-capacity mills, with 9,000-19,000 mt/annum capacity. The two high-capacity mills are located in Jinja and Kakira (about 5 km east of Jinja). These mills were designed to employ a large number (15 and 24 respectively) of low capacity Rosedown expellers. They also included facilities for soap manufacture, double refining, hydrogenation, and container production. In the past, these two mills served as final processors for firms producing semi-refined oil. The Kakira company also owns the largest Ugandan sugar estate and factory. It has potential for estate production of sunflower and recourse to an existing network of outgrowers. The company is promoting sunflower production through seed distribution and is multiplying seed for the CAAS project.

Both facilities are in need of serious repair and renovation. The returned owners have plans to rehabilitate to at least 50% of their original capacity. Their current combined capacity is around 46,000 mt of oilseeds per annum but could double when planned rehabilitation is completed. In 1992-93 the Jinja plant produced 120 mt of oil. The

---

impossible to trace their whereabouts or current status.

Kakira plant has run one lot of cottonseed through simply for testing but has not yet gone into regular production. Both mills have a history of effective management and technical ability. Should these mills resume full operation, they will be classified in Channel 6.

The medium-capacity industrial mills were designed to use several expellers, each able to crush approximately 250 kg of cottonseed per hour. The number of expellers ranged from 2 to 12 (Vura 1986). Estimating the production capacity of these medium size mills is problematic. If one uses earlier published figures for installed capacity from EOSIL, their combined capacity would exceed 552 mt per day (Vura, 1986; Laker-Ojok, 1986). Using an average of 250 working days per annum, this would amount to 138,000 mt/annum. Enger and Burgess (1989) point out that these ratings apparently refer to total quantity of undecorticated cottonseed capable of being crushed in a 24-hour period. Cottonseed was decorticated to approximately half its volume before crushing. This would then imply a similar reduction in actual crushing capacity of the expellers themselves. In addition, many firms used a double pass system, in which the cake was passed through the expellers a second time to remove as much as possible of the residual oil. The second crushing is much faster than the first but the need for a second crushing reduces total annual crushing capacity.

After years of neglect the current operational capacity of these mills is much lower. BCGA (1993) estimates that their combined current capacity is closer to 11,000 metric tons per annum. The report asserts: "Without considerable capital investment therefore to renovate preparation plants, rebuild screw presses and replace boilers, these mills cannot be considered as viable processing units."

In 1992/93, only two of these mills produced oil. These mills were still in the hands of cooperative unions (Soroti and Bunyoro Growers) that processed their own cottonseed. Since the ownership of these mills remains in question, the cooperatives have given no consideration to the need for plant rehabilitation. At least one plant, Jupiter mills in Kawempe just outside Kampala, has been largely rehabilitated. The owner is still hesitant to begin production given current raw material constraints.

Only four mills had double-refining capacity. Two of these have been non-operational for over ten years. The remaining mills were equipped with 5 ton batch-neutralizing tanks for production of "washed" cottonseed oil for the local market. According to the BCGA (1993), washed cottonseed oil is no longer considered fit for human consumption and now requires further refining to meet recognized edible oil standards[92]. This raises questions about the viability of the five USAID-financed small mills that can single refine cottonseed oil. In the past, washed cottonseed oil found a market with low income consumers. Future markets for single refined oil will probably depend on the strictness of enforcement by the recently created Uganda Bureau of Standards[93]. If single refined cottonseed oil is deemed unfit for human consumption, these millers will be forced to sell their oil to a bigger firm for further refining, probably at a substantial discount.

Coles (1968) reports that in 1965 the eight mills with the largest utilized capacity employed approximately 1,500 full-time personnel. The remaining mills operated one or two shifts per day, often for only a part of the year, and had approximately 413 employees, mostly casual laborers. Current employment estimation is difficult, given the largely redundant nature of these mills. The two largest mills employ approximately 217 people, but since the Kakira plant is not yet on line, this is likely to include personnel who have responsibilities outside the oil industry. Under EOSIL management, the medium sized mills reportedly employed about 225 workers but undoubtedly most were laid off with the changes in ownership. Sixty-four people were employed by the two cooperatively held plants that produced oil in the past 12 months. Most of these were largely redundant. Others may have also worked on the cotton ginning activities of the Unions.

---

[92] Cottonseed contains 1-2% of a pigment substance called gossypol. This substance is toxic to monogastric animals including humans. Concentration is normally reduced to insignificant levels if the cottonseed is heat treated during processing.

[93] An interesting case in point is the recent ruling against Rafiki vegetable oil. Apparently this Ugandan firm was importing unrefined palm oil, under the guise of industrial raw materials for soap production, processing and bottling it as cooking oil. The government chemist reportedly ordered it taken off the market, but it can still be found on sale in the wholesale shops in Kampala.

5.3.6 Channel Six: Large-Scale Processors

Channel 6 includes only a single firm, the newest and largest participant in terms of utilized processing capacity[94]. Mukwano Industries built a large soap manufacturing plant in Kampala in 1988. The edible oil capacity came on line in mid-1991. It is equipped with four modern high-capacity Anderson expellers from the U.S. with a total capacity of 90-100 mt per day and a modern refinery. The refinery will soon include hydrogenation capacity but this was still being installed in mid-1993. As the largest processor, Mukwano plays an important role as channel captain, setting the standard for both input and output prices for the smaller firms. It processes sunflower, soybeans and cottonseed. Run on strict profit maximization lines, Mukwano is the main competitor for raw materials for all other participants in the subsector.

While the firm has not gone directly into seed production, it has made several efforts to encourage and promote sunflower production through the distribution of seed[95]. It has attempted to cultivate contract relations with the larger private and institutional farmers but raw materials purchases remain primarily on a spot market basis. The firm has agents throughout the country who retail its soap and oil. These same agents also buy sunflower and soybeans for transport back to Kampala using soap delivery trucks that would otherwise return empty. To maintain reasonable capacity utilization, Mukwano has been forced to import large quantities of cottonseed and smaller quantities of sunflower and soybeans from Tanzania. It is estimated that approximately 20% of the firm's 1992/93 production was based on imported cottonseed.

In 1991, the oil plant functioned for 105 days, producing 227,000 liters (210 mt) of oil. By 1992/93 this had risen to 1,825 mt, implying

---

[94] Two mills, with a capacity of 15,000 tons each, were proposed in the early 1980s. One by the Madhvani group for Gulu and the other, by the Mehta group, for Lira. Neither was built, however, due to the unfavorable economic environment. In particular, the 30% sales tax on domestically produced oils made such ventures uneconomical at the time.

[95] Unfortunately the initial seed distribution was premature and the company was not yet ready to buy the seed after harvest, greatly discouraging farmers and undermining their faith in verbal production contracts.

a fairly high level of capacity utilization[96]. The plant runs two shifts per day. Because expellers have to be thoroughly cleaned each time the type of raw material is changed, the mill concentrates on one type of oilseed at a time. The oil is double refined (neutralized, bleached and deodorized). This results in a uniform product irrespective of the original raw material. The firm does not differentiate the various oils in its pricing, labeling and marketing and probably blends the different oils in its final product. Mukwano has 95 employees in the edible oil plant.

5.3.7 Channel Seven: The Feeds Industry

The final channel in the subsector is that for transformation of the oilcakes into animal feeds (Figure 5.6). None of the large oil processors has gone into animal feeds manufacture. Before 1972, annual poultry, pig and dairy feed production averaged about 80,000 mt. Production declined with the collapse of the commercial livestock industry during the 1970s. By 1984, output had fallen to about 24,000 tons. Of this, nearly 80% was for poultry. By the late 1980s, a growing economy led to increased demand for meat and milk. Feed production rose to nearly 40,000 mt.

The feed subsector is dominated by the Uganda Grain Millers, the Jinja-based company that produces Nuvita Feeds. This is a parastatal firm but is on the list of parastatals for possible privatization. While Grain Millers is by far the largest firm, it faces stiff competition from the smaller feed mills scattered around southern Uganda. The most recent statistics on the feed industry (NICU, 1990) reported on production and capacity utilization of the 13 largest manufacturers. Nuvita manufactured about 35% of the 38,493 mt these firms produced in 1989/90.

---

[96] If Mukwano were processing only cottonseed, 1,825 mt of oil would imply 13,035 mt of cottonseed, using an efficient extraction rate of 14%. This is roughly 217 days of production. Since they process a combination of sunflower, soybeans and cottonseed, with varying levels of oil content, however, the level of capacity utilization is difficult to compute.

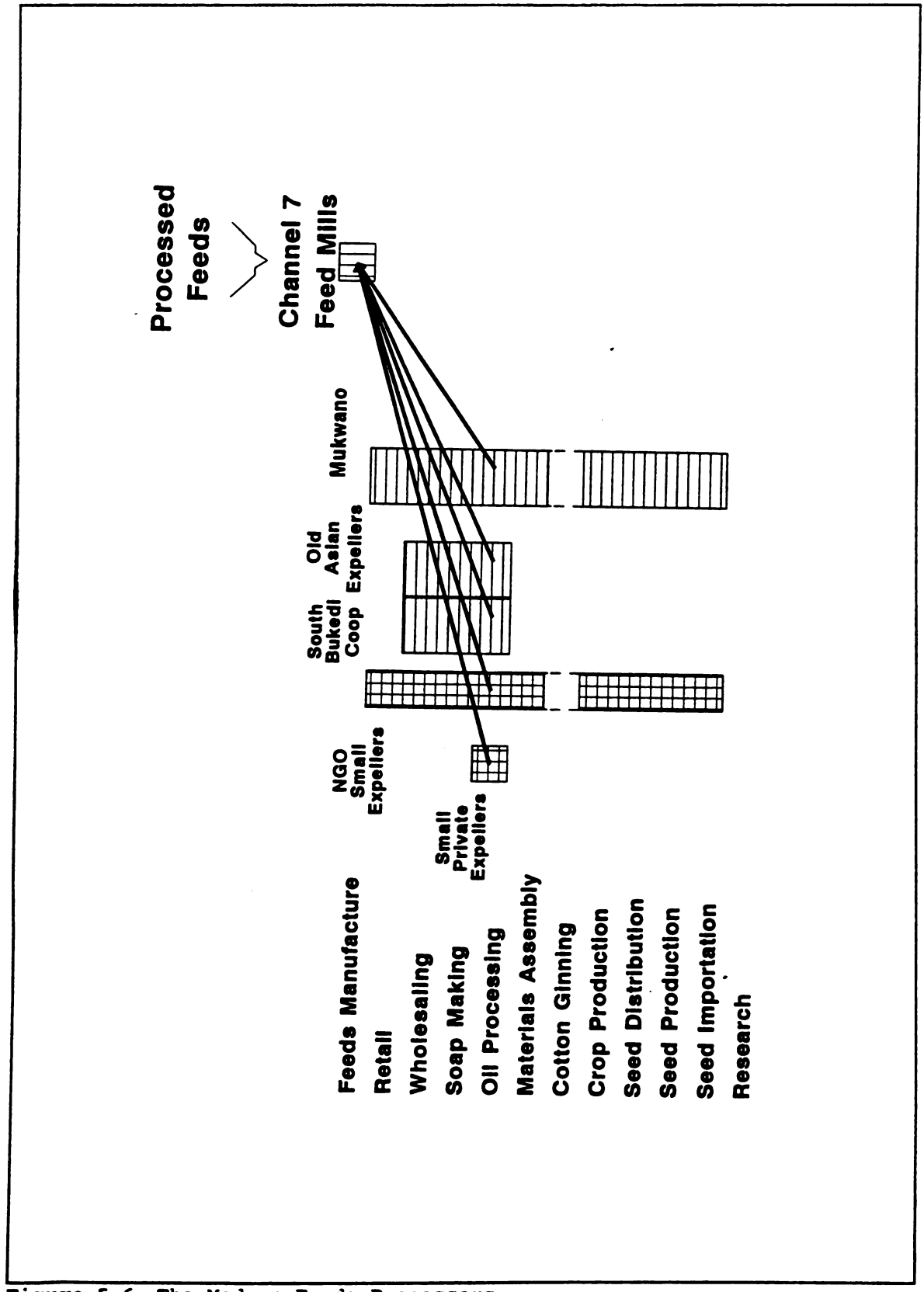


Figure 5.6 The Modern Feeds Processors

The feeds industry is largely concentrated in Kampala and Jinja. This concentration is directly related to the concentration of dairy and commercial poultry farms in this region to serve the larger urban market. Approximately 80% of national feed demand is located within a 40 km radius of Kampala (Nuvita, personal communication). There is definite excess capacity in the industry. Average capacity utilization for these 13 firms was only 33% (NICU, 1990). Potential supply far exceeds demand at existing prices. Feed mills report periodic shutdowns to clear the existing feed stocks.

Most feed companies purchase oilcakes on a spot market basis from the millers. While there may be arrangements of mutual understanding between a miller and a feed manufacturer, these are rarely binding contracts, and prices are renegotiated for each sale. Nuvita is the only feeds manufacturer that is known to purchase its own soybeans and then contract with a local miller for crushing. In this arrangement, Nuvita collects the cake and the miller retains and retails the oil as its crushing fee. This arrangement is advantageous to the miller, but may result in poor quality feed. Expeller temperatures are inadequate to deactivate the trypsin inhibitor, a protein growth retardant that affects monogastric animals and poultry[97].

Expeller temperatures normally reach only 248° F, whereas 260° to 270° F is required to deactivate the trypsin inhibitor. To do this, feed and soy-foods manufacturers need to use an extruder[98]. This machine is a mechanical cooking device that operates on the same principle as an expeller but without the cage bars that release the oil. The resulting temperature and pressure is much higher than that obtained with an expeller (275 degrees Fahrenheit and 400 p.s.i.). The rapid drop in pressure as the material leaves the barrel of the extruder also sterilizes, deactivates the trypsin inhibitor, reduces moisture content

---

[97] Trypsin is an enzyme produced in the pancreas. It acts in hydrolyzing the protein molecule to make it accessible to the animal. The trypsin inhibitor is a protein that inhibits the functioning of this enzyme.

[98] Grain Millers does have one extruder, but apparently its capacity is insufficient, hence the need to rely on additional service milling by local expellers.

and stabilizes the cake without affecting the nutritional composition (Kruse and Burgess, 1992).

The quantity of oilseed cakes used in the feed mix varies from 15% to 25% depending on the type of feed and type of oilcake. As a rough estimate, perhaps 22.5% of the total feed mix is comprised of oilcake. Analysis of the oilcake purchases by Nuvita from 1986 through September 1992 found that the proportion of total feeds production made up of soybean cake is 4.4%, sunflower cake constitutes 2.1% and cottonseed cake is 16%. If these proportions were to hold true for the industry at large, that would imply an annual demand for 1,694 mt of soy cake, 808 mt of sunflower cake and 6,159 mt of cottonseed cake in 1989/90. If we assume that Nuvita's market share is holding, annual feeds production in 1992 would not have increased significantly over 89/90. The oilcake generated from the national oil production for 1992/93 would equal approximately 13,000 mt, assuming an average extraction rate of 20%, compared to a national feeds industry demand of 8,661 mt. The market for cake is depressed. Much of it goes to waste, especially that from the small remote processors for whom the cost of transportation to the southern feed mills may exceed the sales value of the cake. Mukwano has exported limited quantities of cottonseed cake and soycake to Europe, the Middle East and Kenya.

5.4 OVERVIEW: NUMBER OF FIRMS, EMPLOYEES AND PRODUCTION CAPACITY

Figure 5.7 presents a quantitative summary of the information concerning the number of participants, processing capacity, 1992/93 production estimates, and approximate employment for each channel. The seed multiplication and distribution networks have been removed from the subsector overlay for purposes of simplification.

The issue of raw material supply is analyzed in Chapter Six. The high degree of competition for raw materials and oilcake markets is immediately apparent from this subsector map. All processors compete for a limited supply of raw materials. Sunflower and soybeans are sold on a cash basis in the rural markets. Presently, cottonseed is sold by

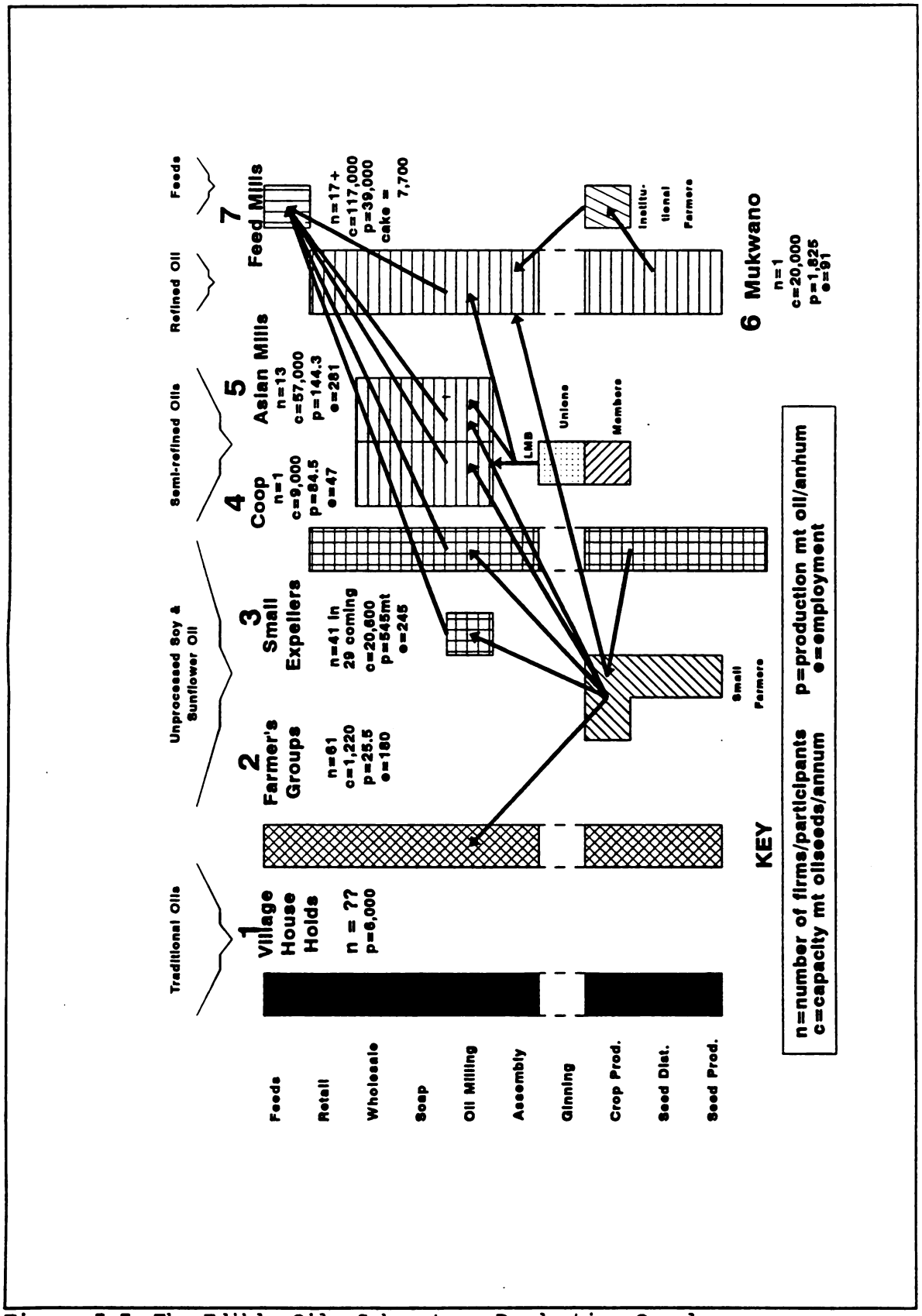


Figure 5.7 The Edible Oils Subsector: Production Overlay

the LMB at a fixed price[99]. With the current trend toward privatization, this market will be increasingly fragmented. Most ginners will be selling cottonseed individually. Processors have no way to precontract to ensure an adequate supply of raw materials for future crushing. Even the distribution of free seed or tractor hire services on credit cannot ensure availability of raw materials, since the farmer will sell to the highest bidder at harvest[100].

5.5 FINAL PRODUCT MARKETS

The preceding analysis of the edible oil subsector reveals that Ugandan domestic oils and fats production lags far behind current consumption levels. The import gap (consumption less production) for 1992/93 is summarized in Table 5.1.

From this table we can see that Uganda is over 75% dependent on imports for its fats and oils consumption. Import dependence varies greatly from 100% for vegetable shortening to 84.6% for refined oils and 0% for ghee and other traditional oils[101].

5.5.1 Imports and Importers

More than 50 firms are involved in the importation of edible oils and fats into Uganda. Unfortunately, it is not possible to rely on Uganda Customs and Excise records to document the inflow of edible oil

---

[99] The formal cottonseed auctions have not operated since the take-over of the oilmills in the 1970's. While EOSIL was functioning, cottonseed prices were essentially an internal accounting mechanisms. More recently, prices have been fixed by the Agricultural Secretariat together with the farmgate prices for seed cotton and the ex-ginnery prices for cotton lint. Competition between mills for cottonseed, therefore, revolves around ability to pay cash, timeliness of transport availability and payoffs to allocating authorities.

[100] Due to the insecurity of recent years, Ugandans still have a very short planning horizon. Short-term advantage tends to outweigh consideration of possible long-term benefits, which may not materialize. The threat of withholding future privileges (e.g. access to credit or tractor hire) is seldom adequate to change current behavior.

[101] There is an active informal trade in palm oil along the Zaire border. The extent of trade flows is completely unknown. For this reason, self-sufficiency in traditional oils production is assumed.

Table 5.1 The Import Gap for Edible Oil and Fats in Uganda

June 92-May 93	Butter & Margarine (mt)	Refined Oils (mt)	Other Oils (mt)	Short-ening (mt)	Ghee & Lard	All Fats & Oils
Consumption[a]	3,243	17,494	1,737	11,459	5,222	39,155
Production[b]	15	2,699	1,737	0	5,222	9,673
Import Gap	3,228	14,795	0	11,459	0	29,482
PL480 Oil Auction Sales[c]	0	3,959	0	0	0	3,959
Other Donor Imports[d]	0	1,096	0	0	0	1,096
Estimated Commercial Imports	3,228	9,740	0	11,459	0	24,427
Import Gap (%)	99.5%	84.6%	0%	100%	0%	75.3%

[a] Consumption figures are based on the Household Budget Survey data projected to 1992 using a 2% rate of per annum income growth.
[b] Production figures assumed to equal consumption for other oils, ghee and lard. Refined oil production based on the author's Oil Miller's Census. Butter production estimates provided by the Uganda Dairy Corporation.
[c] PL480 oil sales data provided by the PL480 Monetization Program. Because of the bulk nature of PL480 imports, the figure for oil sales released unto the market between May 1992 and June 1993 is considered more relevant here than the quantity imported.
[d] Other donors include World Food Program and UN High Commission for Refugees.

imports. The recording of customs data essentially collapsed with the break-up of the East African Community. The last available issue of the Annual Trade Reports for Tanzania, Kenya and Uganda is dated 1973. The Uganda Customs and Excise Department only published its Annual Trade Reports from 1975 through 1979, and the data contained therein is not broken down between edible and inedible oils and fats. Since 1980, import data are only available on special request to the Customs Department. Even when information is supplied, one can seldom tell which classes of oils and fats have been included. Customs records have been largely dependent on statistics derived from the Bank of Uganda's allocations of foreign currency at the official exchange rate. Imports that require no foreign currency allocation are generally undocumented or grossly under-estimated. Even major donor imports are not fully documented in the records of the Customs Department. Cursory analysis

of the available customs information confirms its partial and erratic nature[102].

The large extent to which edible oil and fats imports have gone undocumented and presumably untaxed is evident from an analysis of the Customs and Excise Department printouts for total imports by classification and country of origin for 1990 and 1991[103]. This information is summarized in Table 5.2. According to this table, fully 50% of the edible oil and fats imports into Uganda for this two year period would apparently have come from the PL 480 Program. Interviews and personal observations from retail shops and markets around the country belie this "data." Retailers agree that the quantity of oil from Kenya and Singapore vastly exceeds that from the U.S. By far the most popular brand of liquid cooking oil is "Golden Cup" from Singapore, but there are several other brands of oil that appear to be at least as readily available as the American oil. Quantities of Kimbo and other brands of shortening are also in abundant supply despite the small quantities supposedly imported[104]. Hence, the importance of working backward from consumption estimates to <u>imputed</u> imports instead of the reverse.

Many importers import small quantities of fats and oils as part of a larger consignment of mixed goods. Customs records for February though April 1993 show that 49% of the 290 consignments of shortening

---

[102] For example, data reported in Recon (1990), supposedly provided by the Custom Department, gives annual edible oils import figures ranging from 129,576 mt in 1982 to 806 mt in 1983. Obviously neither figure can possibly be correct. Most likely the first contains either clerical errors or large quantities of tallow and fatty acid oils for soap manufacture.

[103] This information was obtained from the trade summaries provided to the Ministry of Trade and Industry by the Customs and Excise Department. The annual computer printouts for 1992 were not yet available by August, 1993.

[104] In August 1990, an ACDI market survey of 22 district towns found that PL480 oil was only available in 13 locations, compared with imported shortening, which could be purchased in every town, and palm oil, which was available in 19 out of 22 locations. Information provided by the PL480 Monetization Program.

Table 5.2 Edible Oil and Fats Imports Documented by the Customs and Excise Department 1990/1991

Year	Butter & Margarine mt	Ghee & Lard mt	Animal & Vegetable Oils & Fats [a] mt	PL 480 Oil mt	Other Refined Oils mt	Total MT
1990	590	360	115	7,023	2,905	10,993
1991	195	98	230	1,909	3,154	5,586
TOTAL	785	458	345	8,932	6,059	16,579

Source: Customs and Excise Department computer printouts provided by the Ministry of Trade and Industry.

and vegetable ghee were for quantities of less than 100 kg, while only 14.5% of the importers brought in consignments of more than a ton[105].

Edible oil imports tend to come in larger consignments. There were only 147 consignments of edible oils over the three months. The distribution shows 28.6% imported less than 100 kg. Most of these were from Kenya. The proportion of importers bringing more than one ton was 29.3%. Most of these imports were from outside East Africa. Apparently, all the "Golden Cup" oil from Singapore is imported through a single Ugandan agent, Karbil Ltd[106]. This agent handles the importation for private traders who obtain separate letters of credit and customs clearances. Despite this apparent market power, the pricing of edible oils is very competitive, as discussed in section 5.3.3 below.

---

[105] This does not necessarily imply that there were 290 different importers. Data is compiled on a monthly basis by importer, but if there is a minor difference in the name on the bill of lading (ie. UCA Monetization Program versus UCA Mon Program) consignments will be totalled separately. Where possible these were identified and combined, but some may have been missed. In addition, some importers probably brought consignments spanning two or three months and would therefore have been double counted.

[106] This is a subsidiary to Orient Bank Ltd., formerly the largest foreign exchange bureau in Uganda, recently established as one of the new private commercial banks.

5.5.2 Retail/Wholesale Functions

Uganda does not have any private retail chains that engage in importation and wholesaling. There are two parastatal organizations that do this to a limited degree. Foods and Beverages Limited (F&B) is a parastatal firm originally created to handle the importation, distribution and sale of basic commodities at fixed government prices. Since the demise of government price controls, in 1987, it is struggling to compete on the open market. F&B has four main regional depots (in Gulu, Kasese, Jinja and Mbale), serving a network of 15 shops across the country. Presently, its primary importation activities are limited to salt and sugar. Shortages of operating capital constrain its ability to expand into other commodities. More importantly, as a parastatal, it must declare all imports for full taxation. F&B, therefore, finds it difficult to compete with informal-sector traders who are skilled at tax evasion. Most goods stocked by F&B are purchased on the local informal market. F&B has not imported any edible oils or fats since 1989.

The second parastatal involved in oils and fats importation is the National Enterprise Corporation (NEC), which imports for the National Resistance Army (NRA) shop. NEC is a parastatal under the Ministry of Defense, which runs a duty free import business. Ordinary soldiers complain bitterly that they have no access to these subsidized commodities and that profits from sale to civilians are pocketed by management (New Vision, July 22, 1993). The duty free status of the NRA shop was rescinded in the Budget speech of June 25, 1993. In the first quarter of 1993, this organization imported 305.9 mt of cooking oil from Singapore, Malaysia and the U.K., the largest non-donor financed consignment to arrive that quarter.

In theory, Uganda Associated Industries Ltd. (UAI) is the official Ugandan agent for East Africa Industries Ltd. (EAI), the largest manufacturer of cooking fats in Kenya. Discussions with management reveal that it has not imported any edible oils or fats for many years. As a large and highly visible organization, the firm is forced to operate within the confines of the law. If UAI goes through formal channels, purchasing shortening and oils from the factory in Nairobi at the official export price, the landed CIF value in Kampala,

including import duty and sales tax, is higher than the wholesale price on the open market. Several examples are illustrated in Table 5.3. When overheads, damages and the cost of capital, (28 to 31% per annum) are considered, importation of edible oils and fats through official channels clearly becomes an unprofitable exercise.

Table 5.3 The Difference Between U.A.I. Import Costs and Retail Prices

COST (per 12kg case)	Shortening March 1993	Shortening June 1993	Margarine June 1993	Vegetable Ghee June 1993
Export Price	$14.40	$16.32	$20.54	$17.14
Exchange Rate USh/US$	1,256	1,205	1,205	1,205
USh Price (per case)	18,086	19,666	24,751	20,654
Insurance & Freight	271	295	371	310
Import Duty[a]	1,836	1,996	7,537	2,096
Sales Tax[b]	6,058	6,587	9,798	6,918
Total Import Cost	26,252	28,544	42,456	29,978
Wholesale Price Kikuubo	26,000	27,000	29,500	27,500
Difference (loss) in USh	(252)	(1,544)	(12,956)	(2,478)

[a] Import duty on shortening and ghee = 10% of CIF value. Import duty on margarine = 30% of CIF.
[b] Sales tax = 30% of CIF plus import duty.

The extent of the under-invoicing becomes apparent when Customs records are compared with official factory prices from Kenya. In March 1993, the factory price of a kilogram of shortening from E.A.I. Ltd. was 1,507 Ush[107]. The median declared value for a kilogram of animal and vegetable fats and oils from Kenya (the classification category that includes shortening and vegetable ghees) according to Uganda customs

[107] This is the least expensive brand of shortening. Price quoted is for the 500g container, which is the most popular size on the Ugandan market.

records for February through April 1993 was only 921Ush[108]. It is obvious that larger importers are better able to negotiate a favorable valuation. The median price for importers of less than 100kg of shortening was 1,010USh/kg, while the median price for importers of more than a ton was only 722USh/kg. A similar pattern is clearly discernable for all categories of fats and oils. Tax evasion, therefore, takes the form of smuggled or undeclared quantities, and also under-invoicing of those quantities declared.

Since the creation of the Uganda Revenue Authority (URA) in 1991, the system of customs enforcement has tightened considerably[109]. Goods entering Uganda in sealed containers are physically escorted from the border to the bonded warehouse in Kampala, where contents are inventoried during off-loading. Goods in open vehicles are stopped at three checkpoints between the border and Kampala. At each checkpoint all goods are off-loaded at considerable expense and loss to the importer. These procedures have proven inadequate to ensure full reporting and valuation. For purposes of taxation, quantities and values are still subject to negotiation with the Customs Authorities, and kickbacks continue despite the vastly improved salary scales being paid to URA staff.

There are also complaints that large quantities of semi-refined palm oil enters the country duty free, labled as an ingredient for soap manufacture. This oil is resold on the wholesale market for human consumption[110]. It is also possible that some refined oil is being imported under the guise of duty free raw materials for soap manufac-

---

[108] The median value is quoted rather than the mean because the data includes obvious errors in computer entry which result in ridiculous prices at both extremes. For example, prices for shortening range from 1USh/kg to 24,000USh/kg.

[109] Key informants explain that in the past it was sufficient to pay a single bribe at the border, which went entirely to the customs officer. There was no need to bothered to forge invoices or to even get a customs clearance document. Now, however, while some goods are clearly still being smuggled, a larger proportion is at least being declared and documented. While payoffs still exist, at least some tax is now going into the government coffers.

[110] Raw materials for soap manufacture were declared duty free in the 1992/93 budget. Some of this semi-refined oil is blended with refined oil, either imported or locally produced, before it is packaged and resold.

ture. The lack of labeling requirements and quality testing facilities makes enforcement difficult.

Most Ugandan wholesalers are located in Kampala in a section of the city known as Kikuubo. This densely crowded area of small shops and warehouses is approximately four city blocks long and two blocks wide. The number of businesses exceeds the number of premises, since a single premise is usually shared by several tenants, each selling his/her own goods. Often these individual proprietors pool their resources when importing goods from Kenya. Together they may hire a lorry or pickup, but each would have the customs documents prepared in his/her name. This helps to explain the large number of very small import consignments discussed earlier. These importers buy directly from wholesalers in the larger towns of Western Kenya, avoiding the extra expense of transportation from Nairobi, and the red tape involved in purchasing "for export" from the factory[111]. Traders either exchange their Uganda Shillings for dollars through the bureau system, buying Kenya Shillings for dollars on the "open market" at the border; or trade directly in Uganda Shillings, which are gaining an increasing premium at the border because they are fully convertible. The growing gap between the official and black-market exchange rates in Kenya favors Ugandan consumers.

While some shops in Kikuubo will refuse to sell broken lots, most sell either retail or wholesale. Prices are subject to negotiation, and may vary considerably depending on the skill and stubbornness of the customer. Each shop carries a limited range of goods. There are no wholesalers large enough to carry the full range of goods stocked by the average shopkeeper. This means that a retail shopkeeper must move from door to door in Kikuubo bargaining for each commodity on an item by item basis. The managers of the few Western style grocery stores complain that this system discriminates against the larger retailers who don't have time to haggle over every item on a long list.

Kikuubo is where most up-country urban shopkeepers and market hawkers go to purchase their wares. Most travel by public means, buying small quantities of a range of goods at any one time. Many larger

---

[111] Export sales are priced in dollars and must be paid in foreign currency.

shopkeepers, especially from Kampala and the District towns close to the Kenya border, do at least some importation. The smallest rural traders buy from the retailers in the nearest larger town.

Since December 1989, the PL480 Monetization Program has been managed by Agricultural Cooperative Development International (ACDI) for Uganda Cooperative Alliance (UCA). There have been two project cycles. The first, for a total of 10,000 mt, ran from 1989 through September of 1991. This was followed by an interim lot of 600 mt in late 1991 while negotiations were underway on the second agreement. There was considerable opposition to the second PL480 agreement initially. The Mukwano company refused to bring its edible oil plant on-line. It argued successfully that with the existing 30% sales tax on domestically produced oils it was unable to compete with the largely untaxed imports. Because of this opposition, USAID was forced to agree that a 20% levy on sales revenue would go directly to the Uganda Government. This silenced the opposition and facilitated approval of the agreement. The second agreement was signed in December 1991, and the first tender call was held in April 1992. A total of 10,500 mt will be released for sale by September 1994 at a rate of approximately 1,200 mt per quarter.

All PL480 oil is sold on tender by sealed bids. Tender openings are advertised and open to the public. Bid lots are approximately one ton each. A bid bond of 5% must be submitted with the bid. Tenders go to the highest bidders, provided the tender price exceeds the CIF value of the oil[112]. Sales are limited to a maximum of 100 mt per customer. After deduction of the 20% levy, the remaining revenues generated by the sale of the oil go into the Cooperative Bank for support to the Cooperative Movement in Uganda[113]. Forty percent of this money is earmarked for support of the edible oil industry. These funds have been used to support sunflower seed multiplication, and extension advice for farmers close to South Bukedi Cooperative Union. A special line of credit for

---

[112] CIF value is calculated at the official exchange rate from the Bank of Uganda.

[113] Only 17% of the PL480 financed loans are earmarked for the private sector.

women's groups interested in sunflower processing has also been established.

5.5.3 Competition, Prices and Market Margins

Since 1991, the Ministry of Trade and Industry (MTI) has been operating a market news service. This service collects weekly commodity prices at the farmgate, local market and retail levels. No comparable official price series is available for finished products such as cooking oil and fats. Fortunately, the PL480 Monetization program has collected Kampala retail price data on a weekly basis since 1989. These data, supplemented by annual average prices for cooking oil and shortening reported by the Ministry of Finance and a one shot market survey of edible oil prices in various markets, form the basis for the following price analysis.

Nominal edible oil prices have climbed dramatically in the last 20 years, but this is meaningless given the triple-digit inflation experienced throughout much of this period. Real prices, deflated by the 1989 Consumer Price Index[114] provide a more meaningful insight concerning the trend in Ugandan prices. Figure 5.8 shows the average parallel market price for edible oils in Uganda compared to world market prices (World Bank, 1993 and MFEP, 1993). The graph indicates that real prices have declined significantly in Uganda and world wide since the 1984 peak.

Statistical analysis reveals a high correlation between Ugandan and world market prices (Table 5.4). The real price of cooking oil in Uganda is most closely correlated with the official market dollar price of Kenyan shortening. This reflects Uganda's heavy dependence on consumer goods from Kenya and the impact of changing Kenyan exchange rates on the Consumer Price Index. The low correlation between the dollar price of oil in Uganda at the official exchange rate and the

---

[114] The 1989 consumer price index is based on the market baskets defined in response to the 1989/90 household budget survey. Separate indices have been calculated for five urban areas, Kampala, Jinja, Mbale, Masaka, Mbarara as well as a combined index. This combined index has been spliced with earlier versions of the Kampala Low Income index to form a continuous series.

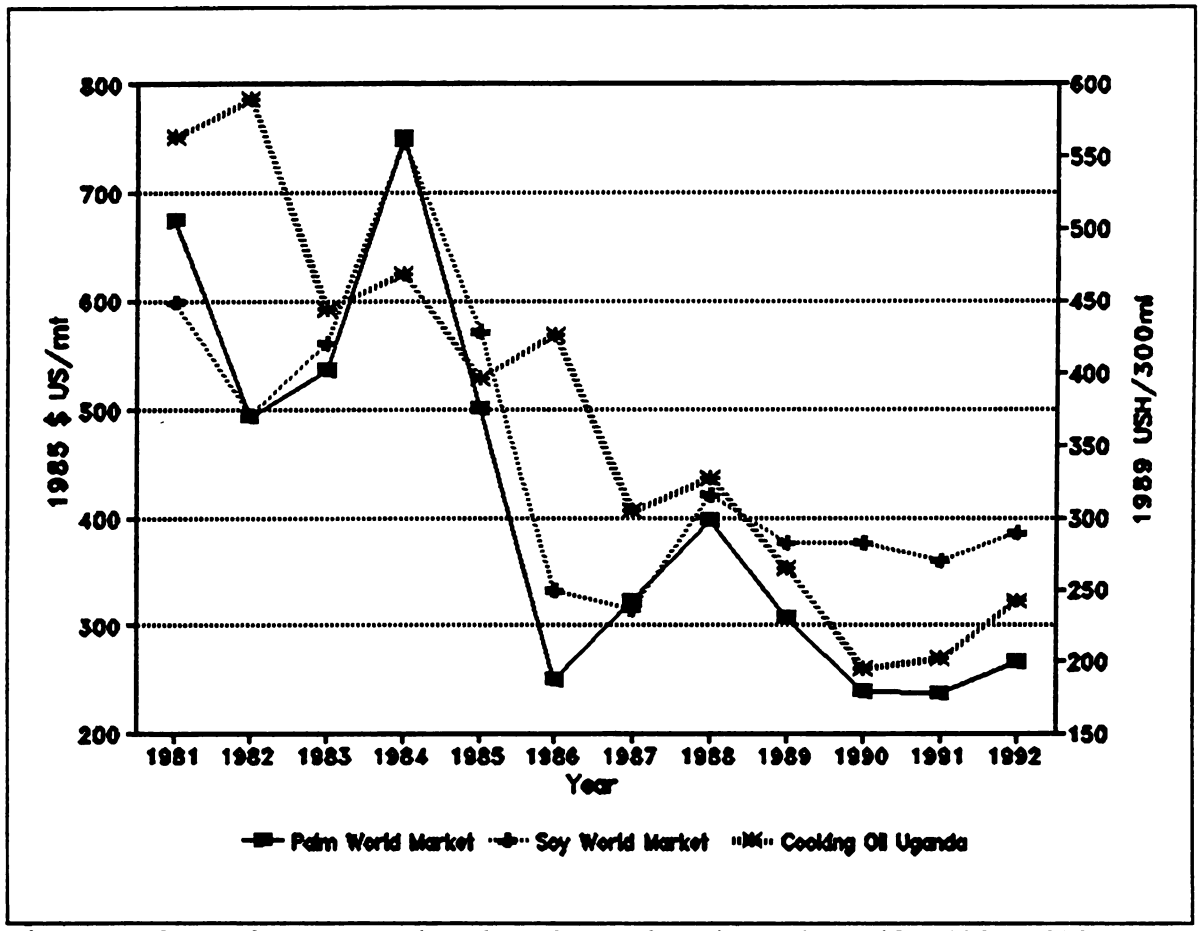


Figure 5.8 Real International and Local Prices for Oil, 1981-1992

explanatory variables suggests that retail pricing of oils is based on the open market exchange rate, even if some importers gain windfall profits by getting foreign exchange at the official rate. The correlation between the open market dollar price for oil in Uganda and both the current and real world market prices for edible oils is highly significant despite the shorter time series due to the lack of parallel exchange rate information for the period before 1984.

The increase in Ugandan market prices since 1991 despite apparent stability in the world market prices is probably related to the increased customs duty and sales tax enforcement. If this is the case, this implies a greater level of protection than domestic producers had previously enjoyed.

Competition at the wholesale level is intense, and great skill at tax evasion is necessary to make a profit. It appears that retail competition is equally stiff. In Uganda, prices of the various oils are

Table 5.4 Correlation Matrix between Ugandan and World Market Prices

	Kenya $ Price Shortening	Current World Market Soy Oil	Real World Market Soy Oil	Current World Market Palm Oil	Real World Market Palm Oil
Real Uganda Oil Price	.98 (12) P<.001	.26 (13) p=.197	.59 (13) p=.017	.59 (13) p=.016	.76 (13) p=.001
Official $ Uganda Oil Price	.79 (12) P=.001	-.01 (12) p=.494	.38 (12) p=.112	.41 (12) p=.093	.57 (12) p=.025
Parallel $ Uganda Oil Price	.77 (9) P=.008	.96 (9) P=.001	.96 (9) P<.001	.94 (9) P<.001	.94 (9) P<.001

Key: Correlation Coefficient
(Cases)
1-tailed Significance

highly correlated, as seen in the correlation matrix presented in Table 5.5. These correlations are based on monthly average prices computed from the weekly price information collected by the Monetization Program for the period of December 1989 through March 1993.

Table 5.5 The Correlation in Edible Oil Prices in Uganda

	COTTONSEED OIL	SUNFLOWER OIL	SHORTENING	PL480 OIL
PALM OIL	.98**	.98**	.97**	.99**
COTTONSEED OIL		.99**	.98**	.99**
SUNFLOWER OIL			.97**	.98**
SHORTENING				.97**

Number of cases: 40 1-tailed Significance: ** = .001

The high degree of correlation in pricing among the various types of edible oils and fats over time is also clearly observed in Figure 5.9. This Kampala price series illustrates both the convergence of edible oil prices over time (especially since Mukwano, the largest domestic processor came on line in 1991), and the increasing premium that shortening commands over edible oils. Initially, cottonseed and

sunflower oils were priced higher than the imported refined palm oil and PL480 oil. In part this reflects the high production costs of the Mukwano plant during the initial period, when it was producing at low capacity. This premium has since eroded. Domestically produced oils are being more competitively priced and consumers now appear willing to pay a small premium for the refined oils.

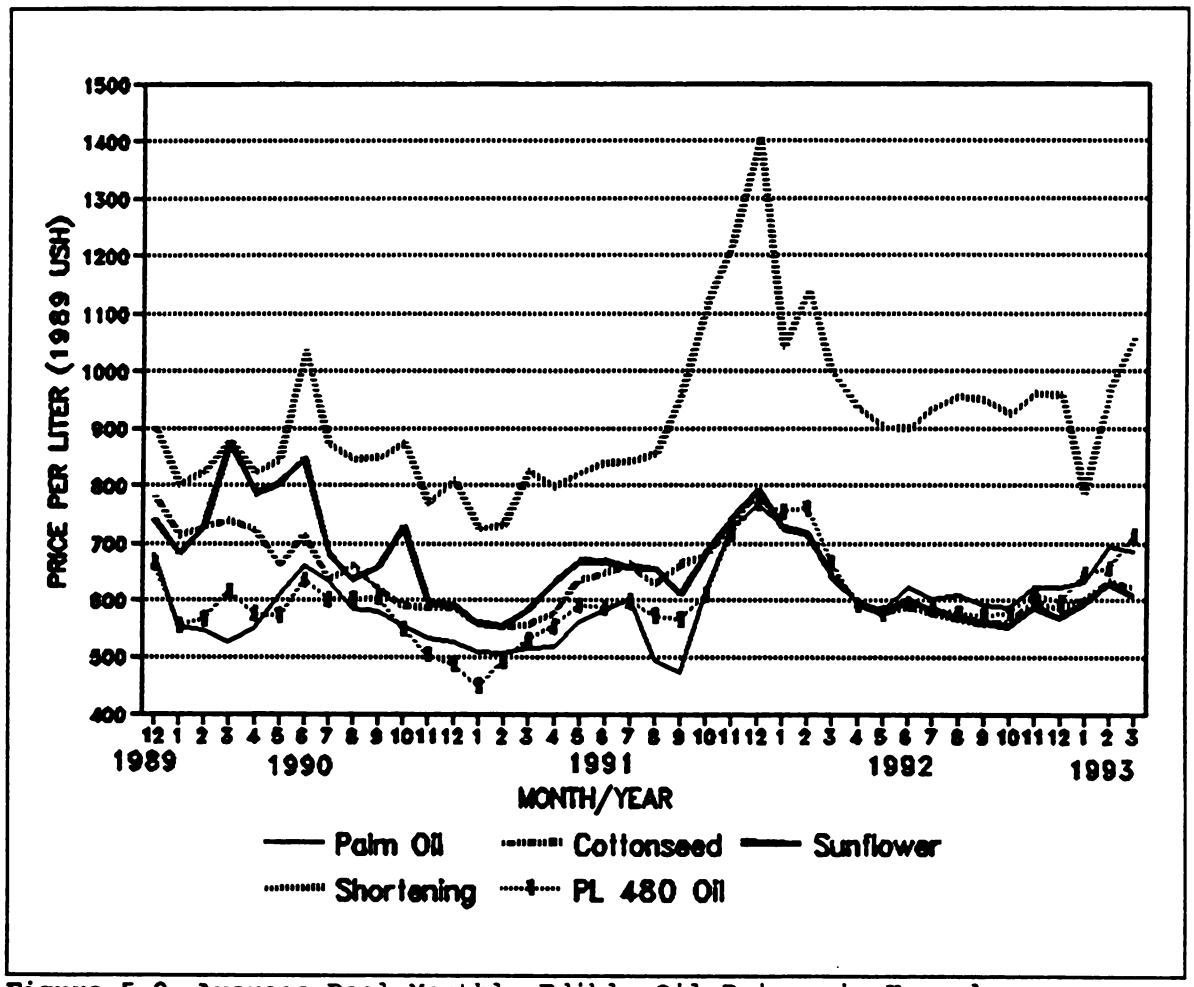


Figure 5.9 Average Real Monthly Edible Oil Prices in Kampala

Recent policy changes in Kenya deregulating the price of edible oils and fats has resulted in a further substantial price increase in shortening prices since June 1993. This is likely to be reflected in the Ugandan market almost immediately. This growing price gap between

oil and vegetable shortening will probably encourage the largest of the Ugandan mills to initiate production of hydrogenated fats[115].

The transparency of the PL480 tender process has undoubtedly fueled the high degree of competition in the edible oil market in Uganda[116]. Despite this competition, PL480 auction revenues, since 1991, averaged only 18% over the CIF value of the oil. This is sustainable only because the PL480 program does not pay customs duty or sales tax. The official customs duty on commercial oil imports is 30%. An additional 30% sales tax is levied on the resulting value (CIF plus import duty). This results in a total tax burden of 69%. The 18% PL480 margin is even insufficient to cover the 20% levy on gross sales, which is paid directly to government. The PL480 oil is clearly being sold at less than it would cost if it were commercially imported.

The wholesale-retail margin for the PL480 oil is probably representative of the margins of related commodities. If it were not, competition would soon force the prices into line with the other brands of oil. A comparison between the average auction price and the retail prices in the same month shows that the margin declined in the first months of the Monetization program, falling from nearly 50% in the first auction to 12% eight months later. Since then it has fluctuated, depending on anticipated supply, but hovered in the 10 to 20% range[117]. This margin must cover the overheads and profits of both the wholesaler and the retailer. Given that interest rates on medium term credit ranged from 25 to 40% per annum during this period, rapid turnover and minimal overheads are essential if such traders are to make a "normal" profit.

---

[115] As noted earlier, in the highly competitive era of the early 1960's, most oil mills were believed to be operating at a loss with the notable exception of the "big four," which purchased semi-refined oils from the smaller mills for final refining and hydrogenation.

[116] In tender calls over the past year, on average the quantity of tender bids submitted exceeded the quantity available for sale by a ratio of 2.7 to 1.

[117] On only one occasion has a bidder decided to forfeit his bid bond rather than accept delivery of PL480 oil for which the submitted bid exceeded the market price at the time of the sale.

Little information is available concerning the nature of the profit margins accruing to up-country traders. The Monetization Program's August 1990 market survey of 22 towns found a small standard deviation in price across locations, except for Kenyan shortening (Table 5.6).

Table 5.6 Mean Edible Oil Prices at Various Locations in Uganda; August 1990

Variable	Cases	Mean	Standard Deviation
PALM	19	773	63
COTTON	15	780	57
SUN-FLOWER	16	760	57
KIMBO	22	1,147	235
PL 480	13	746	57

The prices of palm oil, shortening, PL480 oil and cotton-seed oil tended to be very highly correlated with each other across markets (all >.66 and all significant at the .01 level). Sunflower oil showed a significant correlation at the .01 level only with cottonseed oil[118]. Apparently, for imported oils, distances and road conditions are the major determinants of prices. Simple regressions were run using the price of edible oils at the various locations as the dependent variables and the distance of that town from the Uganda/Kenya border as the independent variable. Table 5.7 shows that distance alone, not even considering such factors as road condition and security, explained most of the variability in prices for shortening, palm oil, PL480 oil and cottonseed oil. Only sunflower oil seems to be priced in response to local supply conditions instead of transportation costs from a distant source. This corresponds very closely with expectations, given the structure of the oils industry in Uganda.

5.6 THE 1990S: A CHANGING INSTITUTIONAL AND POLICY ENVIRONMENT

The donor push for structural adjustment of Uganda's macroeconomic policies goes back as far as the early 80s. For years, however, little institutional reform actually took place. Periodic massive devaluations and adjustment in the nominal price set by

[118] Correlation between specific markets is impossible without time series data.

Table 5.7 Regression Results on the Price of Edible Oils and Fats by Location

PRODUCT	INDEPENDENT VARIABLE			
	DISTANCE FROM KAMPALA		DISTANCE FROM KENYA BORDER	
	R^2	t statistic	R^2	t statistic
Shortening n=22	.38	3.52 **	.69	6.66 **
Palm Oil n=19	.52	4.32 **	.59	4.92 **
PL 480 Oil n=13	.42	2.81 *	.66	4.61 **
Cottonseed Oil n=15	.31	2.80 *	.48	3.47 **
Sunflower Oil n=13	.03	0.67 NS	.14	1.49 NS

Values given are R Squared Statistics and t values for the coefficients from simple linear regressions with price as the dependent variable and distance as the independent variable.
** = Significant at the .01 level.
* = Significant at the .02 level.
NS = Not Significant.

government for export crops were the only major outcomes. Beginning in 1990, Uganda embarked on a conscious program of intensive macroeconomic and institutional reform. The general objective was to establish a macroeconomic environment that would provide the necessary stabilization to launch the country on a path of export-led development. The recognition that the "macroeconomic strategy for Uganda should focus on enabling the operation of such market based incentives: not through increased government (or public-sector) control," (MPED, 1990) was a major break with previous policy. This package of reform included the following key elements:

1. Legalization of the parallel market for foreign exchange.
2. Gradual elimination of the gap between the official exchange rate and the legalized "kibanda" (open market) rate.
3. Control of inflation through disciplined and prudent budgeting.
4. Simplification of tax and trade tariff policy to increase economic effectiveness and efficiency.
5. The reform of export and import licensing procedures to remove unnecessary bureaucracy.

6. Institutional reform of the customs and excise system, and establishment of an expost system of monitoring for exports.
7. Scrapping of the monopoly marketing boards.
8. Judicious privatization of money-losing parastatals.
9. Restoration of private-sector confidence through return of the disputed Departed Asian Properties
10. Review of monetary policy to ensure that positive real interest rates led to an increase in the supply of investable funds in the commercial banking system.

Significant progress has been made on most of these objectives[119]. The legalization of the parallel foreign exchange market and earlier measures removing government price controls on consumer commodities pulled the rug out from under the magendo economy. This is no small accomplishment. At present, opportunities to get rich simply by selling privileged access to scarce goods, are virtually non-existent.

A system of privately owned Foreign Exchange Bureaux was legalized in July of 1990. This has largely eliminated the black market for hard currency. A substantial parallel market still exists in Kenyan currency because of the recent decline in the value of the KSh against the dollar and the difficulties of obtaining foreign exchange in Kenya. For example, in April 1993 the official exchange rate was 45.19 Kenyan Shillings to the dollar. In Uganda, however, the Exchange Bureau rate was 65 KSH per dollar. Kenyan traders are anxious to exchange Kenyan currency for Uganda shillings, which are then fully convertible into hard currency. It is this parallel market that finances much of the importation of consumer goods from Kenya.

The open-market exchange rate was essentially stable for the entire year of 1992, falling somewhat in July 1993. The gap between the official Bank of Uganda auction rate and the Bureau rate has fallen to

---

[119] Information for this section is derived primarily from (i) Background to the Budget, 1993-1994. MFEP, 1993. (ii) "1993/94 Budget Speech" as reported in full in The New Vision, Saturday, June 26, 1993 and (iii) BCGA (1993).

18.4%, compared to a 1990 average of 61%[120]. Measures to create an interbank money market are also being formulated. This market would replace the existing system of foreign exchange auctions at the Bank of Uganda. This would then be the final step in creating a fully unified market system of foreign exchange management. Such a system requires a substantial improvement in the monitoring of imports to ensure smooth release of donor balance-of-payment support[121]. Implementation is not expected until 1994. Initial limitations on the amount of foreign currency that could be purchased through the bureaux was dropped in the most recent budget. Foreign exchange purchased for international trade must be accompanied by the necessary bank documentation.

Inflation has been brought to a near halt, falling from 65.1% in May 1992 to and underlying rate of 7.5% in May 1993[122]. Despite the tight fiscal and monetary policy, the Ugandan economy is projected to have grown by 7% in 1992/93, with agriculture growing at a rate of 9.2% and industry at 3.8% per annum (MFEP, 1993).

The URA was created in 1991 in a bid to restructure and strengthen national taxation and customs collection. Imports are now subjected to extensive physical verification at periodic road checkpoints. Anomalies in documentation or failure to produce valid customs clearances and receipts can lead to confiscation of goods pending payment. In the recent budget, a new policy was announced, authorizing detainment and confiscation of vehicles and vessels carrying uncustomed goods. In an effort to curtail the under-invoicing of goods, a legal amendment that authorizes the URA to buy the importer's goods at their declared value plus interest was also proposed.

---

[120] Computation of the exchange rate gap based on black market rates prior to legalization of the Bureaux and Bureau mid-rates following the legalization. Information supplied by the Bank of Uganda Research Department.

[121] The current system is still overly dependent on the import information supplied through the Bank of Uganda Foreign Exchange Auction.

[122] The 12 month rate of -1.3% reported for May 1993 is distorted by the exceedingly high food costs of May 92 caused by the drought. When the 20.5% drop in food prices is removed from the consumer price index, the underlying rate of inflation is about 7.5% for this same 12 month period. This is more representative of the actual trend in inflation.

The system of export and import licensing was substantially simplified in 1991. Generalized export and import certificates are now available. These certificates allow any legally registered company to engage in unlimited trade in a broadly defined range of articles for a period of six months. These certificates are supposed to be issued within one working day of the submission of a properly completed application. Each export or import consignment must be accompanied by a form from the commercial bank that documents the quantity and value of the trade. Copies of the completed form are supplied to the Bank of Uganda and the Customs Department. Normal customs clearing procedures must be followed. At the time of customs clearance, the back of the export/import certificate is endorsed with the details of the exportation/importation (Ministry of Commerce, Cooperatives and Marketing, 1991). Exporters are allowed to retain 100% of non-coffee export earnings for purposes of further importation.

The major constraint still facing government is low revenue generation. Despite a fairly good performance in 1992/93, government revenues represent less than 8% of GDP. Nearly 50% of this revenue was generated through excise taxes on just five products (petroleum, beer, cigarettes, soft drinks and spirits). The 1993/94 Budget speech focussed almost exclusively on tax reforms to try to remedy this situation. The speech placed substantial emphasis on the need to improve administration of taxation on imported goods. The import tariff structure for customs was rationalized to a simple four rate system (0%, 10%, 20% and 30%). Edible oils, however, now face an additional 5% excise tax.

A program of coffee subsector reform and liberalization was put into motion in 1990. The export tax on coffee was gradually reduced and eventually removed in 1992. The Coffee Marketing Board was disbanded. It was replaced by the Uganda Coffee Development Authority (CDA), a regulatory body, and the free market export of coffee by both private traders and individual Cooperative Unions. This liberalized coffee prices, allowing the farmgate price to be determined by market forces. In addition, coffee is now being traded at the open market exchange rate, improving the local currency returns to traders. Because of

increasing real farmgate prices and improved terms of sale and payment, incentives to coffee farmers have improved considerably.

Moves to liberalize the cotton subsector have been slower to materialize. It is only in 1993 that the bill to create the Cotton Development Organization (CDO), a regulatory body similar to the CDA, has been tabled in the National Resistance Council (NRC). Passage of this bill, which would remove the LMB's monopoly on lint marketing and establish a Cotton Marketing Company (CMC) to compete with Cooperative Unions and private dealers in the export of cotton, is a legal prerequisite to the restructuring of the subsector. Major problems of financial insolvency must be addressed before the management of the cotton ginneries can be "rationalized" and Unions "restructured" to operate commercially.

The World Bank appears poised to launch a major ($51 million) seven-year Cotton Subsector Development Project (CSDP) in 1994. Project activities emphasize research and seed multiplication to improve the quality and yields of Ugandan cotton. This is especially important given the degeneration of existing cotton varieties in recent years due to the collapse of cotton research and the mixing of seed from different regions during the ginning and seed treatment process. The approach will "support and reinforce existing projects and programs to provide the necessary services to cotton producers rather than creat[e] . . . additional services specifically for cotton" (BCGA, 1993). Secondly, the project approach will conform to the government's policy on liberalization and will "encourage free market forces in the provision of services to cotton growers; the withdrawal of government subsidies for credit, input supplies and planting seed; and the removal of central control over the management decisions of private-sector ginneries" (ibid). Specific program initiatives include restructuring of the LMB and establishment of the CDO and CMC; support for national cotton research and animal traction development; continued operation of the seed multiplication system under control of the CDO to be eventually replaced by commercial production of cottonseed; training of extension staff, input dealers and cooperative primary societies; an expansion of the wholesale input supply network; and a major program of debt relief

and reorganization of cotton Unions with an emphasis on joint venture activities with the private sector.

Significant progress had been made in the handling of claims for return of confiscated Asian properties, despite strong opposition from many factions on the Ugandan scene. The rehabilitation of commercial properties in Kampala and Jinja is readily apparent, and the rental market for housing and shops now reflects more realistic market values. A considerable displacement of informal-sector traders and small businesses has resulted from the change of ownership. The return of Asian business interests, therefore, has helped facilitate the transition from informal to formal-sector economic activity. A final deadline of October 1993 has been set for lodging any outstanding claims.

Real interest rates have been positive for most of the period since 1990, and the national propensity to save is slowly increasing[123]. Recently, Government liberalized the interest rates and effective November 1992, interest rates were based on the Bank of Uganda auction rate for Treasury Bills. Interest rates on savings deposits have subsequently fallen from 35% in July 1992 to 25.9% in June 1993. Lending rates remain high, to a large extent due to the high operating costs of the major parastatal banks. There is hope that they may reduce after the two major (parastatal) commercial banks have been restructured. The Bank of Uganda Act has been amended to give the Bank autonomy in implementing monetary policy and the bank has received a substantial new injection of capital.

Efforts at major civil service reform to improve performance have been instigated, but a significant reduction in the levels of petty corruption has yet to materialize. These efforts include a massive retrenchment of civil servants and military personnel (68,000 additional layoffs expected in 1993/94), and a 33% real increase in the total budget for salaries and wages for the current budget year.

These changes in the policy and institutional environment are likely to have a major impact on the edible oil subsector. The shift to privatization and competition in export marketing is essential if the

---

[123] By December 1992 the ratio of time and savings deposits to money supply had increased to 24.9% from its 1989 level of only 12.05%. (MFEP, 1993).

cotton subsector is to revive. The return of Asian properties and improved fiscal management creates a stable economic environment more conducive to large-scale private-sector edible oil processing. Improved effectiveness and transparency in import tax enforcement will provide local manufacturers with greater protection from international competition. In the long run, improved savings mobilization offers hope that crop finance and investment loans will be more available to edible oil processors and at more reasonable interest rates than currently. Improved availability of price and market information will help farmers make rational production choices. Oilseed crops, however, will face stiff competition from non-traditional exports when it comes to a farmer's allocation of land, labor and capital resources. The heavy policy emphasis on non-traditional export promotion raises a significant challenge. Will Uganda be better off promoting oilseed production for import substitution, or should it concentrate on export oriented production? This is the subject of the analysis in Chapters Eight and Nine.

CHAPTER SIX: OILSEEDS PRODUCTION IN UGANDA

6.1 INTRODUCTION

The Ugandan economy is heavily dependent upon an agricultural sector that has largely reverted to subsistence production. Fully 89% of the 1991 population of 16,582,700 were rural. Most rural residents have some access to land use rights for cultivation. There are approximately 2.9 million smallholder farm households in Uganda, and 80% of them have under 4 ha of farmland. The average cultivated area per smallholder household is only 1.4 ha[124].

Because of the macroeconomic policies and political climate of the 1972-86 period, Uganda underwent a dramatic reversal of its earlier agricultural and structural transformation process. By 1986 Uganda had suffered a near total collapse of agricultural research, seed multiplication, output markets, input distribution networks, and extension services.

The Ugandan farmer today is producing at essentially the same level of productivity as he/she was thirty years ago. Virtually no new agricultural methods or technologies have been introduced since the 1960s. Far worse, many labor-reducing or productivity-enhancing technologies have fallen into disuse in recent years, leaving Ugandan yields much lower than those of other developing countries with similar climatic conditions. National fertilizer consumption per area under cultivation has fallen from an estimated 1.4 kg/ha in the 1960s to a mere .2 kg/ha presently. Total annual expenditure on agricultural inputs (fertilizers, implements, seeds and agricultural chemicals) is roughly $10-$15 per smallholder. Farmers in Eastern and Northern Uganda, where animal traction had been well established for nearly 50 years, have suffered a massive loss of draft animals due to political insecurity. The sudden shift back into hand hoe cultivation, with its resulting labor constraints, has reduced the cultivable area per household in these less populated regions. Staple food production

[124] The Uganda National Census of Agriculture and Livestock, Volume II. 1992.

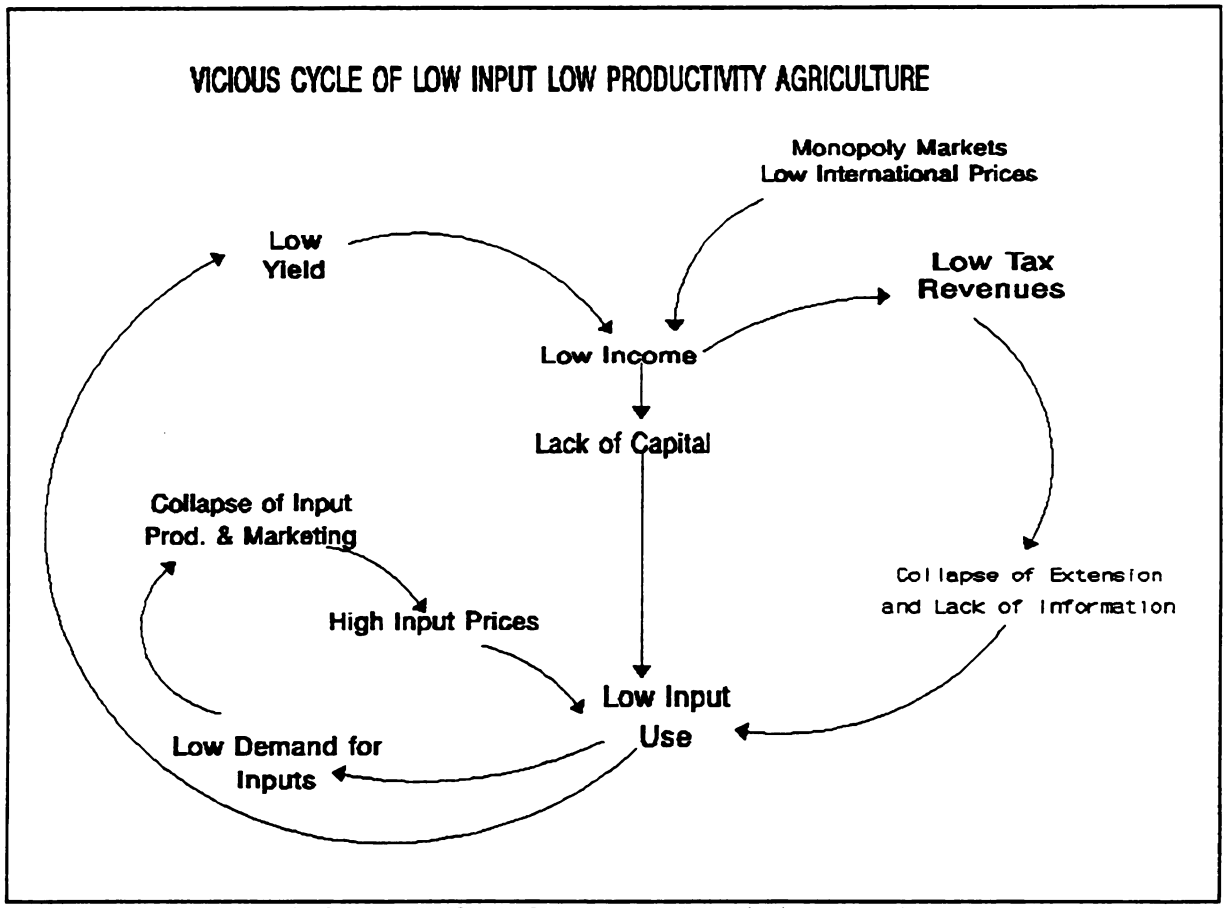


Figure 6.1 The Vicious Cycle of Low Productivity Agriculture

continues to depend on traditional varieties produced from retained seed year after year. There is little incentive for farmers to improve production techniques when markets for surplus are cyclical and unreliable. What results is a vicious cycle of low input/low productivity agriculture. This situation is illustrated in Figure 6.1.

The potential for agricultural transformation in Uganda has greatly improved in the last few years. A major structural reorganization is currently underway. Many positive macroeconomic policies inaugurated by the Economic Recovery Program to reverse the economic decline were discussed in Chapter Five. To facilitate coordination of progress on reforms in the agricultural sector, the Government has established the Agricultural Policy Committee (APC) chaired by the Permanent Secretary of the MAAIF and reporting directly to the President's Economic Council. The work of the APC is supported by the Agricultural Secretariat established with World Bank support in the Bank of Uganda.

The main target of the agricultural sector strategy is to increase yields. The strategy, therefore gives highest priority to a rehabilitation of the agricultural research and extension system and market liberalization in both the input and export markets. The National Agricultural Research Organization (NARO) is a new, independent parastatal organization that can offer more competitive incentives to researchers and demand greater productivity and accountability. Increased allocations for research and extension can only be availed by freeing up resources from activities that do not contribute efficiently to increased production. The government has committed itself to reduce its direct involvement in production and trade. The government is privatizing state farms and tractor services and curtailing its engagement in money-losing trading activities. Recent heavy donor investment in road infrastructure is beginning to pay off, and large investments in feeder roads are scheduled for the coming years. Rehabilitation of the seed multiplication scheme is also underway, with particular emphasis on making the scheme self accounting.

While Uganda's farmers have demonstrated that they are willing to respond to price and market incentives by bringing under-utilized resources into production, future productivity increases will be more difficult to achieve. Raising per capita income and living standards requires an increase in the productivity of the nation's resource base. These production increases must come from new technology and capital formation. Agricultural research will need to play a major role in the identification, adaptation and testing of productivity-increasing technology appropriate to the farming systems of Uganda.

6.2 THE PRODUCTION OF RAW MATERIALS FOR CRUSHING

Edible oils processors in Uganda complain bitterly of a lack of raw materials. Paradoxically, farmers also complain of a lack of markets for their oilseeds. How can this be? The lack of materials has seriously constrained crushing throughput, causing severe under-utilization of productive capacity and high unit costs of production for oil. Processors cannot raise their prices to reflect the costs of production because of the competition from inexpensive imported oil,

much of which by-passes taxation. High costs of processing are, therefore, passed back to the farmers as low farmgate prices for oilseeds. Millers also face a serious shortage of working capital with which to purchase raw materials. Therefore, the demand for oilseeds is irregular and unpredictable. When markets are uncertain and yields are low, the returns to oilseed production are unattractive compared to alternative crops. Raw material availability, therefore, continues to be a constraint. This vicious cycle is illustrated in Figure 6.2.

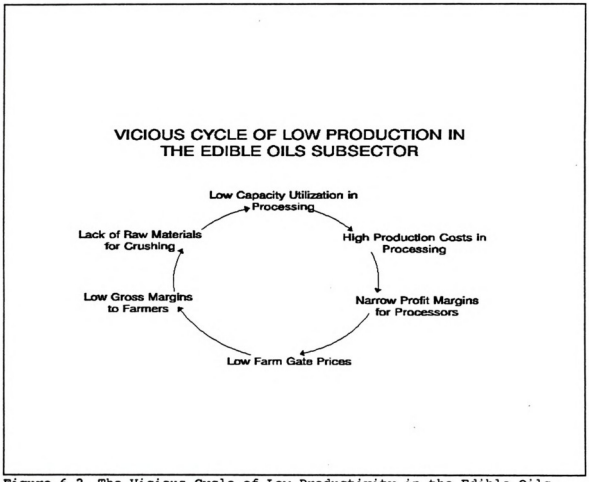


Figure 6.2 The Vicious Cycle of Low Productivity in the Edible Oils Subsector

The primary oilseeds in Uganda are groundnuts, sesame, cottonseed, soybeans and sunflower[125]. Figures 6.3 and 6.4 present the trends in oilseed production from 1971 through 1991. Groundnut, sesame and soybeans production statistics are from the Ministry of Agriculture as reported in the Background to the Budget (MFEP, various years). Cottonseed availability has been calculated from information from the Lint Marketing Board on the number of bales of cotton ginned[126]. Sunflower is the most recently introduced oilseed. Unfortunately, data for sunflower were only available from the MAAIF for 1989 through 1991. Thompson (1988) estimated that until 1987 the area planted to sunflower was only 5,000 ha.

The MAAIF figures need to be viewed with caution, however. Ministry area and production estimates are prepared jointly by the extension staff and the local administration. Adjustments to the previous year's estimates are based on general impressions of the current year's crop and weather conditions, rather than on actual data collection. When there is a heavy political campaign to increase production of a particular crop, chiefs and extension agents will have an interest in inflating production figures. Errors then tend to be compounded over the years.

Fortunately three other one-shot estimates of agricultural production exist against which these official statistics can be gauged. A national agricultural census was conducted in 1963-64 and then again in 1990-91. The Statistics Department of the MFEP also prepared national production estimates, based on the 1989-90 Household Budget Survey. The comparison between these estimates is presented in Table

---

[125] Uganda also produces maize. Processing of corn oil, however, requires large-scale prepress-solvent extraction of the oil from the maize germ. The germ is usually removed as a by-product of cornstarch or corn-sweetener production, neither of which is produced in Uganda.

[126] It takes an average of 544 kg of Ugandan seed cotton to make one 185 kg bale of lint. Seed cotton is approximately 66% seed. Production of one bale of cotton lint generates roughly 359 kg of cottonseed. The quantity of cottonseed will vary depending on the efficiency of the ginning process and the amount of residual linters left on the seed. Commercial cottonseed usually consists of 10-15% linters, 35-40% hulls and 50-55% kernels. The oil content of undecorticated cottonseed ranges from 15-25% depending on variety and storage conditions. International extraction rates range from 13-18% but were much lower in Uganda in recent years.

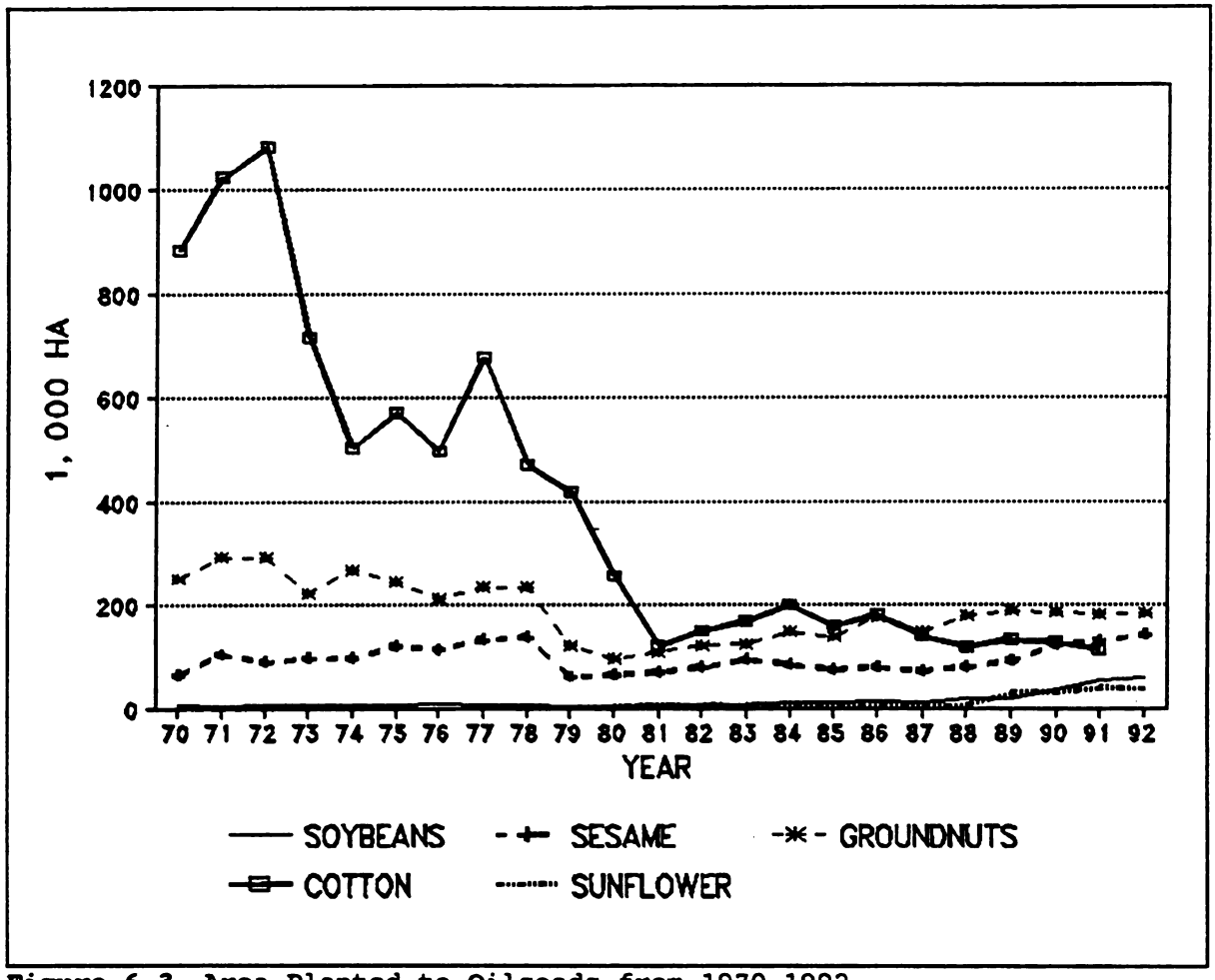


Figure 6.3 Area Planted to Oilseeds from 1970-1992

6.1.

Apparently, the MAAIF time series data was substantially over-estimated in 1963/64, except for the area planted to sesame, which was under-estimated. There is no indication that the Ministry statistics were ever adjusted to correct for the over-estimation. It is likely, therefore, that the peak production levels for groundnuts and cotton that are reported for the early 1970's are exaggerated. The sharp drop in food production reported in the 1979-80 period is also probably exaggerated since despite the war, there were no serious food shortages. In contrast, the table indicates that by the end of the 1980s, Ministry figures may underestimate production, especially for groundnuts, and cotton. The growth in soybean production, however, may be greatly over-stated.

Whichever estimate of current oilseed production is used, however, the supply of raw materials is inadequate to meet the

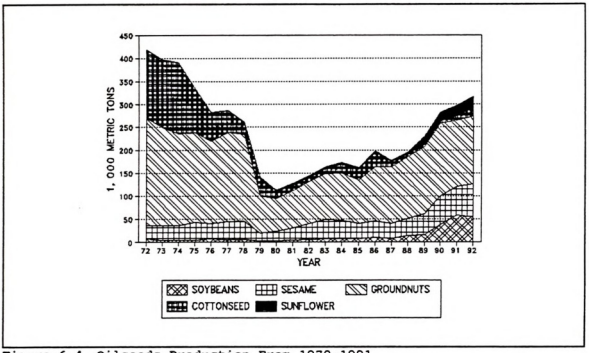


Figure 6.4 Oilseeds Production From 1970-1991

Table 6.1 Comparison Between Alternative Estimates of Oilseed Area and Production

	Groundnuts	Sesame	Cotton	Soybeans
1963/64 Census As % of Ministry Estimates of Area	65%	120%	62%	NA
1989/90 Household Budget Survey as % of Ministry Estimates of Production	86%	89%	NA	98%
1990/91 Census as % of Ministry Estimates of Area	111%	97%	53%	41%
1990 Census as % of Ministry Estimates of Production	163%	142%	99%	53%

Source: Calculated from data in Ministry of Agriculture and Cooperatives (1965), MAAIF (1992), MFEP (June 1993) and data provided by the MFEP, Statistics Department.
NA = Not Available

industry's demand. Most groundnuts, and soybeans are consumed directly. Sesame is either consumed directly or exported to generate badly needed foreign exchange. As a result, most of Uganda's edible oil is produced from cottonseed and sunflower. While the national crushing capacity is approximately 168,250 mt/yr and could rise by 57,000 mt/yr with

rehabilitation of the silent Asian mills, 1992 production of sunflower and cottonseed was less than 43,000 mt.

In assessing the potential contribution of alternative oilseeds to future edible oil production in Uganda both the average crop yield and the extractable oil content of the alternative commodities needs to be considered. In addition, the ability to expand production area is directly related to the ratio of output per ha to seed rate. This ratio is called the expansion rate. The higher the expansion rate, the easier it will be to produce the seed required to expand acreage or replace existing acreage with new varieties. The lower the rate, the longer this process will take. These factors are summarized in Table 6.2.

Table 6.2 Extractable Oil Yield Per Ha for Alternative Oilseeds

Oilseed	Yield (kg/ ha)	% Oil Content		Crude Oil Yield (kg/ ha)	Planting Rate (kg/ ha)	Expansion Ratio[b]
		Absolute	Extractable[a]			
Cottonseed[c]	220	15-20	11.5	25	40	6
Soybeans	800	15-20	12	96	30	27
Sesame	480	45-55	40	160	6	80
Groundnut	800	44-56	40	200	60	13
Sunflower (Sunfola)	1,000	35-42	30	300	4	250

[a] Extractable oil yields assume relatively inefficient mechanical extraction rather than solvent extraction rates.
[b] Expansion ratio is seed yield/planting rate.
[c] Cottonseed comprises approximately 66% of the raw cotton. Yield reported here is for seed only, under low yielding, hand hoe production.
Source: Modified from Coppee Courtoy/Agrer (1989) p. 120. and Bunker et. al. (1991) p.14.

6.2.1 Groundnut Production

Groundnut (*Arachis hypogaea* L.) is the most widely grown oilseed in Uganda. While groundnuts have been widely cultivated and consumed in Uganda since 1862 (Busolo-Bulafu, 1990) there is considerable concern

over the apparent instability and decline in per capita production over the past 20 years (Sserunkuuma and Ekere, 1993; Seruyange, 1991). MAAIF statistics report a significant decline in production since 1971 when production peaked at 250 thousand metric tons. Production apparently fell by 10.7% per annum from 1970 to 1980. While groundnut production has gradually recovered throughout the 1980s, area in 1991 was just over 60% of the peak 1972 official figures. Considering the population increase, this would imply a significant decline in per capita consumption.

The decline is primarily associated with the sharp drop in production in the Eastern region, which contributes more than 30 percent of the national groundnut production. Several explanations have been suggested for this dramatic decline. Sserunkuuma and Ekere (1993) suggest that this decline was precipitated by the lack of marketing opportunities after the expulsion of the Asians and exacerbated by civil unrest. Since groundnuts were never a major source of edible oil, even during the height of the Asian owned crushing industry, this explanation is not very satisfactory. Groundnut exports during the 1960s represented only a very small proportion of total production. Nor is it clear why civil strife should be responsible for the decline, when a major share of the fall in production in the Eastern region took place during the 1974-76 period, long before there was any significant unrest in the area. In contrast, during the period of 1986-1990, when this region suffered severe political instability and massive dislocation of the population, reported groundnut production remained surprisingly stable despite the massive reduction in oxen cultivation capacity.

Regional officials are unable either to verify or to explain the shift away from groundnuts. The apparent decline may be an artifact of the data estimation process. According to the 1963 Census of Agriculture, groundnut production in this region was overestimated by as much as 73%. There is no evidence that regional estimation procedures were ever adjusted to reflect the census findings.

Even more worrying than the fall in acreage is the decline in groundnut yields. Groundnut yields show a significant negative trend during the 1970-91 period. This decline indicates the extent to which farming methods and production technology have stagnated. The declining

yield trend is probably the result of the breakdown in research, seed multiplication, and input distribution. Purchased inputs and improved seed are particularly important in the control of groundnut rosette. While there is a need for field survey work to identify the major production constraints and the magnitude of their impact under farmer conditions, clearly rosette virus disease is a major problem. Rosette virus is transmitted by aphids (*Aphis craccivora*). Heavy infestation can result in complete crop failure. Current research efforts concentrate on the production of rosette resistant varieties, since most farmers cannot afford chemical control. No systematic economic analysis of the returns to rosette control has been conducted. Nor is data available to confirm the extent to which declining yields are caused by an increase in the incidence of this disease.

The average national yield of .8 t/ha of shelled groundnuts compares unfavorably with the 3 t/ha obtained in countries with developed agriculture (Busolo-Bulafu, 1990)[127]. Researchers achieve yields of over 2.5 t/ha on experimental plots, suggesting considerable scope for improved production (ibid.). The yield gap between on-station and on-farm production is related to the high levels of intercropping. Nearly 90% of the groundnuts are intercropped (MAAIF, 1993). Plant populations per unit area are low and highly variable. The most common intercrops are maize, cassava, coffee combined with plantains, and pulses. Researchers identify the following major constraints to increased production in Uganda: rosette virus, early leaf spot (*Cercospora arachidicola* Hori), unreliable rainfall, lack of high-yielding cultivars, and storage losses.

Groundnuts remove large quantities of nutrients from the soil[128]. This is especially problematic in Uganda, where fertilizer

---

[127] Using the yield measurement technique of complete harvesting of small, randomly-selected subplots, the 1990 Agricultural Census estimated the national average yield for groundnuts to be 1.1 mt/ha, which is substantially higher than the Ministry estimates. This estimation methods is known to overestimate total yield, however, because of the more complete harvesting of such small areas.

[128] Nutrient removal in kg/ha is: N, 157; P_2O_5, 27; K_2O, 115; CaO, 66; MgO, 34. (Tropical Products Institute, 1971.)

use is extremely rare. A three to four year rotation is advised to restore fertility and reduce the risk of disease.

Yield estimation is complicated because groundnuts store best in the shell. The farmer's estimation of yield is in terms of the number of bags of unshelled nuts obtained per unit-area of land. Research yields are also generally reported in terms of kg/ha of dried pods. This measure ignores the important factor of shelling percentage as a determinant of the final quantity of consumable shelled nuts (Laker-Ojok, 1993b).

In West Africa, groundnut hay is a valuable livestock feed, and can account for 10-40% of the value of the harvest (Schoonmaker Freudenberger, 1993; Kristjanson et al., 1990). In Uganda, however, groundnut hay is not known to have any recognized commercial value.

6.2.2 Soybean Production

According to S.K. Mukasa (in Jameson, 1970) soybeans were introduced in Uganda between 1907 and 1909. Serious production did not occur until the 1940s when cultivation reached 14,000 to 16,000 hectares in response to the war-time demand from Britain. In 1950, soybean exports reached a record level of 4,314 tons before declining. By the early 1980s production was minimal with an average of 5-6,000 ha under soybeans annually.

Soybeans have gained in importance in the last few years. Area and production have trended upward rapidly since 1985, with an annual growth rate of 33.2 percent. Production has expanded in response to promotional campaigns to meet barter trade export agreements and to the demands of the edible oil industry. Planted area was estimated at 54,000 ha in 1991.

Soybeans were first introduced in central Uganda, but production has gradually shifted to other parts of the country. Currently, the leading production areas for soybeans in Uganda are Busoga (49%) and Lango (23%)(Sserunkuuma and Ekere, 1993).

Soy yields vary but show no significant general trend. Recall data from a farm survey conducted by the author gave average unfertilized yields for both improved varieties of about 800 kg per ha.

This is consistent with data for non-fertilized on-farm trials for 1988-90 (Laker-Ojok, 1993). Experimental yields without fertilizer can reach 1,100 kg/ha (Hittle, 1987). This is still very low compared to the 3,400 to 4,090 kg/ha that are common in many parts of the U.S. (Enger et al., 1989). Crop yields are limited by poor husbandry, the tendency to inter-crop, the lack of natural *Rhizobium japonicum* in the soil and the need to harvest before full maturity to prevent shattering.

Because soybeans are not native to Uganda, the necessary rhizobia to facilitate nodulation and nitrogen fixation are not resident in the soil. Rhizobium inoculation can improve soybean yield by 25-45% in Uganda, at minimal cost to the farmer. Rhizobium also has a measurable impact on soil fertility. Some researchers assert that the promotion of soybean production without solving the problem of rhizobium inoculation can have a severely negative impact on soil fertility because of soybean's heavy nitrogen requirements[129]. Reduced fertility could lead to lower yields for other crops in the rotation, the need for longer fallow periods and an increased demand for organic and chemical fertilizers.[130]

USAID has supported research into rhizobium production and distribution since 1986. Identification of the appropriate strain of rhizobium for Uganda proved relatively straightforward. A production facility was established at Makerere University. During 1990-91 the inoculum program at Makerere sold enough rhizobium to inoculate 367 HA of soybeans. Production capacity of this facility is sufficient to produce rhizobium for approximately 2,000 ha/yr, but serious roadblocks stand in the way of widespread adoption. One constraint is the poor functioning of the extension service. Farmers need to be educated about this entirely new technology. Most extension staff know little more about rhizobium than do the farmers. The second constraint is the lack of input distribution mechanisms to ensure inoculant viability and

---

[129] With the production of 1,000 kg/ha nutrient removal is N, 60; P_2O_5,35; K_2O,80, in kg/ha (Tropical Products Institute, 1971 p. 144).

[130] The same argument could also be made about sunflower or any other non-legume oilseed. Nitrogen requirements are highly correlated with protein content, which is higher in oilseeds than in cereals. No data are available, however, on which an estimate of the economic impact of increased oilseed production on national soil fertility can be based.

timely availability. The inoculant is not expensive but it must be produced under controlled conditions. The rhizobium is distributed in a medium of peat soil that must be protected from extreme temperatures and mixed with the seed just before planting. The lack of supervision and accountability in the Ugandan input system, makes it difficult for poorly educated farmers to ensure that they are getting anything other than just a bag of dirt[131].

ICAL 131, an INTSOY variety, was released by the Ministry as a recommended variety in 1991 under the name of Nam 1. This variety matures in 120 days and is resistant to bacterial pustule and virus. A major advantage of the new variety over the existing released variety, is its resistance to shattering. In addition, Nam 1 does not lodge and is 5-10% higher yielding across locations. It is responsive to inoculation with *Bradyrhizobium japonicum*. Another variety, L73, was submitted to the National Release Committee in late 1992. This variety yields as well as the existing varieties. It is larger seeded and extremely shatter resistant.

Soybeans have a relatively low oil content (15-20%). In the developed world, soybean oil is extracted most efficiently using solvent extraction. The scale of technology required to make solvent extraction profitable would be inappropriately large for Uganda. Simple mechanical extraction is possible but leaves a high residual oil content in the cake. In the US, even with solvent extraction, fully 60% of the value of the soybeans is derived from the cake instead of the oil. It is primarily the high demand for feed meals that has contributed to the very rapid expansion in world soybean production in the past two decades. The input intensity of Ugandan livestock production, however, is still very low. Low per capita incomes constrain the demand for meat and dairy products and hence the demand for feed ingredients. With limited demand for cake, sunflower is more suitable for mechanical oil

---

[131] Since rhizobium continues to reside in the soil, the possibility of inoculation using soil from previously inoculated fields has been raised. It would be very difficult, however, to ensure adequate levels of resident rhizobia by such a method and experts recommend that to achieve full impact, rhizobium inoculation should be repeated for several seasons until sufficient populations are established. American farmers routinely inoculate every season.

extraction because of its higher oil content. While several companies now manufacture full-fat soy flour as an infant food, it continues to be more expensive than traditional maize porridge and demand is largely limited to middle to upper income urban consumers. Soy flour is high in both protein and fats and would be an excellent infant feeding supplement if it were widely adopted. In order for adoption to expand, however, it must become more readily available and less costly. The extent to which rural mothers are preparing their own soy flour is unknown. There is very little information available on final consumption patterns for soybeans. Only a small proportion of the estimated production is actually being processed into oil, animal feeds and commercial flour. The most common way that soybeans are eaten in Uganda is roasted and salted as a snack food.

6.2.3 Sesame Production

Sesame (*Sesamum indicum* L.) originated in North-eastern Africa and is reputed to be the oldest oil crop known to man (Bua and Anyanga, 1993). According to FAO production statistics, Uganda is among the ten largest sesame producers in the world.

Ninety percent of the sesame produced in Uganda is grown in the northern and eastern parts of the country. These are primarily areas of low population density with annual rainfall of 1,000 mm (380-500 mm during the growing season), temperature ranges of 25°-35°C, sandy loam soils with good drainage, and lower incidence of leaf spots, sesame webworm (*Atigastria oxysporium*) and gallmidges (*Asphondylia sesame*)[132]. Sesame is an important component in the traditional diet and farming system in these areas[133]. The sesame from the north-east and north-central Uganda tends to be off-white, while that from the north-west is dark-brown to black and higher in oil content. The oil content of these dark seeded varieties (52-56%) is among the highest in

---

[132] No studies of the economic effects of these pests have been conducted. However, the damage is not thought to be significant.

[133] Sesame was traditionally grown third in the rotation after cotton and millet. With the improved export market, however, farmers have begun to shift to opening land with sesame instead of cotton.

the world (Sergeant and Macartney, 1993). The black varieties are also generally later maturing, larger seeded, give higher yields, are more shatter resistant, and less susceptible to pests and diseases. Sesame has a growth cycle of 2.5 to 3 months. It is drought resistant but cannot tolerate waterlogging. Eighty percent of the crop is grown during the second rains, which are followed by a longer dry season that facilitates drying (MAAIF, 1993). Expansion of first season production would require artificial drying in most areas.

Many earlier research results on sesame were lost during the political instability of the late 1980s. All available genetic stocks were maintained at Serere Research Station, which lacked cold storage facilities, necessitating regular planting to regenerate seed stocks. Not only was such regeneration impossible during the period of political chaos, but seed stocks were broken into, causing considerable loss from physical mixing. Elite sesame materials that were salvaged from Serere in 1988 required considerable reselection effort to restore purity of the strains. The loss of research results is even more serious. The loss of field results may require years of effort to duplicate. The few available reports refer to extensive investigation of the entomology of sesame pests, pesticide screening, seed rate, and intercropping, the results of which are no longer available.

No improved varieties of sesame are currently available to farmers. While two sesame varieties had been released in Uganda, they have never been multiplied by the Uganda Seed Scheme and therefore were not available commercially[134]. "S" is a local variety selected by Hirst in the 1950s and released by the Ministry of Agriculture in 1973 (Anyanga, 1993 and Busolo-Bulafu, 1992). It is reportedly faster maturing, yields over 500 kg/ha and has large white seeds. Serra (1683) is an ex-USA introduction that was released by the Ministry of Agriculture in 1977 based on its high yields and oil content. Few details are available concerning its characteristics. "S" was given the status of universal release. Serra received a limited release for Teso,

---

[134] Sesame seed sales by the Uganda Seed Scheme in 1990 and 1991 were actually commercial seed, not certified seed. The Scheme bought sesame from local farmers, cleaned it and tested it for germination rates. This sesame is sold as seed, but it is not of any particular known variety.

Lango and Acholi, the major sesame producing areas, where it reportedly gained considerable popularity. Adoption in other areas of the country is limited by unfavorable weather and topography, high pest incidence, low price compared to other crops, and a preference for groundnuts in the traditional diets of those areas.

The lack of pure sesame seed has been a problem in recent years. The opportunities for export have encouraged the expansion of sesame production into areas where it is not a traditional part of the cropping pattern. Unfortunately, many aspiring farmers planted sesame purchased on the retail market only to be told by traders that the sesame they produced was of poor quality because it contained a mixture of white and dark seeds. Even in the traditional producing areas, the Produce Marketing Board (PMB) found that the white seed content of the sesame it purchased decreased from 98% in 1989 to 92% during the 1991 season (Abt Associates, 1992).

Sesame production in Uganda is characterized by extremely low levels of management. Seed is broadcast and nearly 75% of it is intercropped, primarily with millet, sorghum and pigeon peas (MAAIF, 1992b). No inputs are used and weed competition is a serious constraint to yields. Weeding of broadcast crops is very laborious and is traditionally a female responsibility. Average yields are low (the MAAIF estimate is 480 kg/ha nation-wide while the 1990/91 Agricultural Census estimated an average yield of 700 kg/ha in the covered area). This compares unfavorably to yields of 880-2200 kg/ha reported for Venezuela (Odwongo et al., 1991).

Closer spacing (30cm x 10cm), line planting and improved weeding may improve yields by 40-100% (Sergeant and Macartney, 1993). Sesame production after tobacco shows considerable improvement in yields due to the residual effects of fertilizer. Further study is required, however, to test the economic viability of direct fertilizer application. The Ministry of Agriculture has been promoting row planting[135], drying on cement floors, higher seed rate, spacing and chemical control of pests and diseases for many years now. These recommendations have had little

[135] Row planting is particularly useful in reducing the labor demands of weeding. Weed competition is reportedly a significant factor is reducing sesame yields.

or no impact on farmer's traditional practices (Busolo-Bulafu et al., 1992). The reason for the low adoption is that such recommendations fail to consider household labor constraints and the economics of adoption given the limited availability of capital in the hands of small farmers.

Sesame is harvested by hand and dried on racks near the field. Timely harvest is important because sesame is especially vulnerable to overheating. (The husk changes color, darkening when exposed to excessive sunlight and pod shattering becomes a problem.) The pods ripen unevenly, those nearest the ground maturing first. Optimum harvest is when a maximum of 10% pod shattering has occurred. Precleaning on the farm is problematic. The lack of cement drying floors, or even simple plastic sheeting, results in most of the Ugandan sesame coming to the market in a very dusty condition. Sesame is sold by weight. Since price differentials for clean sesame are low, farmers minimize precleaning to save time and labor and increase their returns by selling impurities to the buyer. Galton-Fenzi (1993) reports that sesame from five different growing areas in Uganda was found to contain an average of 4% sand and small stone particles by weight[136]. No buying centers with cleaning facilities exist in the rural areas. Such centers could control quality by deducting a percentage of weight for poorly cleaned or dried seed. Such a practice would eventually force farmers to improve their level of on-farm processing. Alternatively, a simple system of cleaning using a double layered table sieve could be initiated at the primary trader level. The top sieve is larger, allowing the sesame to pass through but retaining larger stones and trash. The bottom sieve is smaller, capturing the sesame, but removing the undeveloped seed, dirt, sand and small stones.

Storage is an important constraint to sesame production and marketing. Sesame must be stored under well-ventilated conditions and off the ground on pallets, to reduce infestation. In the early stages of storage, sesame is highly susceptible to pests, especially moths. In the Gambia, Indian traders use a natural fumigant in their stores made from the Neem tree (Galton-Fenzi, 1993). While neem trees do grow in

---

[136] The maximum allowable by international standards is 2%.

Uganda, the extent of their distribution is unclear and this use of the tree seems unknown.

Sesame has excited considerable attention in recent years as a "non-traditional" export[137]. In late 1990 PMB renegotiated its barter deal with Yugoslavia, shifting from maize to sesame because the international price of maize had fallen so dramatically. In 1990 and 1991 sesame became the second largest foreign exchange earner, surpassing cotton (Sergeant and Macartney, 1993). Recent international market trends indicate that the bottom has fallen out of the demand for Ugandan sesame. Foreign exchange earnings from sesame fell from $10.5 million in 1991 to less than $8 million in 1992. During the first quarter of 1993, only $1.6 million dollars worth of sesame has been exported (a decline of 25% over the same period last year) and these exports were reportedly contracted earlier when world market prices were still favorable (ibid).

6.2.4 Sunflower Production

Because of its extensive taproot system, sunflower is well adapted to the drier ecology of northern and north-eastern Uganda. Most farmers prefer planting sunflower in the second rains, which are generally followed by a longer spell of sunshine. Diseases, especially leaf spot, stalkrots and headrots, are a major production constraint in higher rainfall areas. The existing sunflower germ-plasm has very limited tolerance to these diseases. Sunflower can be produced in the moister climates of the southern and western regions if soils are well drained and crops are carefully rotated to control the build-up of disease. Researchers recommend that farmers not grow sunflower in the same field until all the stalks have decomposed (about 2 years). Farmers should also uproot volunteer sunflowers. Beans and irish potatoes share some of the same pathogens as sunflower and therefore should be excluded from the rotation pattern. Cereals are the best

[137] Sesame has been exported for many years but quantities were relatively small. Odwongo, 1991 reports that between 1966 and 1970 sesame accounted for 36% of the total quantity and 52% of the value of oilseeds exported by Uganda.

crops to precede sunflower in the rotation because they are immune to the major fungi that attack sunflower (Ssebbuliba, 1993). Cassava, as a following crop, can form a good lead-in to the fallow period.

Sunflower grows well in a wide range of soils and can produce satisfactory yields even with low fertility levels. It is difficult to estimate actual sunflower yields in Uganda. The common belief is that sunflower will yield 1000 kg/ha. G.E.D. Tiley (in Jameson, 1970) reported average yields of 1,000 lb/acre in 1962 but stated that 2,000 lb were possible under the right conditions. Researchers believe that a yield of 2,500 kg/ha is possible with the right hybrid varieties.

Sunfola is the highest yielding open-pollinated variety tested in Uganda. It has an oil content of 35-40%. Record, a common variety in Tanzania, is an open-pollinated variety that could be promising if its variability can be reduced. According to researchers, its yield on farmer's fields ranges from 800-1000 kg/ha compared to Sunfola's 700 kg/ha. Estimation of sunflower yields in Uganda has proven very difficult. On-farm trials in Masaka District have achieved up to 3,000 kg/ha using proper spacing, fertilizer, clean weeding and careful bird scaring. In contrast, the average on-farm trial yields for sunflower during 1990 ranged from 330kg/ha in Masindi District to 1530kg/ha in Luwero even using fertilizer. These poor yields were attributed largely to the combined effect of drought and bird destruction. Unfortunately, these trials were carried out in areas where marketing of sunflower was problematic. The lack of guaranteed market undoubtedly reduced the level of farmer commitment to bird scaring.

Because of the high protein and oil content of its seed, sunflower extracts a considerable amount of nutrients from the soil, especially nitrogen and potassium[138]. To reduce the nutrient loss, farmers should leave the stalks standing in the field and plow them under later as green manure. The stalks, however, don't rot very quickly and are difficult to plow under effectively with a hand hoe. In many places, therefore, farmers uproot the entire stalk. This is

---

[138] For a good crop of sunflower, nutrient removal is N, 93-113; P_2O_5, 17-20; K_2O, 222-277, in kg/ha (Tropical Products Institute, 1971) This is more than soybeans but less than a good crop of groundnuts. A modest crop of sunflower extracts only about a third this amount.

especially the case in areas with severe fuel shortages, where the stalks are used for cooking. This practice increases the danger of soil depletion. Precious top soil is removed with the roots, while nutrients stored in the stalks and leaves are not returned to the soil.

Sunflower yield is influenced by three factors: the number of heads per hectare, the number of seeds per head, and the average weight per seed. The number of heads per hectare influences yield more than the other two variables. Since there is normally only one head per plant, plant population is the major determinant of yield. The recommended spacing is 75cm by 50cm with 2 seedlings per hill, resulting in an approximate plant population of 53,000 plants/ha[139]. Sunflower adjusts to low populations by increasing weight/seed and seeds/head. Therefore, yield, which is the product of the three components, remains fairly constant through a range of populations. Head size cannot, however, compensate for exceptionally low populations. Variety, weather, soil conditions, weed competition and sunflower pests contribute to considerable variability in yields. Weed competition is a very serious factor constraining yields under local farming practices.

Open-pollinated varieties cannot produce good yields without bees. Bee populations are highest near trees and water. Such an environment is a natural habitat for birds[140]. Bird damage is especially a problem at the early stages of introducing the crop into an area. Birds can completely destroy a small, isolated plot of sunflower. Though bird damage in Uganda is reduced in the second season, human bird scarers with catapults and loud voices remain the only available deterrent. This highlights the importance of economies of scale in sunflower production. The larger the field, the smaller the proportion of total yield that a given population of birds can eat. In addition, while it may be economically profitable to hire bird scarers for a large field, the cost of a similar effort on a small field may be uneconomic.

---

[139] Lower plant populations (33,000-45,000 plants per ha) are recommended in areas of limited rainfall.

[140] One possible solution would be for farmers to hire bee hives to be moved into the vicinity of their fields during peak pollination periods to improve seed set.

Without careful isolation, sunflower can easily be cross-pollinated, even at distances of over a mile. As a result, most of the sunflower in Uganda is highly mixed. It lacks uniformity in color, maturation period, height, yield, and oil content. This variability increases the level of bird losses. The wider the time span between maturity of the first and last heads the longer the time the crop is subjected to bird predation. This is further compounded if farmers in the district stagger the planting of their fields or plant a range of sunflower varieties with different maturity periods. If the birds are spread out over many fields that are all mature at approximately the same time, the amount of sunflower they can consume before harvest will be less than if they all converge on one sunflower field that happens to be mature at that time. Researchers recommend hybrids because of their superior yield, ability to withstand stress, and uniformity. Serious questions have been raised concerning the ability of the National Seed Scheme to manage hybrid seed production. USAID, under the CAAS project, has been supporting multiplication of Sunfola (an open-pollinated variety) but distribution mechanisms are still problematic. The shortage of seed to meet the current demand for high oil content varieties remains a serious constraint.

While sunflower has fewer labor demands than other cash crops such as maize, or cotton, farmers are reluctant to expand sunflower production due to low farmgate prices. In the north, sunflower competes with sesame, cotton and groundnuts. Cotton was the traditional cash crop. When the cotton cooperative marketing system fell apart farmers were desperate for an alternative cash source. For a time sunflower appeared to offer an attractive alternative. During 1990-91, the substantial increase in the price and marketability of sesame greatly eroded farmer's interest in sunflower.

Comparison of estimates of the production of sunflower with quantities that millers report crushing, indicates that less than half the sunflower seed produced in 1992/93 may have actually been crushed. This phenomenon is probably explained by a combination of exaggerated production estimates and high storage and marketing losses. Storage losses for sunflower both on-farm and on-site at the small mills are

very high[141]. Existing market mechanisms are performing very poorly, especially in contrast to the export markets for food crops. Many farmers complain of being unable to secure a market for the small quantities of sunflower they produce and look for alternative disposal opportunities. Some sunflower is fed to chickens. Some is used on an experimental basis for preparing traditional sauces. Much ends up being eaten by rats before it can be sold.

6.2.5 Cotton Production

The dramatic decline in cotton production that resulted primarily from the collapse of the cooperative marketing structures was discussed in Chapter 4. Even so, BCGA (1993) estimates that about 250,000 farmers in Uganda grew cotton in the 1992/93 season "despite the hardships imposed by insolvent slow-paying co-operative-union-owned ginneries, artificially low seed cotton prices through the late 1970s and 1980s, civil war, political turmoil, loss of work oxen, poor supply of seed and inputs and high rates of inflation." In the light of these problems it is difficult to understand farmer's continued willingness to plant cotton. Cotton, however, is firmly established in the farming systems of northern, northeastern and western Uganda. Cotton is a drought resistant crop and many farmers rely on it to earn cash for major expenditure requirements. In addition, cotton plays an important role in the crop rotation patterns. It is generally planted as the first crop in the rotation because it can withstand the rougher seedbed of a newly opened field. Farmers like cotton because it leaves behind a fine seedbed and allows them to plant the following millet crop early with less labor and reduced weed competition. Yields of millet are said to be 20% to 50% higher after cotton than following fallow. In part, this is attributed to cotton's ability to draw nutrients from low in the soil profile. The BCGA report, therefore, found that the returns to labor from cotton followed by millet were considerably higher than from

[141] Some millers report throwing away tons of seed that had gone moldy during extended downtimes due to electricity outages and lack of spare parts. Others have held sunflower seed in storage for over a year, waiting for the arrival of imported equipment.

the cotton crop alone, and apparently exceeded the returns from a sesame/millet rotation even at low cotton prices.

In north-central Uganda, cotton production was traditionally planned and supervised by selected clan leaders and cultivated communally in large blocks. The average area cultivated per household has fallen dramatically due to the massive loss of work oxen during the period of political instability. A comparison between the average cotton area per producing household in the two Agricultural Census reports shows a reduction from .68 ha per household in 1963 to .26 ha in 1990/91. Increasingly, farmers are intercropping cotton, especially with cereals and cassava. The proportion of cotton planted in pure stands has fallen from 74% in 1964 to only 36% in 1990 (Ministry of Agriculture and Cooperatives, 1965 and MAAIF, 1992b).

There is considerable potential for yield increases through improved varieties and agronomic practices. The BCGA study (1993) contends that the recommended technological package can produce yields of 1,000 kg/ha in most seasons while simultaneously increasing the proportion of clean and undamaged seed cotton. Varietal development and improved seed multiplication is required to improve the staple length, ginning outturn[142], and price premium on Ugandan cotton exports[143].

Ugandan farmers have resisted recommendations for early planting and adequate insecticide application for decades now because of food crop competition for labor and shortages of capital to purchase inputs. While research results consistently show improved yields from early planting, most cotton in Uganda is planted during June through August, after the first season food crops. As a result, yields are low - ranging from 250 to 800 kg per ha depending on the time of planting and diligence in insect control[144]. Population pressures are leading to

---

[142] Uganda's ginning ratio is estimated at only 32.5%. This is very low. Most west African countries average 38% and Cote d'Ivoire reports record fiber yields of 44% (Kristjansen et.al. 1990).

[143] These are three of the primary objectives of the current IFAD funded Smallholder Cotton Rehabilitation Project (SCRP) and the proposed seven year follow-on Cotton Subsector Development Project (CSDP).

[144] This compares unfavorably to West Africa. The Cameroon has an average cotton yield of 1,300 kg/ha while Burkina Faso, Mali, and Cote d'Ivoire also have yields typically in excess of 1,000 kg/ha

shortened fallow periods. No one uses fertilizer on cotton and the reduced soil fertility contributes to the continued yield decline. Many farmers no longer spray their cotton. Those who do, generally use insufficient applications to provide effective pest control. The use of purchased inputs is likely to remain low until confidence in the seed cotton marketing process has been restored.

The key constraints to expanded cotton production relate to institutional problems in ginning, marketing management, and the resulting late payment to farmers[145]. If high quality seed were available and farmers could be assured of prompt payment, cotton production in Uganda probably would expand quite quickly. If the security of livestock in Northern Uganda could be ensured and restocking credit availed, expansion under ox-cultivation would be even more dramatic. Any future emphasis on ox-traction, however, needs to address the continued bottlenecks in sowing and weeding that traditional ox-cultivation failed to relieve (Carr, 1982)[146]. Under-utilization, high operating costs, and the high opportunity cost of foreign exchange make subsidized tractor cultivation inefficient (Crown Agents, 1984; Brett, 1992).

(Kristjanson et.al. 1990). Even though these countries cultivate cotton without irrigation, fertilizer and insecticide use are much higher and animal traction is very common.

[145] The success of cotton production in the Francophone West Africa was highlighted recently in the MADIA study (Lele et al., 1989). This study attributed the growth in yields, area and output to the existence of vertically integrated institutions which provided capital, inputs, animal traction technology, extension advice, and marketing services. The value and timeliness of input subsidies and producer payments is identified as a key factor in the differential performance in Francophone and Anglophone Africa.

[146] Socio-cultural customs, heavy soils and tsetse fly infestation are also impediments to expansion of oxen cultivation in some areas.

6.3 THE MICROECONOMICS OF OILSEEDS PRODUCTION

6.3.1 Price Responsiveness of Ugandan Farmers

There is considerable evidence that farmers in Uganda, like farmers elsewhere in Africa[147], respond to price incentives in their production decision making. Many econometric studies of the supply response of Ugandan farmers have unanimously found a positive but inelastic short-run supply response to either current price or lagged price, and a slightly larger long-run supply response. The results for crops of immediate interest to this study are summarized in Table 6.3.

While farmers respond readily to comparative price incentives, shifting easily between alternative annual crops, total aggregate production is seriously constrained by the basic limitations of low-input, hoe cultivation. More detailed microeconomic studies have shown that household food consumption needs, serious labor constraints, shortages of working capital and risk play major roles in farmer decision making in Uganda (Carr, 1982; Hall, 1971; Rukandema, 1976; Uchendu and Anthony, 1975). The information currently available is insufficient to make accurate predictions concerning farmer's production response to price changes from the ongoing market liberalization process. Increased production of oilseeds will require substantial improvement in the market availability of family food needs, continued control over inflation, access to credit and proven packages of improved (labor saving) production practices and inputs.

6.3.2 Comparative Returns to Agricultural Labor

In the past, the Agricultural Secretariat of the Bank of Uganda was charged with the responsibility of setting producer prices and processor margins for coffee, cotton, tea, tobacco and sugar. It also recommended farm-level prices for PMB. As part of the price-setting exercise, the Agricultural Secretariat has collected cost of production

[147] For reviews of the literature on supply response in Africa see Bond, 1983; Ahmed and Rustagi, 1985; Cleaver, 1985; and Ogbu and Obetibouo, 1990.

Table 6.3 Estimated Price Elasticities of Supply for Selected Crops in Uganda

Crop	Source	Time Period	Geographic Coverage	Short-run Price Elasticity	Long-run Price Elasticity
Soybeans	Nalwoga, 1992	1970-1989	National	.27	.29
Cotton	Katabarwa, 1993	1970-1991	National	.73	1.89
Cotton	Vanegas, 1990	1970-1988	National	.34	.53
Cotton	Alibaruho, 1974	1945-1966	Central Region	.50	.63
Cotton	Frederick 1969	1922-1938	National	.25	.25
Ground-nuts	Vanegas, 1990	1970-1988	National	.17	.40
Sesame	Nanteza, 1992	1970-1990	National	.34	.45
Maize	Mwanje, 1993	1970-1988	National	.50	.89
Maize	Katabarwa, 1993	1970-1990	National	.20	.43
Maize	Sidhu, 1984	NA	National	.39	.60
Maize	Vanegas, 1990	1970-1988	National	.22	.41

data bi-annually since 1984. National average crop budgets were prepared, based on farm interviews and market surveys in various regions around the country. With the move to liberalization, the Agricultural Secretariat no longer has price-setting responsibilities. These crop budgets are now primarily used for purposes of monitoring national cost of production trends.

The Agricultural Secretariat regularly reports the returns to family labor for each of the various crops. The variable costs of production, including hired labor valued at the rural wage rate, are deducted from the value of the output. The resulting net margin is then divided by the number of days of family supplied labor. The results for second season 1992 are presented in Table 6.4.

Groundnuts and soybeans were the most profitable oilseeds to produce in 1992. Both provided returns to family labor well above the

Table 6.4 The Returns to Family Labor on Competing Food Crops

(November 1992 - USING HANDHOE)								
Crop	Yield Kg/Ha	Producer Price Shs/Kg	Value of Output 000 Sh/Ha	Variable Cost 000 Sh/Ha	Net Margin 000 Sh/Ha	Family Labor days/Ha	Return per Person-day Shs/Md	RANK
Cotton	645	340	219	103	116	168	693	5
Maize	1625	120	195	136	59	97	607	6
Ground-nuts	700	550	385	163	222	195	1,140	1
Soybeans	800	250	200	62	138	121	1,138	2
Sesame	375	400	150	38	112	128	874	3
Sunflower	650	160	104	27	77	105	730	4

Source: Adapted from Agricultural Secretariat, November, 1992.

market casual labor rate of USh 700/= per day ($.56)[148]. Returns to sesame and sunflower were reasonable as well. The returns to cotton, however, were below the rural market wage rate despite the subsidy encompassed in the 1992 seedcotton price. Returns for maize were even lower during the 1992 season.

The Agricultural Secretariat then calculates the average return to family labor for all crops. The average across all crops came out 9% higher than the rural market wage rate[149]. This average return to family labor is used as the opportunity cost of labor in preparing the detailed cost of production budgets and the returns to land. Oilseed cost of production budgets for second season 1992, are presented in Table 6.4 and Table 6.5. The level of input use and labor requirements for each crop, are based on survey data compiled by the Agricultural Secretariat.

---

[148] This daily wage is considerably below the returns to cotton production reported by the MADIA study (1989) in the Cameroon ($2.85), Senegal ($1.85), Tanzania ($.91) and Zimbabwe ($1.00), but is higher than those reported for Kenya ($.38).

[149] The rural market wage rate was 700 USh/day during second season 1992 while the average returns to family labor across all crops (unweighted average) came to 765 USh/day.

Table 6.5 The Cost of Production of Cotton, Maize and Groundnuts

Cost Component	COTTON			MAIZE			GROUNDNUTS		
	Physical		Finan-cial	Physical		Finan-cial	Physical		Finan-cial
	Family	Hired	SHS	Family	Hired	SHS	Family	Hired	SHS
Inputs									
Seeds (kgs)		40			30	36,000		100	70,000
Chemicals (Ltrs)		2	26,000		2	20,000		2	30,000
Depreciation			10,220			19,300			6,130
Marketing			3,125			9,000			4,000
Sprayer hire			15,000						
Sub-Total			54,345			84,300			110,130
Labor (in Persondays)									
Land clearing	10		7,650	10		7,650			0
Plowing	40	20	44,600	20	40	43,300	40	20	44,600
Planting	8		6,120	5		3,825	20		15,300
Spraying		6	4,200		4	2,800		5	3,500
Weeding	60	20	59,900	20	20	29,300	60	30	66,900
Harvest	30	10	29,950	12	10	16,180	50	20	52,250
Post Harvest	20		15,300	30		22,950	25		19,125
Sub-Total	168	56	167,720	97	74	126,005	195	75	201,675
Total	222,065			210,305			311,805		
Contingencies 5%	11,103			10,515			15,590		
Total Cost/Ha	233,168			220,820			327,395		
Yield (Kgs/ha)	645			1,625			700		
Cost per Kg	362			136			468		
Price (Shs/Kg)	340			120			550		

Source: Adapted from Agricultural Secretariat, November 1992.

Table 6.6 The Cost of Production of Soybeans, Sesame and Sunflower

Cost Component	SOYBEAN			SESAME			SUNFLOWER		
	Physical		Finan-cial	Physical		Finan-cial	Physical		Finan-cial
	Family	Hired	SHS	Family	Hired	SHS	Family	Hired	SHS
Inputs									
Seeds (kgs)		40	16,000		10	5,000		2	800
Chemicals (Ltrs)									
Depreciation			6,800			6,585			6,130
Marketing			4,500			2,000			3,900
Sprayer hire									
Sub-Total			27,300			13,585			10,830
Labor (in Persondays)									
Land clearing						0			0
Plowing	40	20	44,600	40	20	44,600	40	20	44,600
Planting	6		4,590	3		2,295	5		3,825
Spraying						0			0
Weeding	35	15	37,275	35	15	37,275	20		15,300
Harvest	30	15	33,450	40		30,600	10		7,650
Post Harvest	10		7,650	10		7,650	30		22,950
Sub-Total	121	50	127,565	128	35	122,420	105	20	94,325
Total		154,865			136,005			105,155	
Contingencies 5%		7,743			6,800			5,258	
Total Cost Per Ha		162,608			142,805			110,413	
Yield (Kgs/ha)		800			375			650	
Cost per Kg		203			381			170	
Price (Shs/Kg)		250			400			160	

Source: Adapted from Agricultural Secretariat, November, 1992.

These results are somewhat biased by the inclusion of land clearing expenses only in the Agricultural Secretariat's cost of production budgets for cotton and maize. While it is true that cotton and maize are the two crops usually planted first in the rotation, it is inappropriate to apply the full cost of land clearing to one crop when the usual rotation lasts for 5-6 seasons of production. Table 6.7 shows the adjusted returns per person-day when the cost of land clearance is spread evenly over all crops in the rotation[150]. While spreading the cost of family labor employed in opening land does raise the returns to cotton above the rural wage rate, maize continues to be less profitable than the alternative of wage labor. Returns to all other crops are reduced by the additional labor requirement.

Table 6.7 Adjusted Returns To Family Labor For Food Crops

CROP	VARIABLE COST '000 Sh/Ha	NET MARGIN '000 Sh/Ha	FAMILY LABOR days/Ha	RETURN PER DAY Shs/ha	RANK
Cotton	103	116	160	728	4
Maize	136	59	89	662	6
Groundnuts	163	222	197	1,129	1
Soybeans	62	138	123	1,120	2
Sesame	38	112	130	861	3
Sunflower	27	77	107	720	5
Source: Adapted from Agricultural Secretariat, November, 1992.					

The cost of production analysis presented above also masks the considerable variation in returns to labor that results from differing levels of technology and management. These distinctions are probably most pronounced for cotton, which has three alternative levels of management. In western Uganda, large-scale mechanized cotton production is practiced. These mechanized farmers generally plant earlier and apply larger doses of insecticide. As a result, seedcotton yields

[150] This calculation assumes that the additional family labor required to clear a hectare of land is spread equally over five seasons of production, adding two additional days to each crops labor demand.

improve by nearly 40% over those reported for hand hoe cultivation. Given the high cost of tractor hire, however, the returns to labor under mechanization increase only marginally (Agricultural Secretariat, 1992)[151].

BCGA (1993) also contends that combining the analysis for the cotton/millet rotation results in a substantial increase in the returns to labor for cotton. Unfortunately, no data are available concerning the actual yield increment that results from planting cotton as a lead-in for the millet crop[152].

The return to labor from production of alternative crops changes over time depending on market conditions and prices for both inputs and outputs. For example, Uganda suffered a drought that began during second season 1991 and extended through most of 1992. While Uganda was less severely affected than many countries in Eastern and Southern Africa, commodity prices did rise to unprecedented heights during first season 1992 in response to both domestic and international shortages. Groundnut, soybean and maize prices were most affected by the drought. In contrast, cotton, sesame and sunflower prices are more closely tied to market conditions outside the region and did not rise substantially.

Cost of production budgets were prepared using constant labor and input use coefficients from 1990, which was considered a "normal year." Average first season prices for inputs for each year were obtained from the Agricultural Secretariat. Output prices were collected from both the Agricultural Secretariat and the MTI Market News Service. Returns to labor were calculated and then adjusted to real terms using a spliced CPI with 1989 as the base year.

---

[151] This conclusion differs substantially from that of the BCGA (1993), however, which assumed substantially lower yields for hand-hoe and oxen cultivation than did the Agricultural Secretariat.

[152] In the BCGA report the returns to a cotton/millet rotation were compared with a sesame/millet rotation assuming both a 50% and 20% yield increment on millet following cotton. With a 20% yield improvement, the returns to labor for the two rotations were similar. With a 50% increment in millet yields, however, the cotton/millet rotation resulted in a 12% increase in the returns to labor compared to those for sesame/millet.

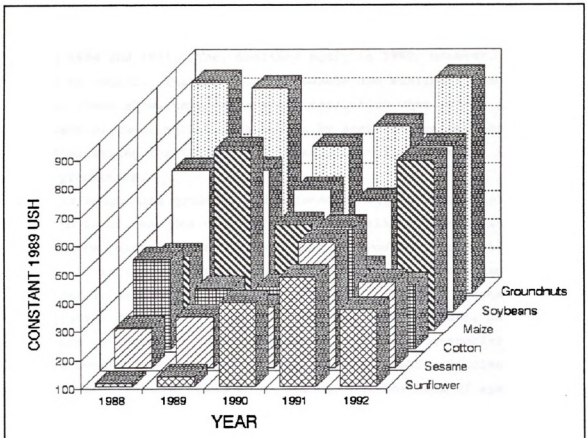


Figure 6.5 Real Returns Per Day of Labor on Alternative Crops

Clearly groundnuts and soybeans have consistently been the most lucrative crops to produce. Even for these crops, however, returns to agricultural labor fell in 1990 and 1991 and only recovered due to the drought induced price rise of 1992. Returns to maize are the most variable among the included crops. Maize ranked fourth in 1988, second in 1989, third in 1990, seventh in 1991 and second in 1992. During the market glut in 1991 many farmers could hardly give their maize away. These returns to labor mask great differences between farmers because they reflect average yields and prices. In 1992 many farmers lost their entire maize crop. But those farmers who managed to get a reasonable crop benefitted from the high price brought on by drought induced shortages.

Returns to sunflower and cotton, the two crops upon which the edible oils industry has been the most dependent, tend to be lower than the other crops. The low level of returns to sunflower and cotton helps

to explain the consistent shortages of raw material for crushing. Returns to sunflower and sesame, however, did improve considerably between 1988 and 1991. They declined again in 1992, however, as did returns to cotton. The expansion in sesame and sunflower production in the late 1980s shows that farmers are responsive when prices improve. The extent of rural market penetration by sesame exporters and resulting ease of marketing for farmers undoubtedly contributed to the increase in sesame production.

If crops like groundnuts consistently appear to earn a higher return to labor, why don't more farmers specialize in producing them? Clearly more research on the constraints to groundnut production is needed. It is important to remember, however, that Ugandan smallholders are primarily subsistence producers. As pointed out in Chapter Four, the evolution of Ugandan institutions placed heavy emphasis on the importance of household self-sufficiency in food. Non-specialization has developed as a major form of risk control. Self-sufficiency keeps marketing transactions costs to a minimum, but the lack of specialization means that the costs of production per unit are higher.

The shift to a reliance on markets is complicated by the thinness of most Ugandan markets. Strong social norms have developed reinforcing the ideal of household self-sufficiency and portraying the farmer who dares to sell the totality of his produce as foolish and short-sighted. Regulations to restrict the movement of commodities between districts and prohibit the sale of food during times of shortage are accepted government interventions[153]. The primary control of cash crop revenues in male hands further reinforces women's preferences for food production to assure family welfare. As a result, even today there is virtually no mass market base in Uganda for either food or consumer items. Nsereko (1979, p.4-5) described the vicious cycle that this perpetuates and his description still holds true:

> Since farmers have no market for food crops, they concentrate on meeting food requirements by raising them on their farms. This limits the acreage of salable commodities and brings inefficiency within the production function through dualism and thus keeps low the income of

[153] As recently as early 1993, when food prices reached their drought induced high, the Ugandan government banned the export of maize.

farm people. Since income is low, farmers cannot purchase the package of inputs which boost production (fertilizers, machinery, land, pesticides etc.) and the constellation goes on.

Although the collapse of traditional cash crop markets during the 1980s did force more farmers to rely on food crop surpluses to meet their basic cash requirements, this has not significantly lessened the primary focus on production for household food subsistence. The importance of meeting subsistence food needs and reducing the risks of crop failure helps to explains the high degree of intercropping reported earlier, as well as the lack of specialization in such higher paying crops as groundnuts. Most Ugandan farmers remain trapped in a marginal subsistence economy; a low-level equilibrium where the ability to generate increased wealth is blocked by constraints in both the input and output markets. These marketing constraints are the subject of the next chapter.

MICHIGAN STATE UNIV. LIBRARI
31293010200750

MICHIGAN STATE UNIVERSITY LIBRARIES
3 1293 01020 0768

THESIS
V.2

LIBRARY
Michigan State
University

PLACE IN RETURN BOX to remove this checkout from your record.
TO AVOID FINES return on or before date due.

DATE DUE	DATE DUE	DATE DUE

MSU Is An Affirmative Action/Equal Opportunity Institution

c:\circ\datedue.pm3-p.1

THE EDIBLE OIL SUBSECTOR IN UGANDA: CAN IT COMPETE?

By

Rita J. Laker-Ojok

VOLUME II

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1994

Erin W. Crawford

CHAPTER SEVEN: THE OILSEEDS MARKETING SYSTEM

7.1 THE MARKET SYSTEM LINKING PRODUCER TO PROCESSOR

The food crop marketing system in Uganda is highly fragmented. Parastatal bodies play a minor role in the market, which is dominated by large numbers of comparatively small-scale traders, wholesalers and retailers. The food processing sector is poorly developed and comprises mainly small oil and flour mills. Various consultants (Abt Associates, 1992; Sergeant and Macartney, 1993; Carl Bro, 1992; Ngategize; 1991) have concluded that the marketing and transport system in Uganda is efficient and effective[154]. If one considers the essential elements of a competitive market system (i.e., independent and decentralized decision makers, free entry and exit for competitors, and well-informed buyers and sellers), certainly at least the first two characterize the system in Uganda. The Ugandan market is characterized by many independent buyers and sellers and there are very few barriers to entry or exit. The rapid response to opportunities for sesame export is an indication of the responsiveness of traders to market incentives.

The fact that the market is competitive, however, does not necessarily imply that it is meeting national performance objectives that will promote economic development. While there is no evidence of monopoly profits or price collusion in the Ugandan market, constraints in the infrastructure and information system make marketing services costly. The fragmentation of the market results in considerable diseconomies of scale and high transaction costs. These costs penalize both farmers and consumers and reduce the competitiveness of Uganda's products on the international market.

---

[154] The Agricultural Secretariat (1991b) concluded that monopsony marketing arrangements at the primary buying level for sesame had resulted in farmers receiving less than the full benefit of world prices. A number of mitigating factors should be noted, however. In 1990, when this observation was made, the PMB monopoly had only been broken for two years. Private trading was just beginning to develop. More importantly, extreme political insecurity in many regions inflated the transaction costs and risk of trading, necessarily increasing traders' margins.

The emphasis of the following description of the marketing structures in Uganda is on identifying barriers to improved performance and under-exploited economic opportunities that might increase the productivity of the subsector.

7.1.1 Market Structure

The marketing chain in Uganda includes farmers, primary traders, urban traders, exporters, wholesalers, and retailers. Most produce is handled by private traders on an irregular and ad hoc basis. The chain between farmer and urban consumer often entails four to six middlemen, most of whom operate as small-scale independent entrepreneurs.

Traditionally, produce sales intended to generate larger sums of cash for school fees, poll taxes or larger purchases, are usually handled by the male head of household. The bulk of the food products are traded in small quantities by women. Because the time available to women to attend to marketing is severely constrained by other commitments, produce is sometimes sold to a rural trader even when the producer lives close to the rural market. Contact between buyer and seller may be initiated by either party, usually based on verbal information. Usually the transaction takes place at the farmgate or rural market. Most farmers transport their crops by headload or bicycle to the nearest market or primary trader's store, with the buyer responsible for onward transport[155]. It is only the wealthier farmers, with ready access to cash or transport, who sell their crop in the more lucrative town markets. Only they can achieve the economies of scale necessary to outweigh the transport expenses, transaction costs and risk involved in such an endeavor.

Ugandan farmers face high levels of risk and uncertainty, poor access to information and credit, lack of capital to purchase inputs, high input costs, poor access to improved varieties, and lack of information from the extension system. On-farm storage facilities are

---

[155] Ogodola and Kaliisa (1989) found that 76% of farmers sold their produce at the rural market. Only 22% reported selling in the town market and 3% sold to PMB. The authors do not seem to have asked about farmgate sales.

rudimentary at best. Post harvest losses are very high and are estimated to range from 20-40%[156]. Weevils start to infest grain soon after harvest, but no fumigation is practiced until the commodities reach the exporter's stores in Kampala. With such storage constraints, farmers are obliged to sell their crops soon after harvest. This lack of flexibility means that farmers often receive a low price for their produce. In a survey of 306 farmers, Ogodola and Kaliisa (1989) found that 60% of the farms sell the crops within a period of two months after harvest. Only 22% store their crops and sell just before the next season when prices reach their peak. Marketed surpluses, however, tend to be small and the primary objective of most production is still to meet household consumption needs.

7.1.1.1 Infrastructure

The produce markets, rural and urban, are primarily retail markets. Rural markets are owned and controlled by the District Administration under supervision of the District Executive Secretary. The District Administration sets aside an official market location with minimal infrastructure. Often the market is merely an open patch of ground with a demarcated entrance. The District Administration appoints a market attendant, who is a district employee. The market attendant's primary function is to collect market dues from sellers. These dues go into district coffers.

Most rural markets are held on a weekly or biweekly basis. Daily markets are usually only found near a larger town. There are also larger monthly markets called "auctions." While the auctions may once have been connected with livestock sales, they no longer are. The monthly auction is merely an expanded market. The principal difference is in the volume of trade, especially in consumer goods. Hawkers in

---

[156] Sergeant and Macartney summarize a number of estimates of post harvest losses for grains in Uganda but fail to provide full citations for their references. Estimates cited include: 20% (DANIDA), 25-30% (Japanese Consultants), 30-40% (Identification report of the "Produce Marketing Board Storage Project"). Other sources, however, suggest that these figures seem unreasonably high compared to data from other developing countries.

large numbers ply the auction circuit with their displays of basic household necessities. The providers of food and beverages grow increasingly busy toward evening as the social aspects of market day supersede the business transactions.

The hawkers make selling a regular occupation and are primarily male. In the rural markets the produce sellers are usually farm women selling the family produce. Produce is brought for sale on a cash-need basis. When it is time to replenish the family's supply of clothing or necessities, the woman is authorized to take a small portion of the stored harvest to market to generate the necessary cash. Produce is sold retail in small non-standardized units including heaps, calabashes of various sizes, cups, mugs and empty tins. Outside the urban markets, sale by the kilogram is rare except for meat, sugar and sometimes salt. On any given day the buyer finds a fairly fixed price for each commodity. Price bargaining is limited except toward the end of the day when an individual seller may be anxious to avoid having to headload produce home again. Grading of produce is rudimentary. Grains are sold as this season's or last season's crop. Groundnuts are sold shelled or unshelled. Bananas are roughly graded by size of bunch. Heaps of produce usually contain a distribution of sizes and degrees of ripeness. While prices on any one day are fixed, they may be quite volatile. Besides seasonal trends, there are day-to-day fluctuations in response to short-term variations in supply and demand in such a thin market.

Individual markets continue to be isolated from each other, and there are considerable inter-market differences in prices that may not accurately reflect the cost of transportation between markets[157]. This can be attributed to:

1. the opacity of prices due to non-standardized units;
2. the lack of ready communication and information sources;
3. the extreme difficulty in travel, especially during the rainy season.

---

[157] This statement is based on personal observations over the course of the author's work and travels in Uganda. While anecdotal evidence could be cited, no price data is available for rural markets, which could be subjected to statistical analysis to test this hypothesis.

Telephone service is limited to only the larger towns and is highly unreliable. There are no local newspapers or radio stations. News travels primarily by word-of-mouth or via national radio broadcasts from Kampala. In addition, arbitrage between markets is limited by the irregularity and small volume of produce. Only in the largest markets, fed by good transportation networks, do larger traders operate on a regular basis. When wholesale traders attend a rural market they often set themselves up at the fringe of the market, offering sellers the chance to sell their entire stock. The buyers are not charged market dues. Sellers must pay, even if they sell everything in a single transaction. Rural traders usually transport the produce to the trading center or urban market by headload or public means.

It is very difficult to estimate the volume of food crops that are marketed. The Ministry of Trade and Industry (MTI), through its regional Marketing Officers, licenses traders and issues produce movement permits. Currently, these licensing procedures are simple and pose no significant constraint to entry into the market. No record of total trade volumes is kept. Much of the trading is in such small volumes as to escape official scrutiny.

7.1.1.2 Rural Traders

The growing demand for produce for export has encouraged greater rural market penetration in recent years. In remote areas village traders are in a strong bargaining position. Farmers have limited knowledge about prices and sell such small quantities that it would be uneconomical to travel far for a minimal increment in price. As one moves closer to the larger regional towns, however, many primary traders compete for the farmers' trade. In these areas, farmers are very price conscious and are rapidly gaining greater market experience.

The rural traders usually have limited capital. Transactions are almost entirely on a cash basis. Most primary traders buy very small quantities at a time (often less than 100 kg) and transport the produce by bicycle, or public transportation on a pickup or tractor.

Primary traders normally rent storage space capable of holding 30-300 tons (Abt Associates, 1992). Stores are usually of poor quality,

with inadequate ventilation and security from pest invasion. The limited storage capacity and constraints on access to working capital make rapid turnover important to traders at this level. Sergeant and Macartney estimate that the average primary trader handles 200 to 2,000 mt/annum. At best, the primary traders carry out minimal drying and sieving to remove foreign matter. Most post-harvest grading, handling, cleaning and fumigation, however, is handled at the exporter or urban retailer-level. There is a virtual absence of grading standards. Quality distinctions are subjective and inconsistent; providing inadequate incentives to farmers and rural traders to differentiate low and high-quality products.

7.1.1.3 Urban Traders

Urban traders buy the produce from the primary traders' stores and transport it to the major towns. Most of these urban traders rent storage space in shops formerly owned by the departed Asians[158]. Few traders have constructed proper storage facilities and the future availability of produce storage is in question with the move to return the Asian properties. Some urban traders provide onward transport directly to the exporters' stores in Kampala. Most traders hire 10-30 ton trucks for shipping the produce (Abt Associates, 1992). Rail shipment is limited to areas directly on the rail line and service has been greatly constrained by damages incurred during the political instability of the late 1980s.

Urban traders have greater access to cash. Some extend cash advances to rural traders for crop purchase for short periods, but such activities are generally informal and highly risky. This form of vertical integration has been popular in the sesame trade, largely because it was initially dominated by foreigners without linkages to the rural areas (Ngategize, 1991).

---

[158] Storage space generally ranges from 100-300 mt (Abt Associates, 1992).

7.1.1.4 Exporters

While there are fewer participants at the export stage[159], there are still more than 100 licensed exporters. Most of these are located in Kampala, although some also rent stores and have representatives in rural towns. About half the exporters interviewed by Abt Associates (1992) owned storage space and cleaning facilities usually in the order of 1,000 to 3,000 mt. Cleaning procedures are rudimentary, consisting primarily of manual screening by up to 500 workers per day. Only the largest exporters own dryers and blowers.

Transactions are driven by the market. When an exporter secures an export market, he lets the urban traders know his requirements and price[160]. The urban traders then buy from the primary traders. At all levels, the storage capacity is low and there is very little speculative purchasing. The high nominal interest rates and unpredictability of inflation further reduce the incentives to invest in stocks.

There is a Uganda Grain Exporters Association with 23 members. This association tries to encourage only members who have stocks to bid on the relief tenders. This policy is advocated to avoid the problems that arose in 1992, when many exporters locked themselves into a price before purchasing the commodities and then lost money due to the steep rise in prices during the drought. Many exporters failed to fulfill their tenders. As a result, relief agencies now require companies to have SGS[161] approval and give performance bonds before tenders are accepted. Tenders range from 500 to 5,000 tons. Holding sufficient stock to meet such a tender requires considerable advance working capital.

The biggest problem facing the exporters is the inability to access working capital. Peak capital demand levels are very high,

---

[159] The most recent WFP tender for maize had 37 competing bidders.

[160] Almost all of the exporters are male. Female participation tends to be greatest at the urban trader level, but is still limited.

[161] SGS is the Swiss agency responsible for quality inspection and certification of imports and exports in Uganda.

especially in the sesame trade, since sesame production is highly seasonal. The peak availability period for sesame lasts only two months and turn-around time for funds varies from 2-4 months if the sesame is sold FOB Mombasa (Odwongo, 1991). It requires about 100 to 200 mt of sesame to justify entering the export trade. This implies the need for a minimum of $600,000 to $120,000 in crop finance. Similarly, when purchasing for the relief agencies the exporter generally has 21 days to deliver the grain, once a contract is signed. To obtain credit through the export credit guarantee scheme of the Bank of Uganda, however, takes as long as 6 months (Sergeant and Macartney, 1993).

7.1.1.5 The Parastatals

There are three parastatal organizations in Uganda that participate in the trade in grains and oilseeds. These are the Produce Marketing Board (PMB), Foods and Beverages (F&B) and Uganda Grain Millers Corporation (UGMC). All three are undergoing major reorganization following the shift to market liberalization in recent years. In 1991 the Cabinet adopted a strategy for reform of the 111 existing public enterprises. The government plans to sell private shares in all three of the produce trading parastatals but will retain a majority shareholding. Government may be willing to accept a minority share if a serious private investor should request it (Carl Bro, 1992).

The PMB was created in 1968 and granted exclusive trading rights in controlled commodities by the 1970 Produce Marketing Board Parliamentary Act. Controlled commodities included maize, beans, groundnuts, sesame, sunflower, green grams, wheat, rice, sorghum, millet and peas. According to the 1970 act, PMB was endowed with commercial, regulatory and developmental responsibilities including licensing of buyers, processors and exporters, enforcement of quality standards, price stabilization, market information, establishment of a famine reserve, and supply of foods for institutional use and government export.

With the fall of the Obote government in 1971, the PMB never attained the budget or the monopoly status of the Coffee and Lint Marketing Boards. In 1978 its legal monopoly position was revoked

except for trade in maize. By the late 1970s, smuggling of food stuffs was rampant and trade was reportedly dominated by military officers and large-scale Muslim buyers who established rural warehouses for buying and assembly. PMB was squeezed out of the market by the price competition (Laker-Ojok, 1986). Beginning in 1982, however, the PMB gained a higher profile because of its position with respect to implementation of the government barter trade agreements. PMB's monopoly powers with respect to the export of beans were reinstated in 1982 and control over groundnuts, sesame and soybeans was granted in 1986. Several barter trade protocols were signed under the NRM government after 1986, including import of consumer goods, pharmaceuticals, vehicles, tractors, building materials, hotel rehabilitation, and petroleum products. Often neither the Ministry nor PMB was involved in the actual negotiations, although they were responsible for implementation. Nor did PMB have control over sale of the bartered imports. As a result, PMB was usually reimbursed for the cost of its procurement only after considerable delay. Carl Bro (1992) concluded that PMB's barter trade activities were generally unprofitable when actual costs of implementation are considered. The net foreign exchange earnings of some of the barter protocols may have been negative, given the high foreign exchange component in transportation costs[162].

PMB faced several other difficulties. Besides low salaries, poor morale and damaged facilities, the shortage of operating capital and limited decision making authority of its regional managers made it difficult for PMB to react quickly to market situations[163]. Lack of flexibility in the buying operations undermined its ability to compete effectively in the rural market. Prices were fixed from Kampala and no quality premiums were offered. As a result, PMB became a buyer of last resort for low or indifferent quality produce. During periods of high

---

[162] The Carl Bro study included an in-depth analysis of the financial operations of PMB. The authors report that it was impossible to quantify the total financial impact of these barter trade deals on PMB and the country at large because of poor cost accounting in PMB. Their analysis convinced them, however, that the barter trade arrangements were largely unprofitable.

[163] Most of the information presented in the discussion of the parastatals is taken from Carl Bro (1992) and Abt Associates, 1992.



domestic demand, PMB was unable to buy sufficient quantities to meet its export commitments. Uganda was forced into the highly inefficient reliance on coffee to meet barter trade agreements. PMB itself had limited autonomy, and the government frequently interfered directly in its operational decisions (Carl Bro, 1992).

Until 1989, most PMB sales were made to domestic public institutions such as the military. In March of 1989, PMB also lost its monopoly on internal marketing of food crops (Ngategize, 1991). Since then, domestic sales have plummeted and PMB now relies on the export market to relief organizations for most of its business. Massive investments in infrastructure at a time of rapidly falling market share have resulted in an extreme shortage of working capital and major financial losses since 1991 (Carl Bro, 1992).

Reorganization to transform individual PMB buying centers and the export unit into self-accounting profit centers is underway, in a bid to improve the company's ability to compete commercially. Commercial activities also may include rental of PMB's under-utilized storage and processing facilities to the private sector. The practicalities of trying to restructure PMB are formidable, however.

Parastatal reform usually involves deciding which residual regulatory, promotional, research, extension functions should continue, once the commercial trading functions have been transferred to the private sector. In this case, however, PMB is not providing any such services. The responsibility for licensing was transferred to the MTI long ago. PMB has never had staff or facilities for quality control of exports. PMB's market share is too insignificant to influence prices. MTI has disseminated market information only since 1991. No food reserve initiatives have ever been undertaken.

Abt Associates (1992) noted the critical importance of these regulatory, promotional, and information services in breaking Uganda out of its current low-level equilibrium. The institutional support structure is currently very weak. There is a danger that farm-level supply problems will continue to constrain the ability of traders to establish regular contracts. This lack of assured market outlets for surplus would then continue to inhibit adoption of improved technology and the maximization of production.



The primary advantage held by the parastatals is their differential access to storage and cleaning facilities. It is estimated that PMB's 65,000 MT of storage space, 230 mt/hr cleaning capacity, and 25 mt/hr drying capacity constitute 90% of the facilities in the country (Carl Bro, 1992; Abt Associates, 1992). Some consultants are concerned that the demise of PMB will replace a current public monopoly on storage and facilities with a private one. The return of Asian properties and high levels of export competition would tend to mitigate this possibility, however.

The private sector has the competitive edge, largely because of its lower administrative costs. Carl Bro (1992) estimated that PMB had a throughput of 34 mt per employee as opposed to 111 mt per employee for the largest private sector firm. In addition, PMB is engaged in only the grain trade, which is seasonal. Most of its competitors carry out a range of activities and can therefore maintain a better utilization of staff and facilities throughout the year. With such high fixed costs, the financial viability of PMB is dependent on adequate capacity utilization. Adequate crop finance and improved business skills to enable the parastatals to compete commercially are essential to the success of the restructuring.

Foods and Beverages (F&B) was established under the Ministry of Commerce, Cooperatives and Marketing (MCCM)[164] in 1974 to import essential commodities such as sugar, salt, cooking oil, and rice for sale at stable, reasonable prices. In recent years the government has dropped its attempts to control prices of essential commodities and has liberalized their trade. F&B lost its monopoly position and was forced to diversify its activities. In 1990, F&B began participating in the export trade in grains and oilseeds to generate foreign exchange to finance imports. By 1991, F&B surpassed PMB as a grain exporter. F&B exports almost exclusively on a FOT (free on transport) Kampala basis through the various relief agencies.

Uganda Grain Millers Corporation (UGMC) was established in 1955 as a private company but became a public corporation in 1969 after Obote's "Move to the Left." It produces most of the locally processed

---

[164] MCCM is now the Ministry of Trade and Industry (MTI).

wheat flour as well as 35% of the country's animal feeds, and 3% of the maize meal. Most UGMC facilities are employed directly in production. UGMC trading activities are primarily aimed at meeting its own raw material needs for processing. It does, however, engage in substantial barter trade of maize for wheat with the World Food Program (WFP). In recent years this had led to supplemental maize export trading with the relief agencies.

Both F&B and UGMC have healthy financial positions and are well-placed to move into commercial joint-venture activities in accordance with current privatization policy. Even given the recent entry of these two parastatals into the grain marketing and export business, the trade is now clearly dominated by the private sector. Carl Bro estimated that by 1992 private sector trade accounted for 96% of the grain purchases, and the majority of domestic and export grain sales. This is a dramatic reversal from the 100% export monopoly granted to PMB before 1988, even if the large extent of informal border trade during that period is acknowledged.

7.1.2 Marketing Constraints

The transaction costs and risks of trade are high in Uganda. Assembly is costly, both in terms of actual cash outlay and in terms of the opportunity cost of the time. Personal contact with farmers is necessary to ascertain availability, negotiate price and physically inspect the commodity. It is very difficult to find an agent who can be trusted with the quantities of cash and level of autonomy necessary to operate such an enterprise. Individuals with the business sense to run a buying station effectively would prefer to do business for themselves. Many have taken advantage of the political instability and lack of communication to abscond with sufficient quantities of employer funds to become independent. Lack of trust, even among family members, is endemic, usually for good reason.

Capital for trading is a significant constraint. All transactions are strictly cash, and the scale of operation is limited by cash-flow problems and the need to generate regular consumption income.

Most traders use personal savings or funds borrowed from family or friends.

In early 1991 the responsibility for the provision of crop finance was moved from the Bank of Uganda to the commercial banks. The commercial banks are in a critical financial position. They have few resources and are generally averse to the risks entailed in agricultural lending. Even where credit is available, interest rates have only recently fallen from the 40% range, which made the cost of borrowed capital prohibitive. Export credit facilities such as the Export Refinance Scheme and Export Credit Guarantee Scheme run by the Bank of Uganda have failed to provide the intended encouragement to the commercial banking sector because of the low interest margins offered the banks and the time required for approval and disbursement.

Transport is a major cost for traders. With the continued deterioration of feeder roads, vehicle maintenance and fuel constitute approximately 40% of the total marketing margins (Odwongo, 1991)[165]. Security problems at times create substantial additional risks. Road freight in Uganda is competitive, however, and there is no evidence of price fixing[166]. When the Agricultural Secretariat conducts its cost-of-production studies, it calculates transportation costs assuming efficient utilization of the appropriate sized truck, average distances

---

[165] This figure represents a rough average estimate. Since transportation costs per ton/km are independent of farm-gate and retail prices, this percentage obviously varies greatly between commodities and over time. It will be highest for low value-for-weight commodities such as sunflower and cotton. It will also be higher when prices are at their lowest just after harvest.

[166] None of the marketing studies reviewed found any evidence of price collusion between transporters. The Carl Bro study, however, reported that despite the highly large number of transporters and absence of any apparent shortage of vehicles, transportation costs appeared to be about 25% higher than the authors considered reasonable. They concluded that small operators might be following rates set by Uganda Cooperative Transport Union (UCTU), the large cooperative transportation company, especially for long distance hauls, despite UCTU's inefficiency and high cost structure. This may indicate that UCTU has considerable market power as a price leader and that the transport market is less competitive than some observers think. Details of the Carl Bro costings were not available, however, and they may have underestimated the transactions costs, downtime, and other hidden costs involved in operating a small business under Ugandan conditions.

involved, and a 25% profit margin for the operator[167]. The Secretariat reports that these rates compare very well with the existing vehicle hire charges (Odwongo, 1991).

Farmer/first handler exchange arrangements are generally inadequate and uncertain. Rural markets are thin and volatile. Organization structure is so highly personalized as to inhibit potential economies of size and scale. No effective institutions exist to organize farmers for purposes of input distribution, sharing of market information, and pooling of market and transportation costs. Vertical integration is minimal.

Abt Associates (1991) noted that traders lack information about the demand and prices in other regions, much less export prices and markets. Few of the rural traders interviewed had any idea of the ultimate export price.

When the weaknesses of the current market structure are discussed, it is important to note that the private exporters have had only five years since liberalization in which to establish their businesses, acquire experience in international marketing, grades and standards, and penetrate the rural market structures. The number of participating firms and quantities exported have risen rapidly. The success of the private traders is mainly explained by their flexibility in adjusting to changing market conditions, fast decision making, and instant cash payment to farmers. Stiff competition is likely to weed out the less competent and force increasing vertical integration to reduce costs and ensure international competitiveness as Uganda moves out of its reliance on relief agencies and barter trade and strives to establish a position as a reliable supplier on the regional and world market. A policy environment, which promotes increasing competitiveness is essential to improve efficiency and lower costs (Ashworth, 1991). Without investment in supporting infrastructure and institutions to promote improved market performance, however, there is a danger that Uganda will remain trapped in a low-level equilibrium that fails to

---

[167] Annual average investment and operating costs were calculated (excluding interest on borrowed funds) and divided by the average expected distance hauled per year. A 25% margin was added to these costs to cover profits and contingencies.

provide the incentives for necessary increases in productivity. Inadequate grades and standards, insufficient market information, costly transportation and communications, high levels of storage losses and unreliable contract enforcement are critical constraints.

7.1.3 Prices, Margins and Market Performance

Analysis of price trends and marketing margins is constrained by the lack of detailed time series data. The only price data available before 1991 is the national annual average rural market price, reported by the MAAIF[168]. This price series does not include sunflower. Sunflower prices were estimated by the author for comparison purposes, based on information provided by millers. Since January 1991, the MTI's Market News Service collected weekly farmgate and wholesale prices at several locations around the country. Beginning in 1992, retail prices were also collected[169]. Unfortunately, sunflower prices were not included.

Figure 7.1 illustrates the trend in oilseed prices since 1981. While prices clearly respond to changes in supply due to weather conditions, there is no evidence of any strong trend in real oilseed prices.

---

[168] These annual averages were apparently calculated based on monthly prices reported by the District Agricultural Officers. Efforts to analyze the original data showed serious gaps in the data for most districts.

[169] This price data is collected by the district marketing officer. Wholesale and farmgate prices are obtained by interviewing local produce traders. Retail prices are obtained from questioning sellers in the local town market. No actual purchases are made. The data series is less than complete for many of the markets. The figures reported here are based on average monthly prices from the four markets with the most complete data series for the 1991 through June 1993 period.

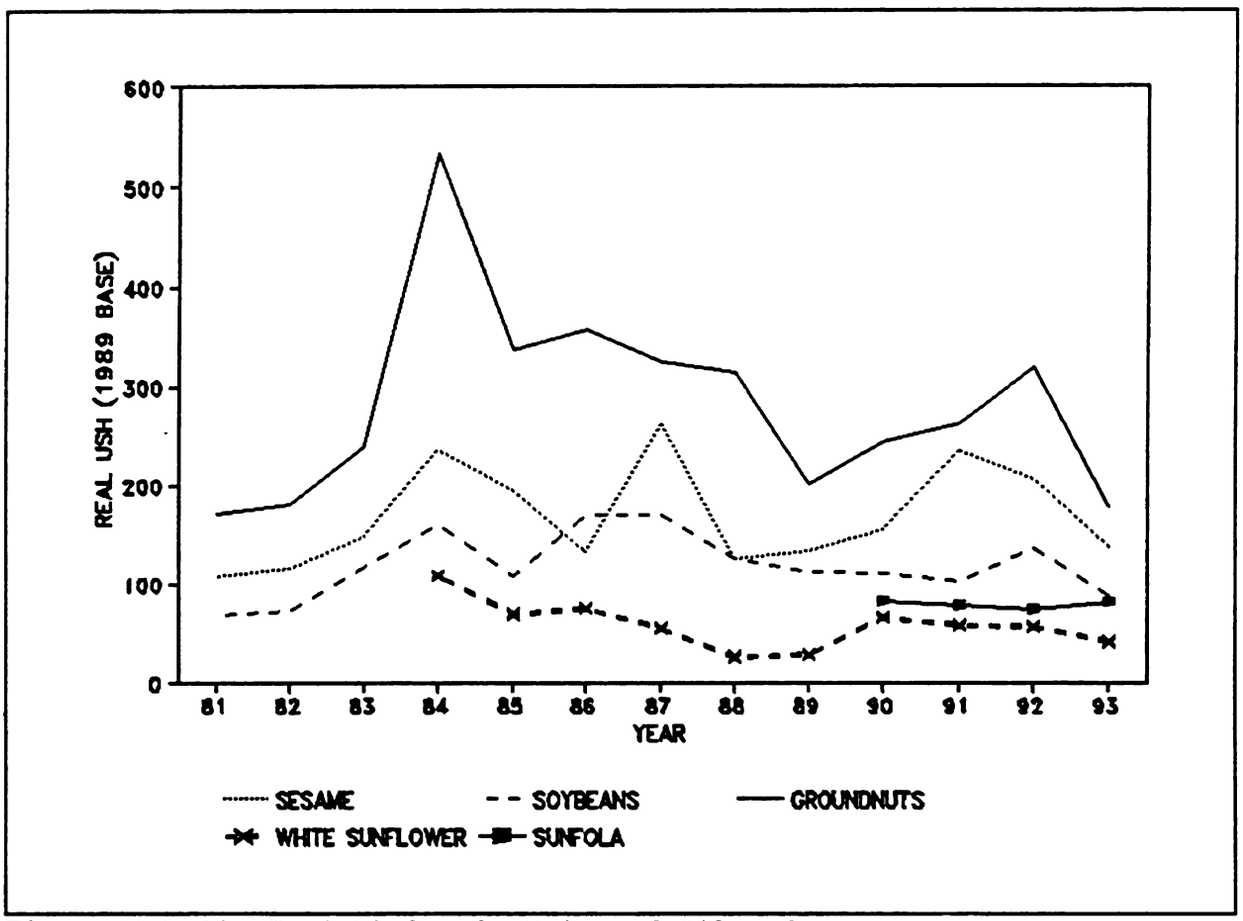


Figure 7.1 The Real Wholesale Price of Oilseeds

Figure 7.2 illustrates the comparison between the price of edible oil and the extractable oil content of alternative oilseeds.[170] If the desired end-product is oil, sunflower has been the least cost raw material for crushing. Soybeans, on the other hand, are a very high cost source of edible oil because of their low oil content, highlighting the importance of the demand for cake in determining the economic viability of crushing. Since 1992, the prices of sunflower, groundnuts and sesame have been converging. At present, the cost of the sesame to produce a given quantity of oil is roughly equal to that of sunflower.

---

[170] The graph is based on calculations using the following extraction rates: soy (12%), sesame (40%), groundnuts (40%), white sunflower (15%), and sunfola (25%). The price of oil is that collected by the Ministry of Finance and Economic Planning for purposes of calculation of the Cost of Living Index. This is the longest price series available. It is based on the retail price of a pepsi bottle of oil sold in the Kampala markets. This is unmarked, unbranded oil. Given that Uganda is over 80% dependent on imports for its edible oil consumption, it is most likely imported oil that is being decanted from 20 liter containers.

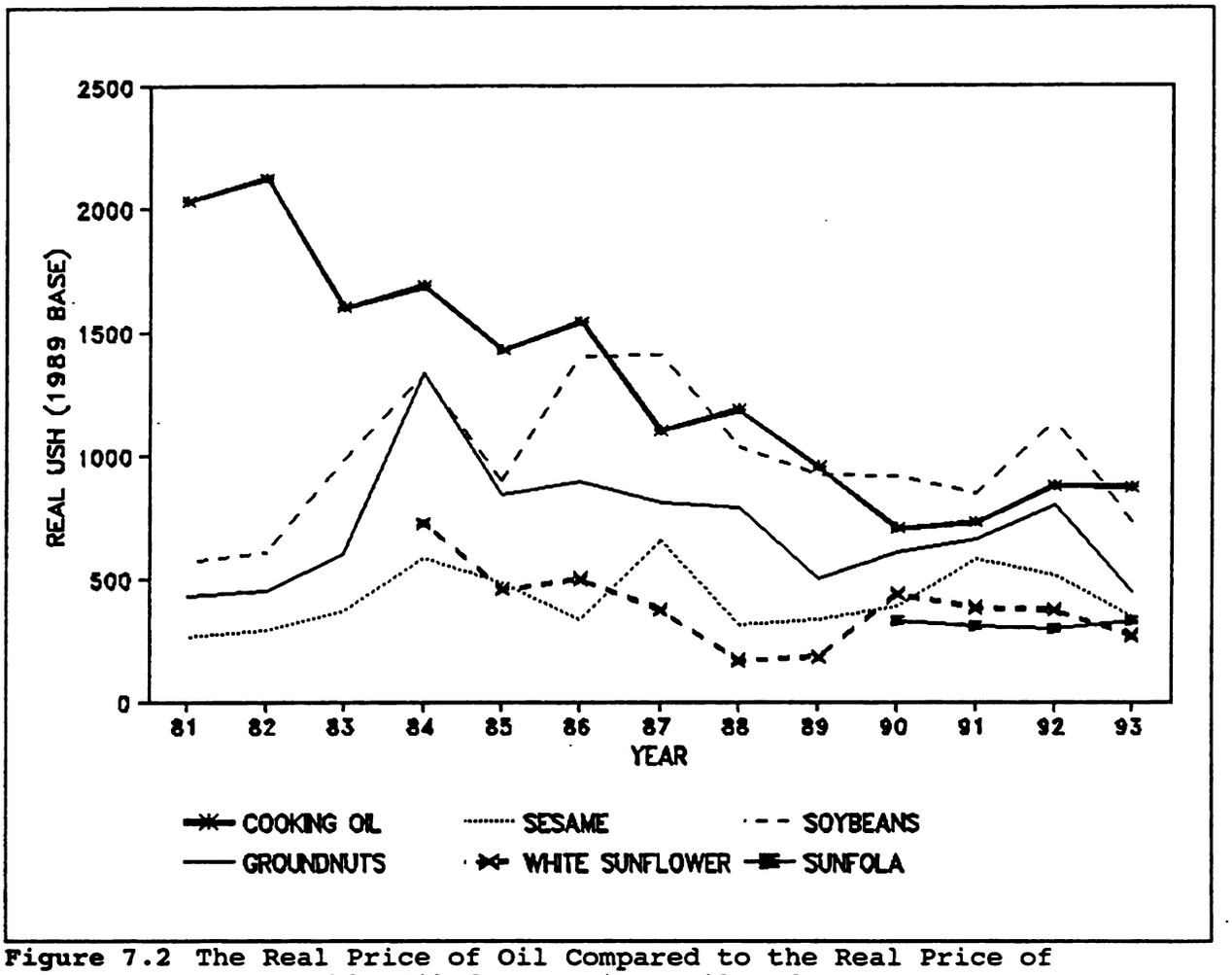


Figure 7.2 The Real Price of Oil Compared to the Real Price of Extractable Oil from Various Oilseeds

Groundnuts are slightly higher. The profitability of processing, however, would depend on the comparative cost of processing and the combined value of the resulting oil and meal. These issues are discussed in Chapter Nine.

The seasonal variability in oilseed prices is masked in price trends based on annual averages. Figure 7.3 shows the same comparison between edible oil prices and the price of various oilseeds on an extractable oil basis, this time using monthly price data from the MTI Market News Service. The monthly data exhibits considerable seasonal variability. Unfortunately the time series is too short to allow effective analysis of the predictability of seasonal price

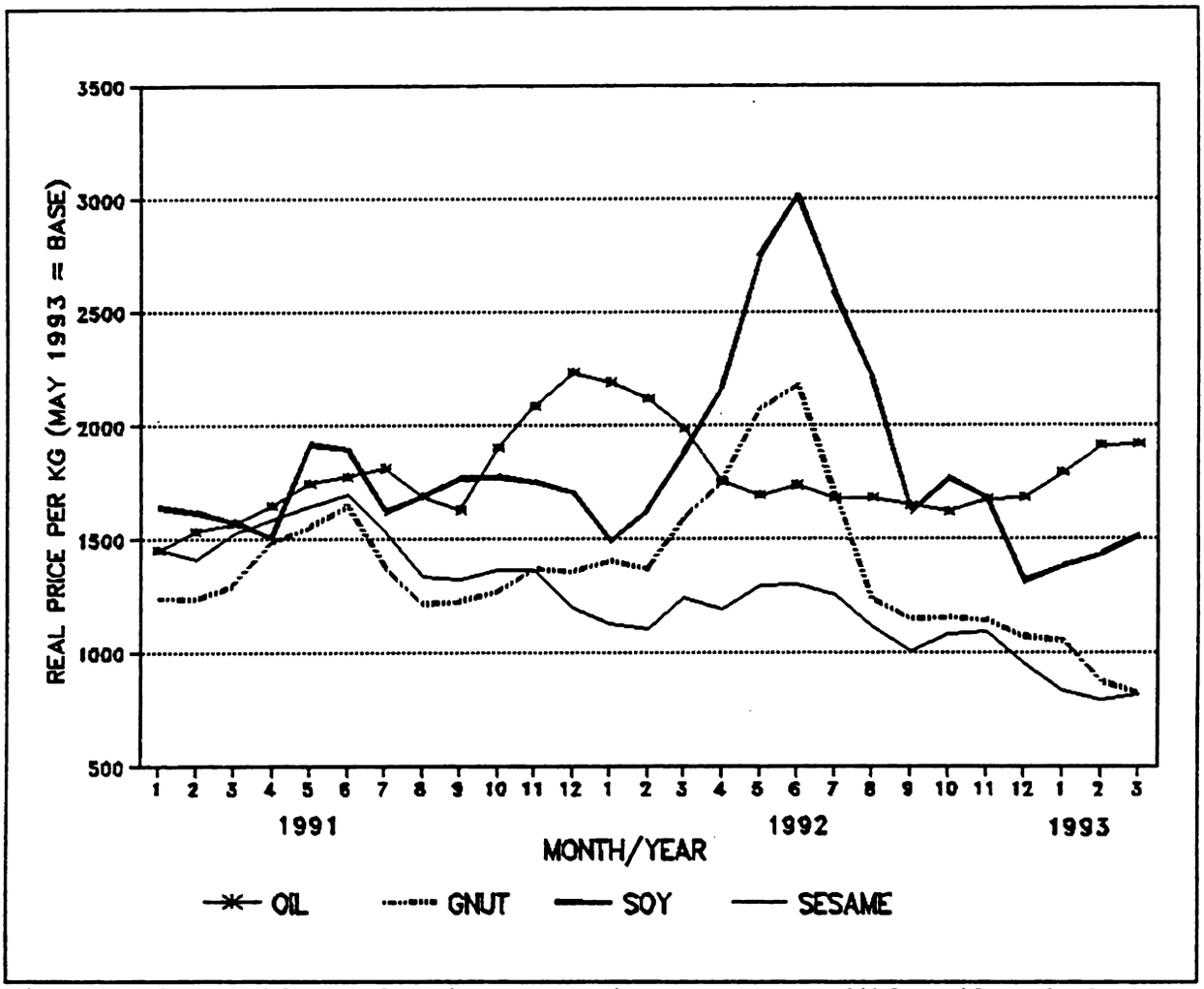


Figure 7.3 Monthly Real Price Comparison Between Edible Oil and the Extractable Oil Content of Various Oilseeds

patterns[171]. The returns to crushing groundnuts, sesame and soybeans are greatest, if the miller has adequate crop finance to purchase large quantities of the necessary raw materials immediately after harvest. It is uneconomic for a miller to purchase these oilseeds during the peak price periods just before the harvest. In mid-1991, the per-unit cost of soybeans and groundnuts even exceeded the value of the oil that could be produced by crushing.

---

[171] Calculation of a seasonal index entails comparison of this month's price with the annual average. A minimum of two years data is therefore needed to calculate a seasonal index for one year. With 30 months of data, it was possible to calculate such indices for the 18 months from June 1991 through December 1992. Given that this was a drought period, however, the seasonal patterns may well be distorted and are not reported here.



Marketing margins for the period of January 1992 through June 1993 are presented in Table 7.1. The wholesale margin is the average difference between the farmgate price and the wholesale market in three up-country towns, expressed as a percentage of the retail price in the same small urban market. The retail margin is the difference between the wholesale and retail prices, also expressed as a percent of the retail price. The annual average is calculated for the same three towns. The total margin is the average difference between the farmgate and retail market across these locations.

Table 7.1 Average Marketing Margins in Uganda

Location and Type of Margin		soybeans		groundnuts		sesame	
		1992	1993	1992	1993	1992	1993
KAMPALA	Retail Margin	15%	31%	8%	16%	10%	29%
OTHER	Wholesale Margin	12%	13%	12%	12%	13%	15%
	Retail Margin	14%	17%	10%	14%	8%	16%
	Total Margin	26%	30%	22%	26%	21%	31%
Total Margin Range	High	55%	45%	44%	50%	55%	55%
	Low	8%	18%	6%	13%	5%	19%

1993 = January through June only.
Margins are expressed as a percent of the average farmgate price.
Other = Average across three District Town markets (Gulu, Jinja and Mbale).
Source: Calculated from data obtained from the Ministry of Trade and Industry, Market News Service.

Both wholesale and retail margins are highly variable in all markets. The wholesale margin averages from 12% to 15%, while the mean retail margin varied from 8% to 17% depending on the commodity and the period. Marketing margins were significantly higher in the first half of 1993 than in 1992. Production during this period had finally begun to recover from the effects of the drought, and farmgate prices declined dramatically. Wholesale and retail prices declined much less rapidly. It is possible that margins during this period are more "normal" than

those in 1992 when nominal farm prices rose to unprecedented heights due to the poor harvest. Without a longer time series, however, this is purely speculation. The total marketing margin averages 31% or less. These margins are relatively low compared to marketing margins in many other countries. The comparison with developed country margins is not really valid, however. Labor is much less expensive in Uganda and the level of services embodied in these marketing margins is minimal. Product selection is limited. Product quality is often questionable. Ugandan consumers and farmers both face high transaction and search costs which are not included in the margin.

The low average margins hide their extreme volatility, however, and the wide range in margins in 1992 depending on location and season (varying from 5% to 55%) tends to support the observation of thinly traded markets and poor price arbitrage between locations.

Sergeant and Macartney (1993) argue that because of the low marketing commissions, most of the sales revenue returns to the rural areas. It is true that most Ugandans are small-farmers whose major input is labor and, as a result, the rural population does benefits when market opportunities are increased by expanded export. These benefits would be further enhanced, however, if market coordination and information were improved sufficiently to encourage greater specialization in production and investment in productivity-enhancing technology.

The observation of low average marketing margins may support the contention by several consultants that Ugandan markets are competitive and efficient[172]. But as Shaffer et al. (1983) point out;

> ..[E]fficiency is a static concept. A market can be efficient and still result in poverty. The "efficient but poor" observation, often made about individual farmers, is equally possible for traders, markets and entire economies. There is nothing particularly desirable about equilibrium. The trick in development is to induce a flow of technological and organizational changes which cause disequilibrium, and to have the institutional and behavioral flexibility to adapt in socially productive ways.

---

[172] Abt Associates (1992) and Sergeant and Macartney (1993) stressed this point in particular.

While the current policy environment is conducive to competitive market development, it will take time for the private sector to become firmly established and to improve the performance of its operation, particularly considering the low productivity and subsistence orientation of Ugandan agriculture. Simply providing a free market environment is not enough. Government should play an important role in the improvement of the transportation and communication infrastructure, ensuring ease of entry and exit, enforcement of contracts, providing access to credit and technical resources. Public market information services and quality and quantity standards are vitally important, as are steps to reduce bureaucratic bottlenecks which impede the flow of produce to the domestic and export markets[173].

One major exception to the assessment of "efficient" markets is the sunflower market. Of all the oilseeds, the marketing mechanisms for sunflower are the most poorly developed. A serious vacuum exists at the first handler stage. Unlike food crops, which can be consumed on the farm, sold directly to other consumers, or through traders for processing or export, sunflower has a much more limited range of potential customers. Oil mills are essentially the only market for the crop. Consequently, the price farmers can obtain is directly tied to the potential for profitable oil extraction.

Sunflower prices tend to be very unresponsive to the supply and demand situation. Most mills maintain a fixed purchasing price for six months or more, irrespective of the costs of storage that a trader would incur between harvest periods. As a result, few traders have shown any interest in bulking and supplying sunflower. Prices vary considerably by location, mostly based on distance from competing mills. June 1993 prices ranged from 110/= a kg of the black seed (offered by Arua Diocese deep in West Nile) to 180/= a kg (offered by Mukwano upon delivery of the crop at the mill in Kampala). Mukwano, the largest oil processor, has wholesale agents for soap and oil in various locations. These agents sometimes also buy sunflower. In this way the mill reduces

---

[173] Recent examples of bureaucratic interference include the early 1992 ban on the export of maize, and the threat that an entire crop of snowpeas destined for export would have to be plowed under because Ministry of Agriculture officials had not bothered to inspect the imported seed before it was planted, as required by the new Seed Law.

transport costs, employing delivery vehicles that would otherwise return empty.

Some mills have attempted to contract informally with farmers, supplying them with seed and offering to buy the harvested crop at a pre-established price. These arrangements have generally proven unsatisfactory to both parties. Farmers complain about millers who distributed seed and then reneged on their promises to purchase the crop. Similarly, millers complain about giving away seed and then having a competitor come and purchase the crop at a higher price. Buying sprees for the large millers tend to be sporadic and unpredictable. Buyers periodically move through the sunflower-producing area like a vacuum cleaner, collecting everything in their path irrespective of quality. They are unreliable, however. Often when the farmer needs to sell sunflower it is impossible to find a buyer.

Collection centers are few. The quantity of sunflower produced by an individual farmer is generally very small. The task of collecting and transporting a bulky, low-value crop such a sunflower becomes costly. Less-expensive mechanisms for collection and transport to the processing centers need to be found if farmer and processor margins are to be increased.

7.2 EXPORT MARKETS FOR UGANDAN PRODUCTS

There is a shortage of accurate export statistics for Uganda. The inadequacy of official data is dramatically illustrated when one realizes that the quantities of maize exported by World Food Program alone exceed the official estimates of total grain exports.

Private exporters were first allowed to export cereals and oilseeds in 1988. In 1993 private exports account for over half the grain exports, and their market share is rising rapidly. Officially reported exports of grains and oilseeds have risen from almost nothing during the 1970s to 50,000 mt in 1992 and 32,000 tons in the first quarter of 1993. As Sergeant and Macartney (1993) point out, the high



cost of transport[174], coupled with the low value-to-weight ratio for grains and oilseeds, effectively precludes export except to neighboring countries. Most of the officially reported grain exports were sent to Rwanda, Sudan and Somalia through the international relief agencies, particularly WFP. Sesame exports have been primarily to Turkey and the Middle East although Odwongo (1991) reports a few European and Canadian contracts. In addition, there is a large informal trade in food crops across the borders. Sergeant and Macartney estimate the informal trade in maize to Kenya at 50,000 to 100,000 mt per annum.

Besides lower transport costs, regional markets have the advantage of less-stringent quality standards that are easier to satisfy than European standards. Participation in regional trade, therefore, could give Uganda the opportunity to improve its processing and marketing efficiency. Improvements in primary storage, reduction in transportation costs (including the restoration of rail service) and the removal of border trading restrictions are required to make Ugandan products competitive on the world market.

7.2.1 International Market Prospects for Groundnuts

Groundnuts are produced in many African countries, with Senegal, Nigeria and Sudan being the largest producers on the continent. The trend in production is shifting away from the continent. Presently, India, China and the United States are the largest producers. Together they account for 65 percent of world output.

Groundnuts differ from other oilseeds in that they have a large direct food use. In years of tight groundnut supplies, prices may be substantially above those for other oilseeds, as food demand exerts a strong claim on available supplies (Kristjanson et al., 1990). Produc-

---

[174] Cereals and oilseed exports outside the region must first be transported by road to Mombasa and shipped by sea. The cost of freight from Kampala to Mombasa varies from $50 to $80 per ton for non-containerized cereals and oilseeds. Rail charges are roughly the same as those by road. Internal transportation to Kampala is also expensive, ranging from $33/mt from Gulu to Ush $25/mt from Tororo assuming there is a return load to help spread the costs. Because of these high transportation costs, only crops with a higher value-to-weight ratio can be competitive on the international market.

tion exceeding food use goes for crushing, accounting for about 60 percent of groundnut use. Meal and oil prices determine the value of groundnuts for this use. The recent trend toward increased relative meal prices penalizes groundnuts, which have a high oil content and produce a poorer quality meal than soybeans.

The groundnut market is fragmented, with most of the world's production protected from world market events by domestic pricing policies. Parastatal control is common in West Africa. India and China severely restrict imports. The US continues to use a complicated system of quotas and support prices. As a result, Kristjanson et al. (1990) predicted a rapid expansion in Chinese production, and slower expansion in the U.S. and India. While World Bank (1991) projections are that groundnut prices are likely to increase from the low levels realized in the 1986/88 period, oil prices continue to remain low relative to meal. The relative price ratio between groundnuts and competing meals and oils is not expected to change. Export markets for African groundnuts are expected to improve only marginally in the next decade (World Bank, 1991). Groundnuts will be thinly traded, as an increasing proportion of the world consumption is supplied by protected domestic markets. Thinly traded markets reduce the risk-hedging opportunities and increase export revenue risk.

The quality price discount for groundnut meal has been increasing in the 1980s in comparison to soybeans. In the EEC, which was the major historical market, groundnut meal is facing increased competitive pressure from expanded supplies of rapeseed and sunflower meals. Previously, groundnut oil sold at a significant premium over soybean oil in the EEC because of its preferred taste and its ability to be heated to high temperatures without smoking. The rapid expansion of sunflower oil, which has similar qualities, resulted in a decline in EC groundnut oil imports in the 1980s (World Bank, 1989). Continued support for European oilseed production is likely to limit the demand for groundnuts and groundnut products in the EC, which has historically been the major market for African groundnuts.

Uganda has been only a marginal exporter of groundnuts. High transportation costs and poor quality reputation are the major constraints facing exporters. The small quantities of groundnuts

exported from Uganda in recent years were largely in response to the bad rains in Southern and Eastern Africa that resulted in a shortfall in regional markets and temporarily higher prices. Future Ugandan groundnut exports will depend on a competitive pricing policy, long-term marketing agreements to reduce risk, and improved productivity relative to countries producing competing oilseeds.

7.2.2 The Export Demand Prospects for Sesame

World trade in sesame seed is estimated to be worth $367 million per year, while trade in sesame oil is valued at only $40 million. The major sesame exporters in order of volume of trade are China, India, Central America, Burma, Mexico and Guatemala. The U.S. is by far the largest importer, at 6,000 tons annually. The growing U.S. market is primarily served by the Central American producers. Most of the sesame reaching Europe is from Africa. European market prices were relatively static from 1988-1992, at $1,400/mt. East African sesame tends to be regarded as a secondary source on the world market both in terms of quantity and quality. Proximity, however, gives it a distinct advantage in the Middle Eastern market.

Over the last few years, both the supply and the demand for sesame have increased. From 1979-85, world exports averaged 275,000 mt per year, while from 1986-91, world exports grew to 378,000 mt per annum. With growing concerns about global warming, more countries are looking for crops that produce well under drier conditions[175]. An upsurge in area planted in the sesame-growing countries is expected over the next few years.

Market demand for sesame oil and seed is also on an upward trend. Sesame has found a niche market in the health-food sector. Galton-Fenzi (1993) predicts that the demand for sesame will increase by 80,000 mt between 1992/93 and 1994/95. There will be opportunities to export high-quality seed to fill this predicted upsurge in demand. Sergeant and Macartney (1993), while less optimistic because of Uganda's

---

[175] Sesame requires light to fair rainfall during the sowing season and through the early period of vigorous growth, but prefers drier conditions during flowering, encapsulation and harvest.

high costs of production and transportation, suggest that a future market opportunity for Ugandan sesame may develop as other countries move out of sesame and into other more lucrative crops.

Ugandan exports of sesame developed during the late 1980s when Sudan was unable to satisfy its traditional markets in Turkey and the Middle East. At the start of 1993, Sudanese sesame returned to the market. Competition for market share heightened. Export prices have fallen from $700-800 per mt FOB Mombasa in 1991 to less than $400/mt in early 1993[176]. Ugandan exports have dropped off dramatically and the local market price has fallen.

Most of the Ugandan sesame requires considerable cleaning to meet international standards. International quality standards for the confectionery trade require uniformly white sesame with a seed size greater than 3 grams per 1,000 seeds. Most Ugandan exporters are new to the business. Many are uninformed about the quality requirements, prevailing prices, documentation requirements and export marketing costs. Price instability has led many Ugandan exporters to default on their delivery commitments. This has damaged Uganda's image as a reliable trading partner.

In contrast, Sudan faces lower transportation costs, and produces high quality white sesame at a lower cost of production. Sergeant and Macartney (1993) concluded that, "It is probable that Uganda will only be a bit player in the sesame market, responding when another country is unable to supply." Consideration must be given to the differing requirements of alternative sesame uses if Uganda wants to diversify into other markets. To become a consistent exporter of sesame, Uganda will need to improve on the quality of its product (cleaner seed and better varieties) and reduce its costs of production and transport.

Given the apparently declining demand for Ugandan sesame, some observers have suggested that Uganda consider exportation of sesame oil as an alternative. Sesame oil is used as a substitute for olive oil in salads and cooking. It is an ingredient in the manufacture of soap,

---

[176] The 1991 price is cited by Odwongo (1991). The current price was obtained from Ugandan exporters.

cosmetics, paints, and perfumes. In addition, sesame oil is also a lubricant and a synergist for pyrethrum in aerosol sprays and other pharmaceuticals (Ngategize, 1991).

When sesame is crushed for oil, it has a naturally bitter taste unless it is first dehulled. The bitterness is caused by the high calcium and oxalic acid content of the hull. The highest oil content sesame is dark in color and will produce a dark oil unless it is dehulled. Both are considered negative qualities for purposes of oil export[177]. Undecorticated sesame cake is also relatively unpalatable as an animal feed and commands a low sales price (Galton-Fenzi, 1993).

Entry into international trade in sesame oil requires considerable expertise because of the "closed-shop" nature of the market. Most sesame importers prefer to process their own oil. Galton-Fenzi (1993) reports a marked reluctance by international buyers to purchase oil from sesame-seed-producing countries in Africa.

Japan is the largest importer of mixed sesame seed for oil extraction. Japan imports about 120,000 metric tons annually, including large quantities of black seeded sesame. High quality (pure single color seed) is the primary requirement for entry into this market. China supplies most of the large Japanese and Korean markets due to its relative proximity and lower transportation costs. Japan is by far the largest exporter of crude sesame oil, cornering roughly 90% of the world market.

Europe is the largest importer of refined sesame oil. While there is a lucrative niche market for organically produced cold pressed sesame oil in Europe, procedures required to obtain certification as an "organic producer" appear insurmountable[178]. The global movement of both crude and refined soft oils is licensed by the Federation of Oils, Seeds and Fats Association Ltd. of London. Registration with the

---

[177] One Ugandan miller, however, reports establishing contacts with an Italian bakery that is particularly interested in a "full bodied" sesame oil. Marketing contracts for such a specialty item would eliminate the need for suitable decortication equipment.

[178] Recent information indicates that a European firm is trying to get all of northern Uganda certified as an organic producer for possible export of honey. Presumably, once organic status has been established, it could apply to sesame as well. This might open up lucrative new possible markets for those exporters with greater marketing skills.

association will be necessary before Uganda can participate in the export of edible oils. Any further effort in this regard will require careful study into the international marketing for oils, especially quality and grading standards. If international market prices are favorable, the added returns to crushing may be marginal given the price of sesame, transportation and processing. Crushing sesame may be advantageous, however, if it increases utilization of the existing crushing capacity. The primary advantage of crushing sesame is that it can help to cushion the farmers from the vagaries of the international commodity markets, providing an alternative domestic market for surplus sesame in years when international prices slump.

7.2.3 The Export Market for Ugandan Maize

While most maize traded on the international market is yellow maize for animal feed, the primary demand in East African regional markets is for white maize for human consumption. Ugandan maize exports have been expanding rapidly. Official statistics show 24,000 mt of maize exported in 1992 and nearly 14,000 mt in the first quarter of 1993. Sergeant and Macartney (1993) estimated that the WFP and other international relief agencies could purchase up to 150,000 tons annually for the next three years. The relief demand is difficult to predict, however, because it is dependent on disasters and misery elsewhere in Africa as well as the flow of funds to international relief efforts. The relief market is by far the most lucrative for Uganda, since agencies are willing to pay just less than the import parity price for maize in Kampala. In May 1993, the world price for yellow maize delivered to Mombasa was US$120/ton. Transport costs to Kampala are about $50 per ton, making the import parity price of maize in Kampala approximately $170 per ton. WFP was offering $153-$163 per ton during January-June 1993[179]. Sergeant and Macartney (1993) project that Uganda could satisfy the relief market demand by the end of 1994. This would require farmers to plant an additional 100,000 ha of maize. Such a rapid expansion seems unlikely without a significant change in the existing

[179] Price information provided by the Agricultural Secretariat.

farming system. The return to widespread ox cultivation could contribute to a rapid expansion in cultivated area. While Ugandan farmers in Northern and Northeastern Uganda would welcome such a move, the insecurity resulting from the large quantity of arms still hidden in Karamoja is a serious impediment[180]. Unless a massive effort to disarm the Karamajong and provide security for neighboring districts is undertaken, the newly restocked herds will simply be stolen again.

If the relief demand were satisfied, Uganda has alternative market possibilities in Kenya, but only at prices less than Kenyan import parity, estimated at $150/ton in Nairobi. To compete in this market, the price would have to fall to approximately $110/ton FOB Kampala. Ugandan costs of production, marketing and transportation would have to be reduced to penetrate this market. Sergeant and Macartney (1993) estimate the Kenyan maize deficit at 500,000 to 1 million tons/annum. The deficit is likely to continue to rise due to population growth and existing land pressures. Because of its more reliable rainfall patterns, land availability and proximity, Uganda is in an ideal position to take advantage of Kenya's demand for imported maize if costs of production can be reduced.

The primary recommendations to increase productivity for maize in Uganda focus on clean weeding, line-planting and the use of the improved open-pollinated varieties recently released by the MAAIF. Such practices could result in an approximately 30% increase in yields (Laker-Ojok, 1993a). Sergeant and Macartney (1993) contend that with such a yield improvement, Ugandan costs of production could be reduced sufficiently to compete in the Kenyan market and still earn farmers a return on their labor that is comparable to what they are currently receiving. Extension agents have been urging farmers to follow early planting and clean weeding recommendations for years, however, with little effect. Evidently, insufficient study of the labor constraints

---

[180] The Karamajong are traditionally a pastoralist people. During the early 1980's barter trade between the Karamajong and the army (guns in exchange for stolen cattle) was rampant. The armory in Moroto was taken and looted during the war in 1986, worsening the situation. During the political instability of the next four years, virtually all the cattle from neighboring districts were stolen by Karamajong raiders.

in the farming system has been conducted to explain the incentives and impediments to adoption of these more intensive practices.

7.2.4 The Projected Market for Ugandan Cotton

Historically, Uganda has enjoyed a reputation for high-quality, medium-staple roller-ginned cotton and has received premium prices for its exported lint. Worldwide, about 97% of the medium-staple cotton is saw-ginned, a process that introduces "neps" (small knots) into the fibers and results in lower prices on the international market. Only East Africa produces significant quantities of roller-ginned medium-staple lint in the 33/32" to 37/32" range[181]. Ugandan cotton is also 100% hand picked, which earns a premium price in certain markets (BCGA, 1993).

Since the early 1980s, Ugandan cotton has deteriorated in staple length, grade quality and ginning outturn. This deterioration is the result of varietal adulteration and reduced varietal virility following the breakdown in cotton research and foundation seed production since 1975. Declining cotton production levels and delays in ginning accentuated the problem of seed supply for SATU and BPA, the two established varieties[182]. When SATU seed ran out in many areas, BPA seed was distributed instead. During ginning, the two varieties became mixed in some areas. SATU lost about 1/32" during the 1970s, falling from 35/32 to 34/32". BPA has lost about 1/16" on average since the mid-1980s (BCGA, 1993).

The deterioration in grade, results from careless segregation of stained, damaged, diseased and immature cotton from the clean seedcotton at the farm-level. Poor grading at the primary society level is also a factor. The breakdown of the marketing system has slowed the movement of cotton from the farmgate, through the primary society stores and ginning process. Seedcotton has often been stored for two to three

---

[181] Staple length is the average length of the fibers in the cotton lint. It is measured in 32ths of an inch.

[182] SATU stands for "Serere Albar Type Uganda". It was originally developed for the areas east of the Nile. BPA stands for "Bukalasa Pedigree Albar". It was developed for the areas west of the Nile.

years before it has finally been ginned. Long storage, under poor conditions, results in dull and lusterless lint. The color changes from white to grey or yellow and fiber length is impaired. Similarly, cottonseed degenerates under storage. It becomes soft and difficult to remove. The free fatty acid content of the seed rises. Viability for planting is reduced, as is the value for oil extraction.

This deterioration in the quality of Ugandan cotton coincided with a drop in world market prices. At the end of 1991, world stocks of cotton lint were abnormally high, about 50% of annual consumption. These large stocks depressed the international price. In late 1993, however, shortfalls in production in China triggered a sharp price recovery from the cyclical low in October. Supply in 1992/93 is again projected to exceed demand by approximately 50% of annual consumption (BCGA, 1993). Nearly 35% of these stocks are held in China, and cotton prices will, to a large extent, be determined by China's future policy with respect to the continued holding of stocks (World Bank, 1993).

In Uganda, seedcotton prices have historically been fixed by government before the season. In recent years the export tax on cotton has been eliminated and farmgate prices have been set as a steadily rising proportion of the world market price in an attempt to encourage expanded production. The 1992 farmgate price was set at USh 340/kg. Given the international market slump, this price represented too high a proportion of the final market value[183], pushing LMB into massive losses for the financial year[184].

Despite the general world price depression, the market for good quality roller-ginned medium-staple cotton remains comparatively firm and unsaturated. The BCGA price forecasts for lint and the potential premiums for Uganda grade and staple are shown in Table 7.2. International prices are based on premiums or discounts from a

---

[183] Historically, the cost of buying ginned cotton from the ginneries has averaged 60-65% of the final value of LMB's lint sales. In 1992, it exceeded the value of the lint sold.

[184] In 1992 LMB sustained a loss of US$2.2 million.

recognized standard grade of cotton[185]. It is unlikely that Ugandan cotton can earn its full premiums in the next few years, however, because of continuing irregularities in the staple and low grade quality. The quantity of exportable roller-ginned Tanzanian cotton now approaches 380,000 bales[186]. If, as predicted, the Ugandan crop expands to 250,000 bales by the end of the decade, the market may become saturated. Prices and premiums would then fall. As market saturation is approached[187], the comparative grade, staple length, spinning characteristics and general quality of Ugandan cotton will become crucial to its price determination. Timeliness of delivery also will be important. In this respect Uganda is at a distinct disadvantage since Ugandan cotton gets to port two to four months later than Tanzanian cotton.

Table 7.2 Lint Price Forecasts, CIF North Europe: 1992/93-2003/04

	92/93	93/94	94/95	95/96	96/97	99/00	2003/4
A Index[a]	148.5	159.5	170.5	183.7	198.0	236.9	278.1
BPA Premium	15.4	16.5	17.6	18.7	19.8	23.6	27.3
SATU Premium	12.1	13.2	14.3	8.8	16.5	19.8	23.4

Source: BCGA, 1993. p. 17
[a] The Cotlook "A Index" is the most commonly cited price index for cotton and is the standard basis for price projections. It represents middling quality medium staple cotton of 1 and 3/32 inch staple length. Price premiums or deductions are then added to reflect variations in quality above or below this standard.
BPA and SATU are the two recognized cotton varieties grown in Uganda.

[185] Prices and price projections most commonly cited are for the "Cotlook A Index". This cotton grade stands for middling 1-3/32 inch quality, with prices quoted CIF northern Europe.

[186] Tanzanian production has expanded rapidly in response to improved price incentives, greater availability of incentive goods, and lower food prices since the 1985/86 low of 107,000 tons. Tanzanian yields, however, are still low (averaging 400 kg/ha).

[187] Market saturation is estimated at 500,000 bales (BCGA, 1993).

7.2.5 The Export Potential of Soybeans and Oilseed Cake

There may be some regional export demand for unprocessed soybeans. Soybean exports face stiff competition from American and European soybeans and meals, which are subsidized by price-support programs. Even after opposition from the American Soybean Association led to a reduction of oilseed subsidies during the GATT negotiations in 1991, European farmers are still receiving twice the world price for oilseeds through the EEC subsidies. Oilcake meals are also subject to stringent quality control due to the danger of aflatoxin[188]. Export quality cake requires a level of preprocessing of the oilseeds that is only found in the largest mills. This effectively precludes small millers from engaging in international export.

There is also a potential market in Kenya for oilcake. The animal feed industry in Kenya is very short of feed. Total Kenyan demand is estimated at 65,000 mt and it is expected to rise to 80,000 mt by the year 2,000. Sergeant and Macartney estimate that the current value of oilseed cake in Kenya could be in the order of $200 to $220/mt. Difficulties include the comparatively high cost of transportation, Kenyan foreign exchange shortages, and the low import parity price of protein meals from Europe and the US.

---

[188] If oilseeds become infected with certain strains of the mould *Aspergillus flavus* aflatoxins can develop. This happens primarily if oilseeds are stored with excessive moisture content.

CHAPTER EIGHT: EXPORT POTENTIAL AND POLICY ANALYSIS FOR OILSEEDS AND COMPETING CROPS

8.1 INTRODUCTION

Policy analysis investigates the extent to which the existing incentive regime encourages an economically efficient choice of production activities. For two decades, inconsistent macropolicies, overvalued exchange rates, and import and export controls led to persistent macroeconomic disequilibria in Uganda. As a result, the stabilization efforts of the 1980s had limited success. The overvalued exchange rate discouraged production for export. Exports at the official rate were implicitly taxed while imports were subsidized. The rate of tax or subsidy was approximately equal to the rate of exchange premium in the parallel market (Matin et al., 1990). Coffee, cotton, and tea, which had a strong comparative advantage, were made non-competitive in the world market due to the overvalued exchange rate which imposed a high implicit tax on these export commodities (Agricultural Secretariat, 1991).

Table 8.1 shows the extent and trends in these policy-induced disincentives to export production, using cotton as an example. The analysis is based on data provided by the Agricultural Secretariat. The Uganda government regulated the market margins of the parastatal marketing boards until 1992. The government collected an explicit export tax equal to the difference between the realized world market border price, valued at the official exchange rate, and the total export cost. The Agricultural Secretariat was charged with the responsibility of setting farm gate prices for seedcotton, the prices paid by the Lint Marketing Board to the cooperative union ginneries for lint and the export marketing margin for the LMB. All foreign currency earnings were converted into shillings by the Bank of Uganda at the official exchange rate. In some years the explicit tax on cotton was actually negative because the sum of government regulated producer prices and official marketing margins exceeded the export price at the official exchange rate.

Table 8.1 Policy-Induced Disincentives to Cotton Production

ITEM	1984	1985	1986	1987	1988	1989	1990
1 WORLD PRICE $/KG[a]	1.94	1.76	1.21	1.45	1.59	1.68	1.62
2 OFFICIAL EXCHANGE RATE SH/$	3	6.5	14	60	150	200	730
3 MARKET RATE SH/$	4.76	16.2	62.75	102	480	600	730
4 EXPORT PRICE (OER) (4=1x2)	5.82	11.44	16.94	87	239	336	1183
5 EXPORT PRICE (MER) (5=1x3)	9.23	28.51	75.93	148	763	1,008	1183
6 IMPLICIT EXPORT TAX (6=5-4)	3.41	17.07	58.99	61	525	672	0
7 MARKET MARGIN[b]	1.98	4.62	8.17	22	86	199	440
8 EXPLICIT EXPORT TAX (8=4-7-9)	0.15	0.05	(3.53)	7	(93)	(263)	66
9 PRODUCER PRICE[c]	3.69	6.77	12.3	58	246	400	677
10 PRODUCER PRICE WITH NO TAX (10=5-7-8)	7.25	23.89	67.76	126	677	809	743
11 TAX ON FARMER (11 = 10-9)	3.56	17.12	55.46	68	431	409	66
12 POLICY DISINCENTIVE (12=11/10)	49%	72%	82%	54%	64%	51%	9%
13 TOTAL EXPORT TAX (13=11/5)	39%	60%	73%	46%	57%	41%	6%

[a] Average $ price obtained by LMB for the cotton crop that year.
[b] Market margin allocated to LMB and the cooperatives. Set by the Agricultural Secretariat.
[c] Producer price set by the Agricultural Secretariat.
OER = Official Exchange Rate MER = Market Exchange Rate
Source: Adapted from Agricultural Secretariat, 1991.

The implicit tax is the difference in value between the world market price when converted at the official exchange rate as opposed to the market exchange rate. The total tax is the sum of the explicit export tax and the implicit tax. It is expressed as a percent of the export price valued at the open-market exchange rate. Despite the negative explicit tax in some years, the high level of implicit tax resulted in a total export tax that peaked at 73% in 1986 before gradually diminishing.

The "Policy Disincentive" measure is a ratio which estimates the percentage income loss to the farmer caused by overvalued exchange rates and export taxes. Inefficiency in processing and marketing should also be included here but, due to inadequate data, the Agricultural Secretariat did not adjust for these inefficiencies in its DRC analyses (Agricultural Secretariat, 1991). The calculation of the Policy Disincentive Ratio is illustrated in Table 8.1.

Recent policy initiatives have had a favorable impact on the international competitiveness of most of Uganda's agricultural exports. Beginning in 1989, all direct export taxes were removed. Since the legalization of the Bureau system in 1990, all export proceeds, except for coffee, were remitted at the open market rate (Agricultural Secretariat, 1991). More recently, the official exchange rate has been pegged to a bank auction of foreign exchange and extended to coffee exports. The official foreign exchange premium has gradually fallen, reducing the levels of implicit subsidy on imports. The proportion of imports financed at the official rate has been declining steadily. The impact of input subsidies is now marginal, due to low input use and the tendency for the small quantities of subsidized inputs to find their way into the market at parallel prices.

8.2 POLICY ANALYSIS FOR OILSEEDS AND COMPETING CROPS

The Policy Analysis Matrix (PAM) is a simple framework for analyzing the incentives to produce a particular commodity under the current price and policy regulations. It summarizes the effects of policy on national comparative advantage and competitiveness. The PAM methodology is described in detail in Pearson and Monke (1988) and Monke



and Pearson (1989). The matrix is based on budgets that reflect the costs of farming enterprises, farm-to-processor marketing margins, processing costs and processor-to-wholesaler transportation. This data is organized to present a comprehensive picture of the policy environment. The PAM simultaneously measures the extent of the transfers resulting from the entire set of existing policies and the degree of economic efficiency in the system (Pearson and Monke, 1988).

The PAM analysis for oilseeds and competing export crops is presented in Tables 8.2 through 8.10. In the northern region cotton, tobacco, maize and beans currently form the major export alternatives. PAM matrices for coffee, tea, sugar and horticultural crops were not prepared. Production of these commodities is concentrated in southern Uganda while oilseed production is primarily concentrated in northern and northeastern Uganda. Severe infrastructural problems are expected to constrain the northern region's expansion into high-value, perishable non-traditional exports for the foreseeable future. The PAM analysis was prepared using 1991 and 1992 data from the Agricultural Secretariat[189].

The analysis is conducted at the farmgate level in order to highlight the impact of policy on farm-level production incentives to produce for exports. Financial revenue is the farmgate price (adjusted for processing ratios in the cases of cotton and tobacco). Economic revenue begins with the border price realized from export of the commodity. The processing, transportation and handling costs to move the commodity from the farmgate to the border and transform it into an exportable quality are then deducted to arrive at the economic revenue per kg.

Taxes are considered transfer payments within the economy and are, therefore, excluded from the production and marketing costs in the economic analysis. This is, therefore, a partial analysis similar to partial budgeting techniques used in making production decisions at the

---

[189] The Agricultural Secretariat calculates DRC ratios as part of its regular price analysis, but does so using only financial prices rather than economic opportunity costs. The conversions from a financial to an economic analysis necessary to complete a full PAM analysis are not conducted. All adjustments from the financial to an economic analysis were made by the author.

farm level. No effort is made to allocate fixed government overhead expenditures among the various agricultural commodities which might benefit from them. The importance of infrastructural investments, social services and public safety to the efficient operation of the agricultural sector is clearly demonstrated by Ugandan history. Their inclusion as direct costs of production and marketing, however, would obscure the immediate question of Uganda's ability to profitably export a particular commodity. Given the current policy regime, the adjustments involved in the economic analysis focus primarily on netting out taxes and including an opportunity cost for land. The major taxes affecting agriculture are those on petroleum products, vehicles and spare parts. They account for approximately 45% of the domestic factor cost of collection and 20% of the domestic factor cost of marketing for most commodities[190].

In Uganda there are few effective subsidies on agricultural inputs. The tradable component of on-farm production costs, therefore, has the same value in both the financial and economic columns of the PAM matrix. For most commodities, it is minimal due to the low level of input use[191].

The cost of labor is assumed to be the same in both the financial and economic analysis and is set at the rural wage rate. Existing minimum wage legislation does not apply outside the estate sector. The agricultural labor market is highly competitive. There is

---

[190] These percentages were derived from an examination of the detailed DRC calculations for sesame prepared by the Agricultural Secretariat. It was not possible to get access to the full details of the Agricultural Secretariat's computations of the DRC for other commodities. The application of a standard percentage across all commodities is not expected to introduce any significant bias, however.

[191] It should be noted that the division of costs between tradeable and domestic factors of production is critical to the final DRC ratio. The following analysis is entirely dependent upon the Agricultural Secretariat's breakdown between foreign exchange and domestic costs of production. It was not possible to obtain sufficiently detailed explanations of the assumptions behind these costings to verify their assessment.

no reason to assume that private and social wages in the rural areas differ significantly due to labor market imperfections[192].

In the financial analysis, the domestic factors of production include primarily labor costs and the opportunity cost of retained seeds. In the economic analysis the cost of land is viewed as an opportunity cost and is included in the cost of domestic resources which forms the numerator in the DRC ratio. The inclusion of the cost of land results in some differences between the DRC ratios calculated in this study and those reported by the Agricultural Secretariat[193]. The cost of land was not included in the Agricultural Secretariat's calculation of the DRC ratio, largely because of the difficulty of assigning a value to a factor of production that has no market in most of the country.

In this study the shadow price, or opportunity cost, of land is calculated as the residual value-added in production after all other costs, including family labor valued at the rural wage rate, have been deducted. The contribution of land is then averaged over the full range of commodities usually produced as part of the rotation in Northern Uganda[194]. Finally, this value is divided in half to reflect the normal rotation in this region, which includes three years of cropping followed by three years of fallow. The resulting value is used to reflects the average contribution of one hectare of land to each season of a typical six year rotation. It is then divided by the yield to arrive at the cost of land per kg of each commodity.

---

[192] This assumption is lifted, however, in the analysis of the costs of processing in Chapter Nine. Processing involves more formal sector employment. Formal sector wages in Uganda do exceed the opportunity cost of drawing additional labor away from agriculture.

[193] The adjustments from the financial to economic analysis tend to cancel each other out to a large degree, since the tax adjustment reduces the cost of domestic factors of production, while the adjustment for the cost of land increases it.

[194] This included cotton and tobacco as traditional cash crops. Beans, cassava, millet, sorghum, sweet potatoes, groundnuts, sesame, sunflower, and soybeans were included as common food crops. All of these crops are produced in the region. Except for tobacco, they are usually intercropped. No data is available on the economics of intercropping is available for Uganda. In the absence of such data, the returns to land from each crop are weighted equally in the averaging. The calculation of the returns to land is presented in Appendix 2.

Table 8.2 Policy Analysis Matrices for Tobacco: 1991 and 1992

TOBACCO POLICY ANALYSIS MATRIX: UGANDA 1991			
ASSUMPTIONS: YIELD = 950 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	1,191	1,459	(268)
TRADEABLES	304	304	0
LABOR	517	517	0
DOMESTIC FACTORS	289	299	(9)
TOTAL COST	1,110	1,119	(9)
PROFIT	81	339	(258)
Value Added (Financial) Rf-Tf			887
Value Added (Economic) Re-Te			1,155
Profitability Coefficient Pf/Pe			0.24
Subsidy Rate to Producers (Pf-Pe)/Re			(0.18)
Nominal Protection Coefficient			
a) Outputs Rf/Re			0.82
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			0.77
Private Cost Ratio (Df+Lf)/(Rf-Tf)			0.91
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			0.71

TOBACCO POLICY ANALYSIS MATRIX: UGANDA 1992			
ASSUMPTIONS: YIELD = 950 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	1,521	2,342	(821)
TRADEABLES	252	252	0
LABOR	915	915	0
DOMESTIC FACTORS	169	181	(12)
TOTAL COST	1,335	1,348	(12)
PROFIT	186	995	(809)
Value Added (Financial) Rf-Tf			1,270
Value Added (Economic) Re-Te			2,091
Profitability Coefficient Pf/Pe			0.19
Subsidy Rate to Producers (Pf-Pe)/Re			(0.35)
Nominal Protection Coefficient			
a) Outputs Rf/Re			0.65
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			0.61
Private Cost Ratio (Df+Lf)/(Rf-Tf)			0.85
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			0.52

Table 8.3 Policy Analysis Matrices for Beans: 1991 and 1992

BEANS POLICY ANALYSIS MATRIX: UGANDA 1991			
ASSUMPTIONS: YIELD = 750 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	150	554	(404)
TRADEABLES	13	13	0
LABOR	147	147	0
DOMESTIC FACTORS	32	44	(12)
TOTAL COST	192	204	(12)
PROFIT	(42)	350	(392)
Value Added (Financial) Rf-Tf			137
Value Added (Economic) Re-Te			541
Profitability Coefficient Pf/Pe			(0.12)
Subsidy Rate to Producers (Pf-Pe)/Re			(0.71)
Nominal Protection Coefficient			
a) Outputs Rf/Re			0.27
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			0.25
Private Cost Ratio (Df+Lf)/(Rf-Tf)			1.31
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			0.35
BEANS POLICY ANALYSIS MATRIX: UGANDA 1992			
ASSUMPTIONS: YIELD = 700 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING . COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	220	319	(99)
TRADEABLES	13	13	0
LABOR	183	183	0
DOMESTIC FACTORS	50	66	(16)
TOTAL COST	246	262	(16)
PROFIT	(26)	57	(83)
Value Added (Financial) Rf-Tf			207
Value Added (Economic) Re-Te			307
Profitability Coefficient Pf/Pe			(0.45)
Subsidy Rate to Producers (Pf-Pe)/Re			(0.26)
Nominal Protection Coefficient			
a) Outputs Rf/Re			0.69
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			0.68
Private Cost Ratio (Df+Lf)/(Rf-Tf)			1.12
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			0.81

Table 8.4 Policy Analysis Matrices for Sesame: 1991 and 1992

SESAME POLICY ANALYSIS MATRIX: UGANDA 1991			
ASSUMPTIONS: YIELD = 400 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	300	628	(328)
TRADEABLES	20	20	0
LABOR	263	263	0
DOMESTIC FACTORS	33	55	(22)
TOTAL COST	316	338	(22)
PROFIT	(16)	290	(306)
Value Added (Financial) Rf-Tf			280
Value Added (Economic) Re-Te			608
Profitability Coefficient Pf/Pe			(0.05)
Subsidy Rate to Producers (Pf-Pe)/Re			(0.49)
Nominal Protection Coefficient			
a) Outputs Rf/Re			0.48
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			0.46
Private Cost Ratio (Df+Lf)/(Rf-Tf)			1.06
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			0.52

SESAME POLICY ANALYSIS MATRIX: UGANDA 1992			
ASSUMPTIONS: YIELD = 375 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	400	482	(82)
TRADEABLES	9	9	0
LABOR	341	341	0
DOMESTIC FACTORS	29	60	(31)
TOTAL COST	379	410	(31)
PROFIT	21	72	(51)
Value Added (Financial) Rf-Tf			391
Value Added (Economic) Re-Te			473
Profitability Coefficient Pf/Pe			0.29
Subsidy Rate to Producers (Pf-Pe)/Re			(0.11)
Nominal Protection Coefficient			
a) Outputs Rf/Re			0.83
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			0.83
Private Cost Ratio (Df+Lf)/(Rf-Tf)			0.95
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			0.85

Table 8.5 Policy Analysis Matrices for Cotton: 1991 and 1992

COTTON POLICY ANALYSIS MATRIX: UGANDA 1991			
ASSUMPTIONS: YIELD = 575 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. SUBSIDY FOR SEED INCLUDED IN MARKETING COSTS. NO LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	923	1,104	(181)
TRADEABLES	172	172	0
LABOR	763	763	0
DOMESTIC FACTORS	107	123	(16)
TOTAL COST	1,041	1,057	(16)
PROFIT	(118)	48	(166)
Value Added (Financial) Rf-Tf			751
Value Added (Economic) Re-Te			933
Profitability Coefficient Pf/Pe			(2.48)
Subsidy Rate to Producers (Pf-Pe)/Re			(0.15)
Nominal Protection Coefficient			
a) Outputs Rf/Re			0.84
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			0.81
Private Cost Ratio (Df+Lf)/(Rf-Tf)			1.157
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			0.95
COTTON POLICY ANALYSIS MATRIX: UGANDA 1992			
ASSUMPTIONS: YIELD = 645 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. SEED SUBSIDY IS INCLUDED IN MARKETING COSTS PRICE SUBSIDY IS 60 USH/KG LINT. NO LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	1,046	939	107
TRADEABLES	145	145	0
LABOR	922	922	0
DOMESTIC FACTORS	91	109	(18)
TOTAL COST	1,158	1,175	(18)
PROFIT	(112)	(236)	125
Value Added (Financial) Rf-Tf			901
Value Added (Economic) Re-Te			795
Profitability Coefficient Pf/Pe			0.47
Subsidy Rate to Producers (Pf-Pe)/Re			0.13
Nominal Protection Coefficient			
a) Outputs Rf/Re			1.11
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			1.13
Private Cost Ratio (Df+Lf)/(Rf-Tf)			1.12
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			1.30

Table 8.6 Policy Analysis Matrices for Maize Exported Outside the Region: 1991 and 1992

POLICY ANALYSIS MATRIX FOR MAIZE EXPORTED FOB MOMBASA: 1991			
ASSUMPTIONS: MAIZE IS FOR EXPORT OUTSIDE THE REGION. PRICE IS QUOTED FOB MOMBASA. Yield = 2,000 kg/ha. No foreign exchange premium. Taxes add 45% to the financial cost of collection and 20% to financial marketing costs. No input subsidies or labor market distortions. Value of land added to economic cost of domestic factors.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	75	12.62	62
TRADEABLES	13	13.05	0
LABOR	57	57	0
DOMESTIC FACTORS	9	13	(4)
TOTAL COST	79	83	(4)
PROFIT	(4)	(71)	67
Value Added (Financial) Rf-Tf			62
Value Added (Economic) Re-Te			(.43)
Profitability Coefficient Pf/Pe			0.05
Subsidy Rate to Producers (Pf-Pe)/Re			5.30
Nominal Protection Coefficient			
a) Outputs Rf/Re			5.94
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			(144.57)
Private Cost Ratio (Df+Lf)/(Rf-Tf)			1.06
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			(163.60)
POLICY ANALYSIS MATRIX FOR MAIZE EXPORTED FOB MOMBASA: 1992			
ASSUMPTIONS: MAIZE IS FOR EXPORT OUTSIDE THE REGION. PRICE IS QUOTED FOB MOMBASA. Yield = 1,625 kg/ha. No foreign exchange premium. Taxes add 45% to the cost of collection and 20% to financial marketing costs. No input subsidies or labor market distortions. Value of land added to economic cost of domestic factors.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	120	(18)	138
TRADEABLES	17	17	0
LABOR	81	81	0
DOMESTIC FACTORS	38	45	(7)
TOTAL COST	136	143	(7)
PROFIT	(16)	(160)	145
Value Added (Financial) Rf-Tf			103
Value Added (Economic) Re-Te			(34)
Profitability Coefficient Pf/Pe			0.10
Subsidy Rate to Producers (Pf-Pe)/Re			(8.20)
Nominal Protection Coefficient			
a) Outputs Rf/Re			(6.79)
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			(3.03)
Private Cost Ratio (Df+Lf)/(Rf-Tf)			1.15
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			(3.69)



Table 8.7 Policy Analysis Matrix for Maize Exported by Relief Agencies

PAM FOR MAIZE EXPORTED BY RELIEF AGENCIES FOT KAMPALA: 1992			
ASSUMPTIONS: MAIZE IS EXPORTED BY AN INTERNATIONAL RELIEF AGENCY FOR DISTRIBUTION IN THE REGION. PRICES ARE QUOTED FOT KAMPALA. Yield = 1,625 kg/ha. No foreign exchange premium. Taxes add 45% to the financial cost of collection and 20% to financial marketing costs. No input subsidies or labor market distortions. Value of land added to economic cost of domestic factors.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	120	152	(32)
TRADEABLES	17	17	0
LABOR	81	81	0
DOMESTIC FACTORS	38	45	(7)
TOTAL COST	136	143	(7)
PROFIT	(16)	9	(24)
Value Added (Financial) Rf-Tf			103
Value Added (Economic) Re-Te			135
Profitability Coefficient Pf/Pe			(1.76)
Subsidy Rate to Producers (Pf-Pe)/Re			(0.16)
Nominal Protection Coefficient			
a) Outputs Rf/Re			0.79
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			0.77
Private Cost Ratio (Df+Lf)/(Rf-Tf)			1.15
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			0.93



Table 8.8 Policy Analysis Matrices for Groundnuts: 1991 and 1992

GROUNDNUT POLICY ANALYSIS MATRIX: UGANDA 1991			
ASSUMPTIONS: YIELD = 800 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	350	348	2
TRADEABLES	31	31	0
LABOR	215	215	0
DOMESTIC FACTORS	92	103	(11)
TOTAL COST	338	349	(11)
PROFIT	12	(1)	14
Value Added (Financial) Rf-Tf			319
Value Added (Economic) Re-Te			317
Profitability Coefficient Pf/Pe			(8.30)
Subsidy Rate to Producers (Pf-Pe)/Re			0.04
Nominal Protection Coefficient			
a) Outputs Rf/Re			1.01
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			1.01
Private Cost Ratio (Df+Lf)/(Rf-Tf)			0.96
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			1.00

GROUNDNUT POLICY ANALYSIS MATRIX: UGANDA 1992			
ASSUMPTIONS: YIELD = 700 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	550	462	88
TRADEABLES	36	36	0
LABOR	301	301	0
DOMESTIC FACTORS	129	146	(16)
TOTAL COST	466	483	(16)
PROFIT	84	(21)	104
Value Added (Financial) Rf-Tf			514
Value Added (Economic) Re-Te			426
Profitability Coefficient Pf/Pe			(4.07)
Subsidy Rate to Producers (Pf-Pe)/Re			0.23
Nominal Protection Coefficient			
a) Outputs Rf/Re			1.19
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			1.21
Private Cost Ratio (Df+Lf)/(Rf-Tf)			0.84
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			1.05

Table 8.9 Policy Analysis Matrices for Soybeans: 1991 and 1992

SOYBEAN POLICY ANALYSIS MATRIX: UGANDA 1991			
ASSUMPTIONS: YIELD = 1,000 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	150	157	(7.33)
TRADEABLES	10	10	0.00
LABOR	121	121	0.00
DOMESTIC FACTORS	20	29	(8.99)
TOTAL COST	151	160	(8.99)
PROFIT	(1)	(2)	1.65
Value Added (Financial) Rf-Tf			139.88
Value Added (Economic) Re-Te			147.21
Profitability Coefficient Pf/Pe			0.32
Subsidy Rate to Producers (Pf-Pe)/Re			0.01
Nominal Protection Coefficient			
a) Outputs Rf/Re			0.95
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			0.95
Private Cost Ratio (Df+Lf)/(Rf-Tf)			1.01
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			1.02

SOYBEAN POLICY ANALYSIS MATRIX: UGANDA 1992			
ASSUMPTIONS: YIELD = 800 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	250	94	155.97
TRADEABLES	4	4	0.00
LABOR	166	166	0.00
DOMESTIC FACTORS	31	46	(14.41)
TOTAL COST	202	216	(14.41)
PROFIT	48	(122)	170.38
Value Added (Financial) Rf-Tf			245.54
Value Added (Economic) Re-Te			89.57
Profitability Coefficient Pf/Pe			(0.39)
Subsidy Rate to Producers (Pf-Pe)/Re			1.81
Nominal Protection Coefficient			
a) Outputs Rf/Re			2.66
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			2.74
Private Cost Ratio (Df+Lf)/(Rf-Tf)			0.80
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			2.37



The Nominal Protection Coefficient (NPC) on output provides a measure of the disparity between the existing producer price and what it could be without taxes and subsidies, given current international market prices. If the NPC is below unity it indicates that the farmer is receiving less than international price equivalent and there is an implicit tax on export of that particular commodity. If the NPC is greater than one, the difference between the relative prices reveals an implicit subsidy or protection from competition. The extent to which the NPC differs from unity reflects the degree of net taxation or protection. An opposite interpretation applies to the NPC on inputs. An NPC greater than one implies a tax on inputs used to produce that commodity. An NPC less than unity would imply a subsidy on inputs for that crop.

For Uganda, most of the NPCs on output are less than unity, primarily because of the taxes on transportation. Since these taxes affect all commodities, however, they do not introduce a bias against any one particular commodity. In those cases where the NPC is greater than unity it is a result of strong domestic demand which has pushed the price above the export value of the commodity[195]. Uganda's landlocked location provides considerable natural protection for domestic producers, and the gap between the export parity price and the import parity price is very wide. Producer prices would have to rise above the import parity price before they induced competition from food imports.

Negative profitability coefficients reflect the fact that for several commodities, farmers earn less than the going market wage on their family labor, as discussed in Chapter Seven. This is not unusual in a highly subsistence economy where farmers give priority to meeting food needs and diversify their production to minimize risk.

The effective protection coefficient (EPC) combines the impact of the dual exchange rate system on both inputs and outputs. Previously, inputs imported at the official exchange rate were highly subsidized, but at present input subsidies are of minimal importance. If the EPC is greater than one, the farmer is being protected by various

---

[195] In 1992, maize exports FOB Mombasa would actually lose money due to high transportation costs to the coast. This causes the high negative NPC.

positive incentives to produce. If it is less than one, the EPC indicates a disincentive to produce the commodity in question. Again, the primary policy influencing the EPC in Uganda is the taxation on fuel and vehicles, which is passed back to the farmers in lower farmgate prices.

The question of the current competitiveness for export is addressed by the DRC ratio. The attractiveness to Ugandan farmers given existing policies is reflected in the Private Cost Ratio. For ease of comparison, these measures are summarized in Table 8.10. The increase in both the Private Cost Ratio and the DRC Ratio for most crops in 1992 is directly related to the fall in yields that year due to drought conditions.

Table 8.10 The Private Cost and DRC Ratios for Alternative Crops: 1991 and 1992

Commodity	1991		1992	
	Private Cost Ratio	DRC Ratio	Private Cost Ratio	DRC Ratio
Cotton	1.16	.95	1.12	1.30
Tobacco (flue cured)	.91	.71	.85	.52
Beans	1.31	.35	1.12	.81
Sesame	1.06	.52	.95	.85
Maize (Import Parity FOT)	NA	NA	1.15	.93
Maize (FOB)	1.06	(163.60)	1.15	(3.69)
Groundnuts	.96	1.00	.84	1.05
Soybeans	1.01	1.02	.80	2.37

NA = Not Available
Source: Calculated from data in Agricultural Secretariat (1991 and 1992)

Even given the lower yields in 1992, Uganda retains its ability to compete in the export markets for tobacco, beans and sesame. High marketing costs result in low producer prices for these commodities,

however. Returns to labor are below the rural wage rate. The degree of disincentives to produce is reflected in the extent to which the Private Cost Ratios exceed unity.

Uganda clearly does not benefit by producing maize for export outside the region, as indicated by the extremely high DRC ratios for maize exported FOB Mombasa (Table 8.6). The negative sign on the DRC ratio means that Uganda incurs a net loss in foreign exchange by engaging in maize export at these prices. The combined foreign exchange cost of inputs and marketing expenses is so high that it exceeds the export value of the maize. This is in distinct contrast to Uganda's strong competitive position when selling maize to the relief agencies on a FOT (free on transport) Kampala basis for export within the region. The Private Cost Ratio for maize also exceeds unity indicating that in both years farmers lost money by producing maize.

In 1991, Uganda exhibited a competitive advantage in cotton production, with a DRC ratio of 0.95. The fall in international prices combined with the lower yields in 1992 resulted in the DRC ratio rising above unity. this implies that the alternative uses for domestic resources such as land, labor and capital exceeded the value of the foreign exchange gained by production for export. The Private Cost Ratio remained unfavorable during both years, despite the subsidy element included in the 1992 producer price.

Small productivity increases could easily shift Uganda into a competitive position for groundnut production (Table 8.8). Under current productivity levels and market conditions, the DRC hovers very close to one. The high domestic demand for groundnuts contributes to their low Private Cost Ratio. It should be noted that this analysis excludes any value for the groundnut hay.

Tobacco is the only commodity that exhibits both a low Private Cost Ratio and a strong competitive position for export (Table 8.2). Expansion of flue cured tobacco production is constrained by the high on-farm capital requirements[196] and the existing limitations on British American Tobacco's marketing and processing capacity. Clearly,

---

[196] Tobacco production is labor intensive and requires considerable capital for both input procurement and barn construction.

expanded production would enhance both smallholder incomes and foreign exchange earnings.

Because BAT holds an effective private monopoly on tobacco processing, the marketing and extension relations between BAT and its producers differ from other crops. Producer prices are set by government in advance of the planting season, based on negotiations with BAT and the producer's cooperative[197]. Producers are members of cooperatives which act as conduits for inputs and extension services on credit from BAT. This is the most effective input distribution, extension and marketing system in the country. Careful consideration should be given to whether an association of edible oil processors could provide similar support to oilseed producers. The element of competition between processors is a complicating factor, however, and intervention to ensure against defection might be required in order to make it work.

While the drought induced rise in soybean prices resulted in a favorable Private Cost ratio in 1992, Uganda cannot be competitive in producing soybeans for export. Limitations on demand are likely to constrain further growth in soy production unless improved markets for cake make increased crushing profitable.

8.3 SENSITIVITY ANALYSIS

Cotton, sesame and groundnuts are the export crops of most direct concern to the edible oils industry[198]. For this reason, further sensitivity analysis is conducted on the DRC ratios for these commodities to answer the following questions:

- Given expected future world market prices, can Uganda be competitive in future export markets?

---

[197] In 1992 rising export prices were not fully passed back to farmers resulting in an increased gap between financial and economic farmgate revenue.

[198] Because of sunflower's high bulk and low value to weight ratio, sunflower exports are unlikely to ever be economically viable for a land-locked country such as Uganda.

- If Uganda does not have a competitive edge in producing this commodity, what would costs and prices have to be in order for Uganda to become competitive?

8.3.1 Sensitivity Analysis for Cotton

The future of Ugandan cotton production will have a critical impact on the edible oil industry. Uganda is disadvantaged in all its exports by the high cost of transportation to port. Uganda must be a lower cost producer in order to deliver its cotton in Europe at the same price as other producers facing lower transportation costs. Comparisons show that despite low yields and the high cost of marketing resulting from inefficiencies in the cooperatives and LMB, Uganda is still a low-cost producer of cotton lint. Table 8.11 summarizes the cost of production estimates for several competing African and international producers. These figures need to be viewed with caution because the estimates are for different years and have not necessarily been calculated in the same way. They are, nonetheless, indicative.

Uganda is apparently among the lowest-cost producers of cotton lint in the world[199]. Among the comparison countries, only Zimbabwe and Australia have lower costs of production. This factor, combined with the premiums accruing to Uganda's longer staple, roller-ginned, hand-picked quality, should contribute to Uganda's future ability to compete on the world market.

Based on the PAM analysis, it is possible to calculate the world market price at which Uganda's DRC just equals unity. This price can be compared with projected future prices to suggest the likelihood of future competitiveness, assuming no significant changes in the cost of production. Historical data show that from 1970 through 1986, the border price that Uganda realized was nearly identical with the reported world market price for grade A middling cotton CIF in northern Europe (from Agricultural Secretariat, 1992). This implies that the cost of

---

[199] The cost of production comparison is highly dependent upon the choice of exchange rate. Uganda is at a policy advantage because of its lack of exchange rate distortion. The comparative figures for other countries are valued at their official exchange rates, which may be overvalued in some cases.

Table 8.11 Cross-Country Comparison of Cotton Production Costs

Country	Year of Estimate	Cost of Production ($US/kg lint)
Uganda[a]	1991/92 1992/93	0.93 0.97
Cameroon[b]	1985/86	2.08
Senegal	1985/86	2.04
Burkina Faso	1985/86	1.34
Mali	1985/86	1.29
Cote d'Ivoire	1985/86	1.60
Kenya	1988/89	1.04
Tanzania (Traditional) (Modern)	1988/89 1988/89	1.36 1.60
Zimbabwe (Small Scale) (Large Scale)	1988/89 1988/89	1.73 0.75
Pakistan[c]	1986/87	1.01
Iran	1986/87	5.70
Philippines	1986/87	1.20
US - Far West US - Southern Plains US - Mississippi Delta US - South East	1986/87 1986/87 1986/87 1986/87	1.59 2.00 1.53 1.98
Columbia	1986/87	2.38
Israel	1986/87	1.94
Australia	1986/87	0.86

[a] Based on data from the Agricultural Secretariat (1991 and 1992).

[b] Data for Francophone and Anglophone Africa from the MADIA Study (1989) cited in Kristjansen et.al. (1990).

[c] All other countries from International Cotton Advisory Committee (1988) cited in Kristjansen et.al. (1990).

international shipping was largely offset by the quality premiums. Since 1986, quality has deteriorated and the realized border price has averaged $.18/kg less than the world market price. Using alternative price predictions from the World Bank (1993) and the BCGA (1993), we can project a possible 1995 border price range for Ugandan cotton of between $1.44 and $1.70 per kg[200]. The breakeven border price for 1991/92 was $1.46. That for 1992/93 was $1.30. At 1992/93 costs of production, Uganda's DRC could exceed unity even at the lower end of the price range, which assumes that the cost of transportation exceeds the quality premium.

The major drawback has been Uganda's high marketing costs[201]. No adjustment was made in the previous PAM analysis for the current high costs of processing and collection of cotton due to low throughput, low capacity utilization and inefficiency in the cooperatives and LMB. There is, therefore, further scope for improving the competitiveness of Uganda's cotton if privatization reduces the costs of production by correcting these inefficiencies. The BCGA (1993) is also projecting significant increases in yields and ginning outturn with the release of purified seed over the next few years.

A recent PAM analysis for Kenya assessed the potential impact of improving the capacity utilization of the ginneries from 50% to 90% (Kristjanson et al., 1990). The change in capacity utilization alone resulted in a fall of the DRC for Kenyan cotton from 1.02 to .72. While there is inadequate detail in the Agricultural Secretariat's cost data to test the impact of improved capacity utilization, improving on the Uganda's current 38% capacity utilization would clearly enhance Uganda's competitive position.

---

[200] The low end of the range uses the lower World Bank price projection of $1.62 and deducts $.18 for transportation. This assumes that quality has not yet improved sufficiently for premiums to offset the cost of shipping. The higher estimate is the BCGA price projection for grade A middling cotton ($1.70/kg), assuming that premiums offset all shipping costs.

[201] The marketing and processing costs comprised 38% of the export value of lint in 1991/92 but fell to 32% in 1992/93. This is very high compared to non-African producers. In West Africa the processing and marketing margins range from 33% to 46% (Lele et al., 1989). The relevant parastatals, however, provide additional rural development services, making it difficult to interpret any comparison.

Sensitivity analysis was conducted to show the impact of increasing the ginning outturn from 32.5% to the West African average of 38%. Such an improvement in the ginning ratio has a significantly positive impact on the DRC ratio. Improving only the ginning ratio reduces the 1991/92 breakeven price to $1.27 and the 1992/93 price to $1.16, both well below the projected 1995 price range[202]. A second sensitivity analysis, however, showed that even a 20% reduction in marketing costs had minimal impact. This suggests that improved efficiency in ginning operations may be the most important potential contribution of privatization.

Interestingly, the most recent data obtained from UNEX (the cooperative export advisory body funded by USAID to assist the cooperative unions to export their own cotton lint) indicate that in the first half of 1993 the five most efficient cooperative unions were able to achieve substantial improvements in processing compared to the national average. Their ginning ratio averaged 38.5% and total marketing and processing costs fell by 20%. Such changes may be indicative of the positive impact of changing the incentive structure facing processors. These improvements, however, were partially offset by a further worsening of the realized export price, which fell to $1.07. Table 8.12 illustrates the impact such changes had on the DRC ratio. With the improvements in marketing and processing, the DRC ratio has fallen to .97 despite the lower international price. If international prices increase to predicted 1995 levels and the new research and seed multiplication project helps to recapture the quality price premiums for SATU and BPA, Ugandan cotton should be in a strong

---

[202] An improved ginning ratio would also be beneficial for the oil industry as it implies a smaller proportion of lint remaining on the seed. This reduces the level of delinting losses and improves the oil extraction rates for cottonseed.

Table 8.12 The Policy Analysis Matrix for Cotton Exported by Cooperative Unions in 1993

COTTON POLICY ANALYSIS MATRIX: UGANDA 1992			
SENSITIVITY ANALYSIS: RECALCULATION USING 1993 MARKETING COSTS AND GINNING RATIOS ACHIEVED BY FIVE BEST COOPERATIVES AND PRICES REALIZED IN PRIVATE EXPORT THROUGH UNEX. GINNING RATIO INCREASED TO 38.5%. MARKETING COSTS FELL BY 20%. REALIZED PRICE FELL TO $1.07. YIELD = 645 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS. PRODUCER PRICE = 340 USH/KG SEEDCOTTON.			
	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE (PER KG LINT)[a]	883	1,049	(166)
TRADEABLES	122	122	0
LABOR	779	779	0
DOMESTIC FACTORS	77	124	(47)
TOTAL COST	977	1,024	(47)
PROFIT	(94)	25	(119)
Value Added (Financial) Rf-Tf			761
Value Added (Economic) Re-Te			927
Profitability Coefficient Pf/Pe			(3.73)
Subsidy Rate to Producers (Pf-Pe)/Re			(0.11)
Nominal Protection Coefficient			
a) Outputs Rf/Re			0.84
b) Tradeable Inputs Tf/Te			1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			0.82
Private Cost Ratio (Df+Lf)/(Rf-Tf)			1.12
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			0.97
DRC BREAK-EVEN EXPORT PRICE FOT			$1.05
PCR BREAK-EVEN PRODUCER PRICE PER KG SEEDCOTTON			376

[a] Analysis is conducted per kg of lint, not per kg of seedcotton. At a ginning ratio of 38.5%, 2.6 kg of seedcotton is required to generate one kg of lint.

competitive position. The impact of privatization on ginning and marketing efficiency, however, remains to be seen.

8.3.2 Sensitivity Analysis for Groundnuts

In 1992/93 the breakeven border price for groundnuts was $620/mt as opposed to the realized price of $600. A mere 4% price increase would have reduced the DRC ratio to unity. While no price projections are available for groundnuts, discussions with exporters indicate that Ugandan groundnuts are selling at a substantial price discount compared to South American nuts of similar quality. If increased experience on

the part of private sector exporters leads to improved marketing strategies and a stronger international reputation for Ugandan exports, this may be sufficient to move Uganda into a more competitive position. Further market research is required, however, to identify the specific cause for the quality discounts offered on Ugandan groundnuts and determine the cost of alternative measures to improve the grade and price of exports.

Additional analysis shows that either a 20% reduction in marketing costs, or a 5% decrease in farm-level production costs (equivalent to a 35 kg/ha increase in yields at the same cost) would have allowed Ugandan groundnuts to achieve a DRC of 1 in 1992. Both alternatives appear achievable, especially given that 1992 was a drought year. The primary issue for groundnuts will, however, continue to be the price situation on the domestic market. Unless production increases significantly, leading to a fall in domestic prices below the export parity price, exports will be a consideration only after the domestic demand has been satisfied.

8.3.3 Sensitivity Analysis for Sesame

The PAM analysis for sesame was conducted in late 1992 when the export price was still at $600/mt. By 1993, the price has fallen to $400/mt. Breakeven analysis suggests that below an international border price of $540/mt, Uganda can no longer profitably export sesame. If current market conditions hold, Ugandan sesame cannot compete on the international market. Consideration should be given to crushing to maintain producer incentives, particularly if niche markets for undecorticated sesame oil can be developed.

CHAPTER NINE: THE ECONOMIC VIABILITY OF EDIBLE OILS PROCESSING IN UGANDA

9.1 THE ADVANTAGES AND DISADVANTAGES OF ALTERNATIVE PROCESSING TECHNOLOGIES

Even though installed processing capacity is high in Uganda, Chapter Five demonstrated that total throughput has been low. Many millers complain that oilseeds processing is unprofitable. Throughput and profits have been constrained by a number of factors, including:

- Lack of raw materials.
- Low oil content of available oilseeds.
- High cost of assembling sufficient quantities of raw materials from widely dispersed small producers, and the high costs of transporting bulky low-value oilseeds to centralized processing locations.
- The high cost of capital (1993 lending interest rate averages 23%) and the shortage of working capital credit to enable processors to pay cash for oilseeds at harvest.
- Severe problems of machine maintenance. Lack of technical support for local manufacture and repair of machinery and replacement of worn parts.
- Poor electrical supply, resulting in extensive downtime[203]. The high cost of diesel, which faces a 130% excise duty, makes it uneconomical as an alternative power source[204].

The main objective of this chapter is to quantify the economic impact of these constraints on the cost of edible oil processing using alternative processing technologies. There are several possible approaches to oilseed processing, varying from large-scale solvent extraction used in developed countries, to the small-scale manual cold press method used at the village level. The three major types of

---

[203] It is not at all unusual for upcountry expellers to have no electricity for weeks at a time. In some locations power is often available only at night.

[204] Gasoline is taxed at an even higher rate of 175%.

commercial oilseed processing used in the developed countries are mechanical extraction, solvent extraction and prepress-solvent processing[205].

Mechanical extraction presses the oil out of the seed using an expeller. The expeller was patented by V.D. Anderson in 1896. Initially designed to press whale blubber aboard ship, this machine came into serious use for processing cottonseed, flax and other oilseeds, beginning in 1904. Expelling was the dominant method of oil extraction until late 1950's. In 1949 the process of precooking prior to expelling was developed. The primary economic gain from cooking is that it increases the oil yields from the 40-75% maximum recovery possible with cold processing to 95% for cooking. Oil quality is lowered by the high processing temperatures but this is offset by lower refining losses. Refining losses with cooking typically range from 3% to 1% depending on the free fatty acid content of the seed as compared to 9-15% for cold processed oil. Cold pressed meal is subject to bacterial and fungal incursions. Cooking deactivates the legume trypsin inhibitors in soybeans and groundnuts. It also sterilizes the meal and destroys salmonellae and most other harmful bacteria (Bunker et al., 1991)[206]. This process rapidly dominated extraction. By the mid-1960s most oil was produced by cooking and extraction.

Small- and medium-sized expellers are just downsized versions of the industrial expellers. Because of the high costs of many of the components, these machines are expensive to install and maintain, but if operated with good maintenance and financial management, can produce viable enterprises.

Most expellers can crush a wide variety of oilseeds without significant changes in the process, although modifications in the expeller configuration and speed would make for more efficient extraction from particular seed types. Expeller extraction has higher energy and maintenance costs and is more labor intensive than other

---

[205] For a detailed discussion of the stages involved in processing with each type of facility, see Scheithauer and Dripchak (1988).

[206] Unfortunately, spore formers such as anthrax are not destroyed.

commercial methods. Expellers also have a lower extraction rate than solvent methods. Even with precooking, 3.5% to 10% of the oil remains in the cake. Mechanical extraction facilities range in size from 1 ton/day to 200 ton/day. Studies show that economies of size are captured once production exceeds 5.5 mt/day[207]. The oil produced by small expellers is qualitatively different than that from larger mechanical extraction plants because it is unrefined. Seed cake from these small expellers retains a high oil content, necessitating rapid utilization to avoid the danger of aflatoxin contamination. Mechanical expellers represent less than 5% of U.S. processing capacity (Scheithauer and Dripchak, 1988).

Solvent extraction was introduced into the U.S. in 1939. Solvent extraction is used mainly for materials with an oil content of less than 25% (i.e., soybeans and cottonseed). This is the most common type of extraction facility in the U.S., accounting for roughly 55% of the facilities and nearly 80% of the capacity. First, the seeds are cracked and rolled into flakes. Hexane is then used as a solvent to wash the oil from the flakes. After several washings, the oil is separated from the solvent. The flakes are then sent to a desolventizer toaster where they are conditioned into a low-oil meal. Solvent extraction rates are high, typically 99.5% of available oil. All solvent extraction processes have high refining losses due to the presence of non-lipids and pigments. Solvent extraction lends itself to large economies of size. Facilities generally range from 500-3,000 tons/day to minimize per-unit operating expenses. In 1988, the average solvent extraction plant in the U.S. had a rated capacity of over 1,100 t/day (more than 10 times the size of the largest plant in Uganda). Such capacity would be excessive for Uganda's relatively small market and limited raw material supply.

Prepress-solvent extraction is used for oilseeds that have an oil content exceeding 25%. The pre-press extraction system was developed in 1956. It incorporates cooking and expelling prior to

---

[207] Mechanical extraction facilities with 1 mt/day capacity were found to be more cost effective than those in the 5.5 mt/day range primarily because of the assumption that installation at the farm level would imply reduced construction and labor costs and elimination of overheads and working capital expenses (Scheithauer and Dripchak, 1988).

solvent extraction. The expellers reduce meal oil content to about 12 to 20% producing high quality oil. This is followed by solvent extraction of the remainder. This procedure reduces the solvent extraction equipment required for a given throughput while reducing residual oil in the cake to less than .5%. Roughly 16% of U.S. processing capacity is made up of this type of facility. The most economical prepress solvent extraction plants in the U.S. are reportedly in the 5,000 mt/day range (Bunker et al., 1991).

9.1.1 Manual Ram-Press Processing

The availability of small affordable quantities is probably the single most important factor in marketing cooking oil in the rural areas of Uganda. The cost of transporting oilseeds from the rural production areas to the urban processing centers and then transporting the oil and feed cakes back to the rural consuming public is very high, however. Marketing and transportation costs are minimized by village-scale technology. In the rural markets, proximity to raw materials and local markets, less stringent consumer preferences, low management and capital costs, and short distribution chains favor local production of oils even if the extraction rates for such production are lower.

Various agencies have been experimenting with the design of appropriate technologies for processing edible oils at the village level. The most popular, and the one best suited to sunflower processing, is the Bielenberg ram press.[208] The ram press uses the principle of mechanical advantage to exert high pressure on a small quantity of seed with a minimum of labor. Seed from a hopper falls into

---

[208] KIT has also developed a manual spindle press with accompanying pre-press equipment. This system suffers from several drawbacks. It is expensive ($5,000 plus shipment and installation), and has a capacity of 250-300 kg/day. The complex series of steps in the processing precludes service pressing of small quantities. It therefore requires considerable working capital to ensure sufficient capacity utilization to repay the investment. The spindle press requires a more sophisticated level of maintenance and management than the ram press and takes six people to operate. A few of these presses were introduced in Uganda but none have operated successfully on a sustained basis. Seed dehulling, roller milling and spindle pressing is laborious. Operators tend to feel the payoff is insufficient to justify the effort. This system is unlikely to be adopted and is not analyzed further. For further details see Burgess (1991) and Kruse, Lubozhya and Raile (1991).

the chamber and as the long arm is pulled down, a piston forces the seed into a cylinder. The seed is restrained by the restriction cone at the exit of the cylinder. Pressure, up to 10 mt/sq in, and the tearing motion of the ram force oil out of the seeds. The oil is collected and allowed to settle (Bunker et al., 1991).

The ram press offers certain advantages over other available technologies. The most significant factor in its favor seems to be the small size of the operation. Investment and operating expenses are low. Management skill needs are minimal. The technology is simple, and repair and maintenance requirements low. Most of the oil produced can be sold to buyers within walking distance of the press, the majority of whom will provide their own containers. It has the added advantage of having virtually no reliance on imports for operations or maintenance. The capacity for commercial manufacture of village technology exists in Uganda, but a market for the technology has to be developed through extension efforts before manufacturers will be motivated to begin commercial production.

ATI experience with the ram press technology in Tanzania and Zimbabwe, and similar small-scale shea butter processing in Mali, strongly suggests that a broad understanding of the need for interventions at various levels in the subsector is critical to the success of small-scale oil processing. Needed interventions often include: 1) ensuring access to high-yielding, high-oil-content seed, 2) fostering sustainable fabrication of the equipment and spare parts, 3) promotion of ownership and management patterns that facilitate profitable use of the technology, 4) effective provision of extension, training and monitoring services, and 5) provision of unsubsidized credit based on careful appraisal of the credit-worthiness of the investor and strict enforcement of repayment (Hyman, 1991, 1993a and 1993b). With the provision of such support, however, ram pressing has proven highly successful. Small-scale producers will adopt new technology where the benefits are large enough, the costs affordable, and the risks manageable; but the characteristics of early and late adopters differ. The appropriateness of technologies that save women's time will depend on the cost of the technology relative to the economic status and productivity of the participants' alternative activities.

Key lessons from ATI's project in Tanzania include the following:

1. Initial resistance to a manually operated technology gradually diminished as modifications reduced the effort required to operate the press and news of its profitability spread.
2. Press owners expand their production of sunflower and readily adopt improved varieties. Rural pressing encourages adoption of high oil content seed by allowing farmers to experience the difference in oil content directly.
3. Most press owners provide service pressing in exchange for payment in-kind to increase utilization of the press beyond the limits of their working capital.
4. Individually owned presses are used more extensively than group owned presses.
5. Hired labor is usually used to operate the press, even when owners are male.
6. Seed cake sales are more problematic for ram press operators than oil marketing. The market for seed cake in Tanzania built up slowly over time as people became aware of its uses. Marketing cake to larger commercial farmers requires investment in handling and storage of cake until a marketable quantity can be accumulated for sale. There is a tradeoff between investment in storage facilities and loss of income through discarded cake.
7. Due to their limited outreach, small processors market their production almost exclusively in the rural areas. NGOs in Tanzania, Zimbabwe and Kenya note that while local oil production and consumption increased markedly, less than 5% of the oil produced by ram presses leaves the rural areas for urban markets. Improved oil processing supplants traditional processing methods in a similar way to that in which powered maize mills replace traditional grinding stones. It is unlikely to play a major role in supplying the larger urban markets.

9.1.2 Small-Scale Processing With a Motorized Expeller

The most common of the small mills in Uganda, the Rosedown Mini 40, was developed at the instigation of the Overseas Development Natural Resources Institute (ODNRI), which provided extensive financial and technical support to the manufacturer[209]. The Mini 40, together with an electric motor and basic spares, costs approximately $17,900 CIF Kampala and has a capacity of only 40 kg/hr.

Roughly 68% of the 138 Mini 40s produced by 1988 were located in Africa, most of them purchased with donor funds. Unfortunately, the performance of these mills has been very disappointing. An extensive evaluation (Zadek, 1989) of 19 presses in Zambia, Malawi, Cameroon and the UK found only 7 operating machines[210]. The evaluators concluded that the financial returns to users of the technology were negative at the low levels of operational efficiency commonly found in rural Africa, but positive at higher levels of operation. The economic returns, however, were found to be negative at any production level, due to the low value of the edible oil compared to the opportunity cost of producing the raw materials (Zadek, 1989). For this reason, ODNRI evaluators concluded that, while the Mini 40 was technically sound (though not necessarily any better than the Indian and Chinese machines it was designed to replace), the technology was inappropriate for the type of conditions existing in rural Africa.

There are a number of other types of small-scale motorized expellers available on the market. The Komet press from Germany has an even smaller capacity (25 kg/hr) and is really best suited to laboratory testing of seed oil content rather than for production purposes. There are several slightly larger expellers from Japan, China, Italy and

---

[209] Zadek (1989) reports that from 1978-1989 approximately £1 million was spent on research, development and testing of the Mini 40, of which 60% was financed through the ODNRI project. Total project costs are expected to equal roughly 22% of the real ex-factory sales price of every Mini 40 that will ever be produced during the 1978 to 1998 period.

[210] Reports from small mills in the Gambia have also shown that when depreciation of machinery is included these mills are not viable. Out of 16 small mills started by Catholic Relief Services, only 5 were in full working order after 6 years (Galton-Fenzi, 1993).

India. Their capacity ratings, estimated cost (CIF Kampala), and working capital requirement for six month's supply of sunflower are listed in Table 9.1.

Table 9.1 The CIF Price and Capacity of Available Types of Small Expellers

Model	Country of Origin	Capacity Rating Kg/hr	Estimated Cost (CIF Kampala)[a] and Date of Proforma US$	Six Month's Working Capital Requirement in US$[b]
Rosedown Mini 40	United Kingdom	40 kg/hr	$18,125 (1992)	$5,760
Komet	Germany	25 kg/hr	$9,300 (1991)	$3,600
CECOCO	Japan	120 kg/hr	$17,900 (1989)	$17,280
Hander	Japan	100 kg/hr	$27,500 (1991)[c]	$14,400
Simplex	India	80 kg/hr 225 kg/hr	$6,700 (1993) $19,200 (1993)	$11,520 $32,400
Tiny Tech	India	90 kg/hr	$3,300 (1992)[d]	$12,960
United Engineering	India	225 kg/hr	$16;500 (1991)	$32,400

[a] Expeller plus motor and standard spares only. Recommended preprocessing equipment such as decorticator, winnower, cooker, boiler, etc varies depending on intended use and is excluded.
[b] Assumes 120 days of crushing undecorticated sunflower for 8 hrs per day, using a sunflower price of $.15/kg.
[c] Information provided by an owner, no invoice available.
[d] With boiler, decorticator, and filter press, this system costs $7,100.

While market conditions in Uganda are quite favorable for small millers, most other factors are not. Firms running small motorized expellers face high levels of risk due to many factors in the operating environment. In addition to having a high initial investment cost, small expellers require efficient operation, careful maintenance, frequent replacement of costly imported spare parts, and adequate working capital to achieve sufficient capacity utilization.

Millers in Uganda complain of a serious lack of technical information and support. Most processing facilities in Uganda were

purchased with funding from various donor agencies. Equipment selection has been haphazard, usually dictated by the donor agency on the basis of little information. The few that were purchased with commercial financing are finding it virtually impossible to generate sufficient cash flow to meet financing payments. Delays in procurement and delivery (in excess of two years), lack of financing for construction, installation and working capital, and a 40% interest rate have nearly killed the six USAID-financed oil mills before they even begin operation. These medium-scale millers will require large lines of credit from the commercial banking system to secure adequate raw material supplies to operate at anywhere near capacity.

Worms, cage bars, cylinders, and choke rings all wear steadily under normal use. The rate of wear is greater, however, for undecorticated or dirty seed. Worms need rebuilding and replacement several times a year depending on the level of use, nature of seed cleaning and preprocessing, variety of oilseed, and regularity of machine maintenance. CECOCO (the Japanese manufacturer) claims that a worm and cage bar set should last 1,000 hours in normal use. Conscientious Ugandan millers often refill their worms every week during the busy season. Millers have a difficult time getting wear parts rebuilt or replaced. Downtime represents a high cost to small operations. Large Ugandan processors complain of up to 20% loss due to trash, moisture loss, spillage etc. Some processors even accuse farmers of intentionally adding dirt and stones to their seed to increase weight. Small processors often insist on cleaning the seed at the time of delivery and pay only for clean seed. This reduces payment for trash, but imposes high transaction costs on farmers wanting to deliver seed and is impractical for large deliveries.

Access to working capital is one of the biggest problems for small millers. Rural traders are generally unwilling to speculate on the sunflower trade because prices rarely rise enough over the season to cover the cost of capital and storage. On-farm storage losses are very high. Most farmers try to sell their sunflower as soon after harvest as possible in order to minimize losses due to rats and other pests. Competition with the large millers for the more accessible supplies of sunflower means that small processors must have ready cash to buy up as

much raw materials as possible at harvest. The miller is therefore obliged to construct storage facilities and hold input requirements for nearly six months. Inability to do so may well result in long periods of downtime between seasons due to lack of materials. The value of six month's working capital for each of the press models was included in Table 9.1 above. In most cases, the amount of capital tied up in six month's worth of raw material stocks exceeds the investment cost for equipment.

Small motorized expellers require a greater level of management to be successful. Mills with poor management are likely to fail due to competition and errors in judgment. The system is technically complex by rural standards. Financial management and marketing also need to be more sophisticated. As the scale of production increases, the identification of points of sale and development of a distribution system become increasingly important. Supply of storage containers, handling of finished product, maintenance of quality, and techniques for distribution to avoid tying up working capital are often key constraints for small processors.

Oil cake sales are problematic for small-scale processors. The greatest demand for cake is from the commercial feed manufacturers, and these are concentrated in southern Uganda. Small mills need to decorticate sunflower in order to reduce the wear on the machines, increase oil yield per hour of milling, and increase the value of the cake as livestock feed.

Kruse et al. (1991) quote a small expeller operator in Lusaka as saying "Small is NOT beautiful" and conclude their analysis of alternative processing technologies for Zambia by saying "While it would appear that the small motorized mill offers great potential for small enterprise development in Zambia, the many practical constraints identified during the course of this study have persuaded the team that this is an idea whose time has not yet arrived." These constraints are just as evident in the Ugandan case.

There are, however, special circumstances that will continue to allow selected small millers to operate profitably. In particular, the highly cross subsidized mills being run by NGOs may function quite well if they are well managed. Several small-scale private processors have

mentioned that many of the people they hire to operate their businesses are family members whom they would be obliged to support or subsidize in the absence of such an enterprise. During downtimes, such labor is often deployed on alternative activities (e.g., farming, construction etc.) whose benefits are rarely included in the enterprise accounts. For such processors, therefore, the wage bill is essentially a sunk cost and is heavily discounted in their assessment of the returns to investment[211]. Similarly, religious organizations often offer employment to parishioners or charity cases who would otherwise require alternative assistance.

The possibility of buying secondhand equipment, installing it in an existing underutilized building, and processing local oilseeds on a contract-milling basis may also be a viable low-cost option if sufficient raw materials are available locally.

9.1.3 Large-Scale Commercial Processing

9.1.3.1 Rehabilitation of Former Asian Large-Scale Mills

In 1989, Enger et al. reported that most of the existing large-scale expellers at former Asian mills were in repairable or usable condition. They highlighted the need for additional investment to improve pre-expeller preparation of raw materials and refining of oil, in order to operate efficiently and produce a product that would be acceptable on the market. Export Policy Analysis and Development Unit reviewed the status of the edible oil industry (EPADU, 1990) and recommended that the edible oil industry be developed for domestic and export markets. Based on that recommendation, the Uganda Cooperative Alliance (UCA) commissioned a consultancy to develop a strategy for the cooperatives to get involved in the Uganda oil industry.

The strategy proposed by Bunker et al. recommended that USAID

---

[211] The extended family structure puts great pressure on Ugandans. School fees and pocket money for the large numbers of AIDS and war-related orphans impose a heavy burden on the entrepreneurial class. Hiring such dependents in family businesses during holiday periods is one of the better ways to meet such expenses while inculcating a sense of responsibility.

provide grants to UCA to allow it to purchase equipment and facilities from the Departed Asian Properties Custodian Board on behalf of the cooperative sector and upgrade them with additional preprocessing equipment[212]. A large-scale processing company owned by interested cooperative society shareholders was envisioned. This approach was recommended in order to provide competition to the existing large-scale mills. This ambitious proposal concluded that the addition of one more large mill would create adequate production resources for Uganda to be self-sufficient in edible oils within 5 years, given production support and a reliable market outlet.

Little interest was aroused in the cooperative sector, however, because the analysis showed marginal profits, negative initial cash flows for several years even with grant financing of the capital investment, and the need for expensive skilled consultants to manage this complex business venture. Given the high levels of cooperative indebtedness and their poor managerial capacity, this proposal is unlikely to be implemented. The analysis, however, does address the question of the possible returns to investment in rehabilitation by returning former Asian owners, a number of whom are currently assessing market conditions and raw material availability in anticipation of possible plant rehabilitation.

9.1.3.2 Modern Large-Scale Facilities

The cost of transportation is a critical factor in determining whether large-scale, centralized processors can compete effectively with small local processors for the rural market. Oilseeds and cake are bulky and costly to transport compared to their value. There will always be some point at which local processing becomes more economic than centralized processing, but these boundaries shift with changing factor prices. The greater the economies of size that large processors can capture, the better able they are to absorb the cost of transportation involved in raw materials assembly and product

---

[212] Proposed renovations included facilities to decorticate sunflower and generate electricity and steam from the discarded hulls.

distribution. It appears that in the short term the balance in many areas of Uganda favors local processing.

9.1.4 Summary of the Advantages and Disadvantages of Alternative Technologies

The advantages and disadvantages of alternative technologies are summarized in the Table 9.2.

Table 9.2 Advantages and Disadvantages of Alternative Crushing Technologies

Technology	ADVANTAGES	DISADVANTAGES
All	▪ Good demand for oil at current prices.	▪ Poor quality of raw materials, especially sunflower and cottonseed.
Ram Press	▪ Low capital investment (<$500). ▪ Minimal preprocessing required. ▪ Reasonable extraction rate for a manual technology. ▪ Simple to manage. ▪ Low labor requirement and minimal skills needed. ▪ Easily accommodates service pressing. ▪ Can press sunflower, sesame or groundnuts. ▪ Can be locally manufactured and repaired. ▪ No imported parts required.	▪ Quality of seed is vitally important for both oil content and soft shell. ▪ Requires a high level of human effort. ▪ Rate of wear may be high with whole sunflower. ▪ Sunflower seedcake has lower value when undecorticated. ▪ Settling of crude oil is slow. Speeding the process requires fuel to heat the oil or a filtration system.

Technology	ADVANTAGES	DISADVANTAGES
Small Expeller	▪ Higher throughput relative to manual machines. ▪ Higher extraction efficiency relative to ram press. ▪ Achieves economies of size. ▪ Can serve a larger market. ▪ Cake quality better than manual because of lower oil content. ▪ Can process soybeans.	▪ Larger initial investment (>$8,000). ▪ Import requires foreign exchange. ▪ High working capital needs. ▪ Requires skilled labor. ▪ Regular maintenance critical to machine life. ▪ Excessive wear with undecorticated sunflower. ▪ Replacement parts expensive and difficult to obtain. ▪ Needs regular electricity. ▪ Needs greater management skills than ram press. ▪ Soybeans not heated enough to deactivate trypsin inhibitor.
Rehabilitated Large Expeller	▪ Greater economies of size and better extraction rates than small expeller. ▪ Reduced capital investment compared to new facility (about $1,000,000). ▪ Installation of preprocessing equipment results in export quality cake. (Precooking deactivates trypsin inhibitor, gossypol and aflatoxin. Decortication improves throughput, reduces machine wear and increases protein content of cake.)	▪ Requires a large catchment area for raw material. ▪ Working capital needs greatly increased. High cost of credit. ▪ Large, skilled labor force. ▪ Electricity and water supply problematic. ▪ Greater management and marketing skill required. ▪ Limited demand for cake. Export requires additional skills and knowledge. ▪ Must pay full taxes while imports largely untaxed.



Technology	ADVANTAGES	DISADVANTAGES
New Commercial Large Expeller	▪ Similar advantages to rehabilitated large expeller. ▪ Large enough to negotiate favorable international financing and donor assistance (e.g., PL480 tallow for soap production). ▪ Able to mobilize funds to pay cash for raw materials at harvest. ▪ Better product quality. ▪ Reduced raw materials transportation costs through use of empty return trips from soap and oil distribution. ▪ Large enough to make export feasible. ▪ Diversified production to reduce risk.	▪ Very high investment costs to recoup (Largest existing plant in Uganda cost nearly $7,000,000). ▪ Difficulty in obtaining adequate raw materials to run at full capacity. ▪ Poor international prices for cake but high transportation and marketing costs. ▪ High taxes. ▪ Stiff competition from inexpensive, untaxed imports.
Solvent or Prepress Solvent	▪ Large economies of size. ▪ High quality oil and cake.	▪ Too large to be viable in Uganda.

9.2 THE RETURNS TO ALTERNATIVE PROCESSING TECHNOLOGIES

Processing costs vary considerably depending on the type of technology. In addition, they are site-specific. The costs of land, construction, installation, labor, transportation and raw materials vary considerably by location. Processing costs are also highly sensitive to the oil content of the raw material. For any given extraction technology, processing costs are consistently higher for oilseeds with a lower oil content at all levels of production capacity (Scheithauer and Dripchak, 1988).

Most literature on the cost of oilseed processing in the U.S. is at least 10 years old. Interest in constructing oilseed processing facilities has been negligible in the past decade, primarily due to the chronic excess supply of edible oils that has led to the closure of several U.S. processing facilities[213]. The most recent available

[213] Scheithauer and Dripchak (1988) report that most U.S. processing facilities operate at less than full capacity, shutting down for an average of two and a half months each year.

study of the costs of American oil processing is by Scheithauer and Dripchak (1988). Figure 9.1 presents their estimates of the costs of processing alternative oilseeds with different types and scales of technology (at 1986 prices). This information is indicative of the costs of production against which Ugandan processors must compete. It must be interpreted with caution, however, because the analysis relied on updated cost studies from the 1970s and early 80s[214], rather than current cost of production data. More importantly, Ugandan oil producers are protected by Uganda's land-locked location and the resulting high transportation cost for imports. It is only if Uganda moves beyond import substitution and into export that the full impact of such price competition will be felt.

It is very difficult to obtain accurate information on the parameters necessary to evaluate the cost of processing edible oil in Uganda. Most engineering and feasibility studies assume efficient operation and ideal rates of throughput. Ugandan manufacturers who have access to cost data consider this to be proprietary information and are generally unwilling to make it available. NGOs, which may be more willing to reveal information, seldom operate in a commercial manner. They rarely keep adequate records to evaluate the profitability of their production. These operations also invariably involve many hidden subsidies (management, facilities, labor, utilities, transportation, donated equipment, etc.).

Available analyses of returns to investment in various types of edible oil processing are either feasibility studies for proposed financing of private investments, or project proposals that included provision of grants or credit as part of the investment (Bunker et al. for rehabilitated former Asian properties, Kruse and Burgess on small-scale expellers, Hyman on ram presses)[215]. This study, however, is not an economic analysis for a specific donor project, nor is it a

---

[214] Costs were re-estimated using the Uniform Cost-Estimation Method for Biomass Production and Conversion Technologies (published in 1985) and updated to 1986 dollars.

[215] None of these studies looked at the benefits or costs of such investments to the economy as a whole. Economic analyses, using world-market CIF prices for oil without import duties, were not conducted.

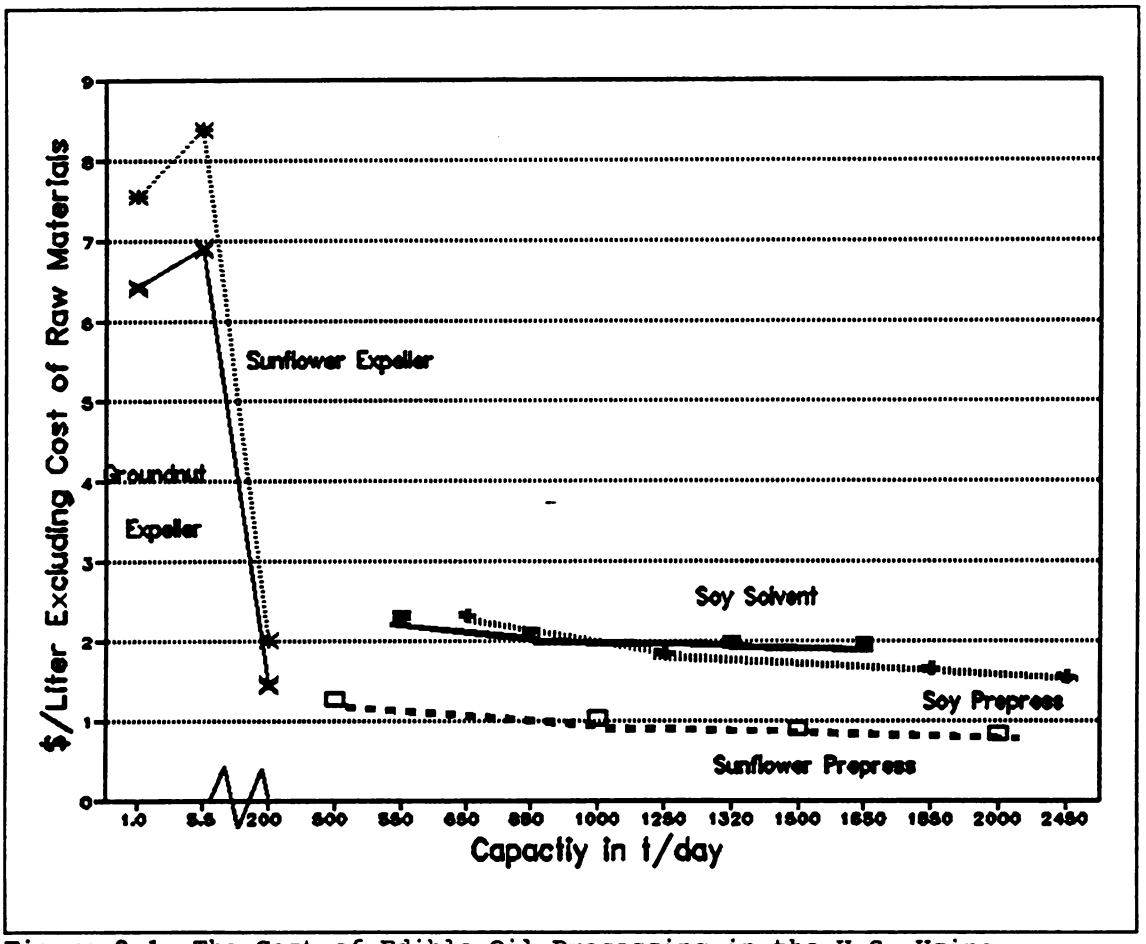


Figure 9.1 The Cost of Edible Oil Processing in the U.S. Using Alternative Technologies

feasibility study for a commercial investment decision. The objectives of this analysis are: 1) to evaluate the potential economic benefits of promoting edible oil processing as an import substitution activity as opposed to production of oilseeds or alternative commodities for direct export, and 2) to measure the impact of existing and potential policies on the incentives for efficient allocation of productive resources. As a result, the manner of shadow pricing and handling such issues as loans and finance charges differs from that used in previous studies.

Technical assumptions for the following economic and financial analyses of edible oil processing have been drawn from a number of secondary sources and adapted based on information obtained in extensive interviews with key informants in the processing sector in Uganda. June

1993 prices are used for all inputs and outputs in the analysis. The exchange rate at that time was 1,185 USh/$.

A simple economic cashflow analysis has been conducted for each technology. All costs and prices are presented in constant (real) terms. No attempt is made to project inflation rates or exchange rates. The result is an assessment of the real profitability of alternative technologies under current circumstances. The same price parameters are used in all models to facilitate comparison of the profitability of these alternatives. Because of the importance of adequate access to working capital, the cost of six month's supply of raw materials is included in the investment capital in year zero in all scenarios. Additional working capital requirements are incorporated as capacity utilization increases over time. Total working capital is then recovered in the last year of the analysis.

The economic and financial rates of return to each investment were calculated[216]. The rate of return (ROR) is comparable to the rate of bank interest that the investment would have to earn to achieve the same net returns. Once the ROR has been determined, it can be compared to the prevailing interest rate or some other measure of the opportunity cost of capital to determine the relative attractiveness of the investment. If the ROR exceeds the cost of capital, then the investment is considered economically worthwhile. Since the analysis is conducted in real terms, the appropriate comparison is with the real rather than the nominal cost of capital.

The financial rate of return reflects the profitability to the entrepreneur as opposed to the economy as a whole. Two measures are calculated, the ROR to all resources engaged and the ROR to equity after taxes[217]. These measures are calculated from the incremental net benefit stream based on the cash inflows and outflows each year. The ROR to all resources engaged summarizes the incremental net benefit

---

[216] The advantages and disadvantages of various alternative measures of project worth are discussed in detail by Gittinger (1982).

[217] For a further discussion of these measures, see Gittinger (1982) pp. 210-213.

stream before financing and taxes. This reflects the current financial benefits of the investment given the existing policy configuration.

The financial ROR to equity after taxes indicates the level of incentives for entrepreneurs to invest. It is based on the after-tax cash returns to the firm. There is a 10% sales tax on oil in Uganda that is levied at the manufacturer's level rather than the retail level[218]. The corporate income tax is 30%[219]. The analyzed scenarios, however, assume that all investments are equity financed (rather than loan financed). The resulting rate of return on the investment can then be used to assess the enterprise's ability to carry debt. If the real rate of interest is lower than the financial rate of return calculated for the enterprise, the business can afford to borrow money. In such cases, the financial rate of return would increase if loan financing were included, because of the leverage provided by the loan. No attempt has been made to calculate the financial ROR to equity after financing since this is highly dependent on the specific terms of the loan agreement[220] and is not directly relevant to the issue of import substitution versus export.

The economic ROR is calculated from the perspective of the entire economy. It assesses the annual benefits generated by the investment when inputs and outputs are valued in terms of their opportunity cost to the nation as a whole. Since edible oil is a traded commodity and substitutes for imports, it is valued at its import parity price (CIF import price plus transportation and marketing costs). Seed cake is also a potentially tradable good. Demand for feedstuffs is low in Uganda, however, and exports are limited by the high cost of

---

[218] For purposes of both the financial and economic analysis, revenues should be net of sales tax. Sales taxes are levied on edible oil at different points depending on the source of the oil (at the factory for domestic oil and in the import duties for foreign oil). Oil prices quoted at the retail level, therefore all include varying amounts of sales tax. Sales taxes are therefore included in the spreadsheets for the financial analysis to ensure that they get netted out of the reported wholesale (ex-factory) price.

[219] The sales tax was 30% until 1992. The 30% income tax only became effective in June 1993. Previously, the corporate income tax rate was 35%.

[220] To assess the viability of any particular investment loan, a specific feasibility study needs to be prepared.

transportation. It is therefore valued at its domestic market price. Taxes are excluded because they constitute a transfer within the economy. Open market exchange rates are used throughout.

Gittinger notes that electricity is an indirectly traded good whose value includes both imported generation and transmission equipment plus domestic factors of production. In addition, electricity and other utilities are often provided by monopolies, and public utility rates generally bear little relationship to the marginal cost of production. In 1992, Uganda exported nearly 37% of the electricity generated by the Owen Falls facility to Kenya, despite the severe shortage of power to meet even basic domestic needs. The export value of this electricity would therefore be one measure of its opportunity cost. The actual foreign exchange prices for electricity could not be obtained, but information for 1992 provided in the 1993-94 Background to the Budget indicates that income generated by this export represents only 13% of UEB's annual revenues. Either electricity is being exported at roughly 25% of its domestic price or collection of payment from Kenya is a serious problem. Given the shortage of electricity in Uganda, the potential value of domestically used electricity to alternative manufacturing industries would be an alternative opportunity cost measure. This is very difficult to estimate, however. Gittinger notes that such measures are rarely used in project analysis. Instead, a government planning office usually estimates a shadow price for electricity for use in project analysis. Such an estimate was not available, and therefore current rate charges were used[221]. It should be noted that such rates undoubtedly underestimate the opportunity cost of electricity, but electricity is a minor production cost.

In an economic analysis, labor should also be shadow priced at its opportunity cost. In Uganda most people have access to land for small-scale farming. Peak season labor shortages are an important factor in the agricultural sector, especially with the current reduction in draft cultivation. The rural wage rate is therefore considered a good measure of the marginal product of agricultural labor during peak labor periods.

---

[221] If a diesel-powered technology were being assessed, it would probably be necessary to shadow price diesel because of the high level of excise duty.

Gittinger recommends use of the marginal value product of agricultural labor (estimated by the rural wage rate) times the normal number of days such wage labor would be available in a year as the measure of the shadow price of unskilled labor for additional manufacturing enterprises. The financial cost of unskilled labor may be much higher, especially for formal-sector large-scale processors who must abide by minimum wage and employment regulations.. If we assume that the average rural person could get rural employment for 150 days per year (Uganda has two growing seasons) at the current average rural wage rate of 800 USh/day, this comes to an annual shadow wage of USh120,000 or USh10,000 per month for full-time employees[222]. This assumes that dry season employment opportunities are minimal.

To the extent that small-scale processors can hire temporary employees on a casual basis during non-peak labor periods, the actual opportunity cost of such labor may be very close to zero. Despite the extensive documentation on the importance of off-farm employment in Africa (Liedholm and Mead, 1990), at present the Ugandan economy offers few income generation activities outside the agricultural sector, especially in northern Uganda where political insecurity has drastically reduced the rural standard of living. Manual sunflower processing, which is most active during the longer dry season that follows the second season sunflower harvest, offers an important income generation opportunity. Investments that generate income during these periods exhibit an even larger differential between the financial and economic returns to investment because of the low opportunity cost of labor.

Skilled labor is in rather short supply, however, and market wages in the private sector are considered to reflect fairly well the opportunity cost of skilled labor. (In the public sector, official wages grossly underestimate the opportunity cost of labor. Productivity

---

[222] This compares to an national average rural salary for permanent labor of USh13,800 per month which would be the equivalent of 207 days of wage employment per year. The national average is pulled up by the higher permanent labor salaries for areas where perennial crops such as coffee and bananas spread the labor requirements over a longer production period. USh 10,000 per month is more common in areas with annual crops such as sunflower and cotton. Daily and permanent wage rates are averages provided by the Agricultural Secretariat based on a May 1993 survey.

in the public sector is very low because employees spend most of their time in unofficial activities designed to supplement their official salary. To get full-time effort, private sector wages must be much higher.) Social security taxes are considered transfer payments and are excluded from the economic analysis.

The major input for edible oil processors is the oilseeds themselves. Since these commodities are traded on the competitive open market, no shadow pricing was required for sunflower, which is non-traded internationally. For sesame, which has a greater potential for export, consideration needs to be given to the opportunity cost of the export foregone. In the economic analysis sesame is shadow priced at the international market price (FOB) less transportation and marketing costs.

In the financial analysis, capital investment includes duties. In the economic analysis, such duties are considered a transfer payment and are deducted from the investment costs.

Unfortunately it is not possible to verify all of the technical assumptions involved in the analysis. Sensitivity analysis is therefore critical to identify those parameters that have the greatest impact on viability and returns to investment.

9.2.1 The Returns to Ram Press Investment

An assessment of ram press enterprises in Uganda was conducted by Eric Hyman (ATI, 1993) using two alternative ram press models developed by ATI in Tanzania, the CAPU model and the smaller CAMARTEC BP-30[223]. These are the most popular available models and are likely to be introduced in Uganda by ATI's UPRESS project, which is to be initiated in late 1993. Data from his analysis has been adapted for comparison with other technologies. The assessment assumes recommended procedures for operation of the press and the availability of soft-shelled,

---

[223] CAMARTEC BP-30 ram presses have been in commercial use in Tanzania and Zimbabwe since 1991. In early 1993, ATI modified the CAMARTEC press to increase its durability and expected lifetime. The CAMARTEC has about the same extraction rate as the CAPU, but a lower throughput rate per hour.

high-oil-content sunflower varieties. In most cases village enterprises remain informal and thereby avoid the costs of taxation.

Table 9.3 summarizes the key assumptions used in the analyses of the CAPU and CAMARTEC presses. The price of both presses is expected to be higher in Uganda than in Tanzania. The sale price of the CAPU model in Uganda is approximately USh 445,000 ($376). The cost of the smaller CAMARTEC BP-30 press is expected to be around USh 318,500 ($269).

The farm-gate price of sunflower represents the opportunity cost of crushing, even if rural processors grow their own raw materials. The price of sunflower ranged from USh 130 to USh 160 per kilogram. This price is lower than the factory-gate price for large processors, which includes the costs of transportation.

The rate of return (ROR) to investment is calculated for three levels of throughput for each press. Availability of suitable sunflower varieties is likely to be a constraint, at least initially. The analysis, therefore, assumes lower throughput rates than have been obtained in Tanzania. The annual throughput rate ranges from 1,250 kg of seed to 4,250 kg with the CAMARTEC BP-30 press and 4,500 kg to 10,000 kg with the CAPU press[224]. In addition to extraction of oil from purchased seed, owners may also offer service pressing. Service pressing customers usually pay the press owner a share of the oil and seedcake in exchange for crushing the sunflower[225]. It was assumed that service pressing would add another 20% to these throughput levels. For purposes of this analysis, a pressing fee of 25% of the oil was assumed, as this is similar to the rates charged by existing NGO owned expellers. The economic analysis treats all throughput as if raw materials were purchased and products sold at their opportunity cost.

---

[224] In 1989/90, the average individual Tanzanian owner processed more than 10 mt of sunflower (Hyman, 1993b). In 1992 groups which owned older models of the ram press in Uganda reported an average press throughput of 3.75 mt. Some owners reported pressing more than the ten tons used as the optimistic assumption in this analysis, even with machines which were much more laborious to operate (Rugumayo and Kalyebara, 1992).

[225] Service pressing is widely practiced in Tanzania. The average pressing fee is 33% of the oil and 50% of the cake. The analysis assumes a lower level of service pressing than observed in Tanzania, because the practice is still new in Uganda.

Table 9.3 Technical Assumptions for Analysis of the ROR to Ram Press Investment

ITEM	CAPU PRESS			CAMARTEC PRESS		
	Low	Base	High	Low	Base	High
Cost of seed: USh/kg	130	140	160	130	140	160
Throughput: kg/yr (economic = all commercial pressing)	1250	2500	4250	4500	6500	10000
Service pressing: kg/yr	250	500	850	900	1300	2000
Lifetime of the press: yrs	5	5	3	10	10	7
Oil Yield: liters/kg	0.20	0.24	0.28	0.20	0.24	0.28
Oil price: USh /liter[a]	1300	1400	1500	1300	1400	1500
Cake yield: kg cake/kg seed	0.80	0.76	0.72	0.80	0.76	0.72
Press cost:	318,500			445,000		
Drums for oil storage: Expected lifetime 2 years	36,750			73,500		
20-liter jerrycans	5,000			12,500		
Cake price: USh/kg	50			50		
Labor cost: USh/liter[b]	150			150		
Seed cleaning: USh/bag[c]	250			250		
Marketing costs USh/liter	61			61		
Oil loss: %	9%			9%		
Repairs and lubricants: USh/year	31,850			31,850		
Firewood: USh/bag[d]	320			320		

No income tax on the profits of the ram press enterprise. No sales tax on oil.

[a] In the economic analysis oil is priced at the rural import parity price of 1,130 USh/lt.

[b] In the economic analysis labor is costed at 800 USh/day.

[c] A bag of sunflower assumed to weigh 50 kg.

[d] Firewood is used only for oil clarification.

Source: Adapted from ATI "Uganda UPRESS Proposal" 1993.

Added income to sunflower producers from service pressing is therefore captured in the economic benefit stream.

Price competition from imports and larger oil mills sets limits on the retail price of oil produced with the ram press. A price range of USh 1,300 - USh 1,500 per liter is assumed (US$ 1.01-1.27). This is slightly lower than the price of refined oil[226]. In the economic analysis oil is valued at its average CIF price plus transportation and marketing costs to the rural market (USh 1,130 = US$0.95/lt). Taxes on fuel, vehicles and spare parts and import duties and sales taxes on oil are excluded, since they represent a transfer payment within the economy.

Rural unskilled labor costs are also lower than urban skilled wage rates. Based on their Tanzania experience, ATI staff estimated the labor cost at USh 150 per liter produced. It requires 10 person-days to press 1,000 kg of sunflower seed with the CAPU press (twelve kg per hr) or 16 days with the CAMARTEC press (8 kg per hour). At this rate assuming a 5-hr work day, a laborer could earn USh 2,400 a day with the CAPU press (USh 1,760 with the CAMARTEC). This is higher than the rural wage rate (800 USh/day). Press operation requires certain skills, however, and incentives need to be high enough to retain experienced labor. In the economic analysis, the rural daily wage rate is used as the shadow price for labor, assuming a 5-hr working day.

The sale of the sunflower-seed cake could provide an additional revenue source for ram press owners. In Uganda, however, the market for animal feed is very limited. To be marketable, the seedcake from the ram press will have to be sold at a much lower price than the commercial feeds. This analysis assumes that the sunflower-seed cake from the ram press can be sold at about 35% of the price of decorticated cottonseed cake in Kampala. This is assumed to reflect the opportunity cost for

---

[226] In June 1993, the ex-factory wholesale price of sunflower oil sold by up-country expellers was USh 1,300 - 1,500 per liter in 20 liter containers. The Agricultural Secretariat's May 1993 survey found that the average rural retail price was 1,900 per liter but ranged from 1,300 to 2,800, with higher prices observed where no local processing facility existed. In Kampala, imported palm oil in 3-liter containers sold for USh 2,167 per liter and PL 480 food-aid soybean oil sold for USh 1,750/liter in 4-liter tins.

purposes of the economic analysis as well, since there is no export market for this cake.

The range of oil yields was 10% to 14% for both the CAMARTEC and the CAPU presses. These values reflect experience in Tanzania. The lower yields result from poorer varieties. Seedcake yield is inversely proportional to oil yield. A nine percent oil loss in clarification and packaging was assumed. The period of the analysis was extended to 10 years for both models. Allowance was made for the cost of replacing the presses as they wear out and salvage value at the end of the tenth year. Press lifetime varies with capacity utilization (see Table 9.3).

In the sensitivity analysis the assumptions for the oil extraction rate, oil price, and seed prices are varied. To account for the cumulative effects of changes in key variables on the profitability of the enterprise, the unfavorable scenario combines the lowest oil yield, the lowest oil price, and the highest seed cost, holding other assumptions from the base case constant. Alternatively, the more favorable scenario included a slightly higher oil price, lower seed price and higher extraction rate.

The ram press can also be used to crush sesame, which has a higher oil content than sunflower. During periods of strong export demand, sesame prices are likely to rise to levels that make crushing uneconomical. The current slump in sesame prices, however, favors oil production. The ROR to crushing sesame is analyzed, using 1991 and 1992 prices. Extraction and throughput rates were provided by ATI, based on experience in the Gambia (Schoonmaker Freudenburger 1993 and ATI, personal communication).

Table 9.4 summarizes the financial and economic rates of return for the two ram press models at three throughput levels[227]. Calculation spreadsheets for the base case scenario are found in Appendix 3.

If the real rate of interest is 10%, both the CAPU and the CAMARTEC BP-30 presses are profitable in Uganda under the current economic conditions reflected in the base case financial scenarios.

---

[227] The ROR is always rounded off to the nearest whole percentage point, since the underlying projections never can justify the implication of greater precision (Gittinger, 1982).

Table 9.4 The Rate of Return to Ram Press Investment in Uganda

SCENARIO		CAMARTEC Low	CAMARTEC Base	CAMARTEC High	CAPU Low	CAPU Base	CAPU High
Unfavorable Prices	Financial ROR	-07%	18%	31%	30%	40%	51%
	Economic ROR	-18%	02%	10%	19%	26%	71%
Base Case	Financial ROR	27%	63%	94%	78%	99%	124%
	Economic ROR	11%	39%	59%	56%	71%	99%
Favorable Prices	Financial ROR	54%	105%	154%	125%	158%	198%
	Economic ROR	32%	69%	100%	89%	111%	141%

Source: Results of Analysis

Under the less favorable assumptions of higher labor cost, higher seed price, and lower oil yield, the CAMARTEC press would be reasonably profitable at a medium- or high-capacity use rate. With base case assumptions, the CAMARTEC press is a highly profitable investment at the medium- and high-throughput levels. The CAPU press would be profitable at the lowest throughput rate analyzed, even with unfavorable conditions, and very profitable under favorable conditions or at the high-production level. It should be noted that these financial rates of return represent returns to the full investment including working capital, which exceeds the cost of equipment except at the lowest throughput level.

The financial capacity of press owners to purchase or produce sunflower will vary and some may need to secure additional financing for working capital. CAPU owners could easily afford to pay real interest rates of 15% under any scenario. Financing of the CAMARTEC press would be risky, especially under low input levels or unfavorable price relations. The sensitivity of the findings to the throughput rate illustrates the key role of working capital in the profitability of both presses. One way for enterprises with limited working capital to make more profit while expanding the social benefits to other farmers is through service pressing.

The CAPU model would be more attractive to a small entrepreneur with little working capital for seed purchases. Due to its lower initial cost, the CAMARTEC is more profitable than the CAPU when total

throughput is low. (Note that the highest throughput rate assumed for the CAMARTEC is slightly lower than the lowest rate for the CAPU.) The land requirements or working capital needed to grow or buy enough sunflower for profitable use of the press is lower for the CAMARTEC than for the CAPU. The CAMARTEC is, therefore, more suitable for low-income households with underutilized labor. At high levels of utilization, the Camartec's low investment cost may be outweighed by its shorter expected life span and possible higher labor costs[228].

In the economic analysis, the lower value of oil when priced at its import substitution opportunity cost is offset by the lower opportunity cost of labor and added returns to service pressing. If we assume that the social opportunity cost of capital is in the 15 to 20% range (in real terms), the CAPU model is worthwhile under all scenarios but the CAMARTEC is not worthwhile at the lowest throughput levels or unfavorable price relations. In general, both models appear to be sound investments that would contribute positively to national economic development. Total impact, however, is dependent on adequate throughput and limited by the small size of the investment.

The possibility of using the CAPU press to produce sesame oil was also analyzed[229]. Because sesame is exported, the economic analysis must included the export value of sesame at the farm gate level as well as the import substitution value for the resulting oil[230]. International prices for sesame have been changing, however. Three sets of price relations (those from 1991, 1992, and June 1993) were assessed. The assumptions and price relations under these three scenarios are presented in Table 9.5.

The results of the analysis are given in Table 9.6. The table shows that crushing of sesame is highly unprofitable under the

---

[228] Press operators are usually paid a flat rate per liter of oil produced. Because this is a new technology, there is no way to know whether the pressing fee will differ between models. The Camartec is slower, but this is offset by its ease of use.

[229] Results for the CAMARTEC are lower because of the smaller throughput. They are omitted in order to limit the number of variables under discussion.

[230] Both are expressed in local currency and are based on current costs of transportation and marketing, excluding taxes and duties.

Table 9.5 Assumptions for the Analysis of Sesame Crushing with the Ram Press

ITEM	CAPU PRESS		
	Low	Base	High
Cost of seed: USh/kg	265	300	375
Export Price of Sesame (FOB Mombasa): $US/mt	$400	$600	$700
Economic Value of Seed: USh/kg	243[a]	482[b]	628[c]
Yearly throughput: kg/yr (economic = all commercial pressing)	4500	6500	10000
Service pressing: kg/yr (economic = 0)	900	1300	2000
Oil Yield: liters per kg[d]	0.30	0.36	0.48
Financial Oil price: USh /liter	1,300	1,400	1,500
Import Parity Price for Oil: (Constant at current level) USh/lt	1,130	1,130	1,130
Cake yield: kg cake/kg seed	0.52	0.64	0.52
Cake price: USh per kg		50	
Labor cost: USh/liter oil (economic= 800/day)		150	
Oil loss: %		9%	

All other assumptions same as for sunflower analysis on CAPU press.

[a] Low prices are equal to current farmgate and export prices for sesame given existing marketing costs.
[b] Base case seed and export prices equal to 1992 levels.
[c] High prices for seed and export are those observed in 1991.
[d] Extraction rates from Schoonmaker Freudenburger (1993).
Source: Based on PAM analysis for sesame in Chapter 5.

unfavorable conditions of high sesame price, low oil price and low extraction rate. It is, however, financially profitable at all three levels of throughput under the base case assumptions and highly profitable under the favorable price relations. The current low export and farmgate prices for sesame will probably encourage a substantial degree of sesame crushing if presses are available.

The economic analysis is complicated by the need to consider the world market values of both oil and sesame. Expected extraction rates are also uncertain. The analysis was conducted with the current local currency equivalent of the world market price for oil, but varying both the export value of sesame and the extraction rate of the press. The

Table 9.6 The Financial and Economic Rate of Return to Sesame Crushing Using the CAPU Ram Press Under Alternative Scenarios

Type of Analysis /Scenario		THROUGHPUT		
		LOW	MEDIUM	HIGH
Financial ROR				
	Unfavorable	-33%	-31%	-29%
	Base Case	40%	48%	56%
	Favorable	129%	151%	175%
Economic ROR				
Export and Seed Price	Extraction Rate			
High Price	Low	-100%	-100%	-100%
(1991)	Base	-90%	-89%	-88%
	High	-55%	-54%	-53%
Medium Price	Low	-82%	-81%	-80%
(1992)	Base	-57%	-55%	-54%
	High	-13%	-11%	-10%
Low Price	Low	16%	22%	27%
(Mid-1993)	Base	47%	56%	66%
	High	99%	116%	134%

Source: Ram Press Analysis with Prices from PAM Analysis for Sesame in Chapter 6.

results show that at all expected throughput and extraction rates the economic returns to crushing sesame are negative except in the low export price scenario. At low export prices, however, the economy is better off if sesame production is diverted from export into crushing.

Changing throughput levels has minimal impact on the economic returns at the high to medium export price levels. It does have a significant impact at the lower price. Results are more sensitive to extraction rate. This indicates the need for careful testing to improve the appropriateness of the technology for crushing sesame[231].

Break-even analysis indicates that the economic rate of return at the medium extraction rate will equal 15% if the export FOB Mombasa price is $457/mt. At current real costs of marketing and

---

[231] Freudenberger (1993) also concluded that extraction rates were critical to the returns to sesame crushing in the Gambia.

transportation, the economic returns to crushing will exceed 15% whenever the export price falls below this level.

9.2.2 The Returns to Investment in Small Expellers

In 1992 USAID commissioned an evaluation of the potential for cooperative investment in large-scale edible oil processing. The consultants concluded that such investment was unwise, given the current levels of cooperative indebtedness and risky nature of the investment. They recommended primary-society-level investment in small-scale processing instead. The following financial and economic analysis is based on the technical assumptions of their report (Kruse and Enger, 1992).

The investment under consideration is a Tiny Tech expeller and filtration system, combined with a decorticator and winnower from UNATA or CECOCO. This is one of the least expensive small expeller systems (see Table 9.1) and has a higher throughput than more costly British and German expellers. Two Ugandan firms are using this equipment (without the decortication step) and technical extraction coefficients are available from an Intermediate Technology Development Group (ITDG) study in Zimbabwe (Russell 1990).

The Kruse and Enger analysis has been updated to mid-1993 prices. Specific issues related to project grant and loan financing have been removed to make the analysis comparable to those of alternative technologies. A base case, favorable and unfavorable scenario were analyzed at three levels of capacity utilization. The favorable scenario combines the low seed price, high extraction rate, and high oil price. The unfavorable scenario is the inverse. Table 9.7 summarizes the assumptions for the alternative scenarios.

Comparison with prices used in the ram press analysis reveal a number of minor differences. Seed prices are higher because of the cost of assembly from a wider catchment area. Oil prices are slightly higher, reflecting better quality as a result of the use of a pressure filtration system. It is assumed that oil will be sold wholesale in the rural towns rather than in the village. All packaging is in 20-liter containers. Seed cake prices are double those for undecorticated

Table 9.7 Technical Assumptions for the Small-Scale Expeller Analysis

ITEM	TINY TECH EXPELLER		
	Low	Base	High
Cost of seed: USh/kg	140	160	180
Percent of Capacity Utilization[a]	40%	60%	80%
Lifetime of the press: yrs	10	10	10
Oil Yield: liters per kg	0.22	0.26	0.30
Oil price: USh /liter (economic= 1,130/lt)	1,400	1,500	1,600
Cake yield: kg cake/kg seed[b]	0.55	0.51	0.48
Capital Investment: USh		22,690,000	
Cake price: USh per kg[c]		100	
Waste (Oil and Cake losses)		05%	
Labor Force:		7	
Marketing Costs (% of Sales)		02%	
Equipment Repairs as a percent of initial investment		5% - 14%	
Building Maintenance		5% - 10%	
Sales Tax (on Oil only)		10%	
Income Taxes		30%	

[a] In all scenarios capacity utilization in the first year is 40%. In the low scenario is stays constant. In the medium scenario it rises to 60% in year two and then stays constant. In the high scenario it increases to 80% in year three.
[b] Decortication of sunflower accounts for 20% of seed weight.
[c] Cake price higher than ram press because decorticated. Lower than large scale because of distance to market, high oil content, and no pre-cooking.
Source: Adapted from Kruse and Burgess (1992).

sunflower. Storability of cake is also improved by the lower residual oil content.

The financial ROR to all resources engaged and the financial ROR after taxes were calculated for each scenario. Table 9.8 presents the results of the analysis. Spreadsheet calculations for the base case scenarios can be found in Appendix 4. The results indicate that investment in small expellers is highly unprofitable under unfavorable conditions no matter what the capacity utilization rate. Under the base case assumptions, financial returns exceed the likely cost of capital (assumed to be in the range of 15-20% real rate of interest) only at high-capacity-utilization levels. Small mills need to grow as rapidly as possible within the limits of their input and output markets.

Table 9.8 The Rate of Return to Small-Scale Expelling

SCENARIO		CAPACITY Low	Medium	High
Unfavorable Prices	Financial ROR to All Resources	-38%	-19%	-11%
	Financial ROR After Taxes	-38%	-20%	-11%
	Economic ROR	-35%	-23%	-16%
Base Case	Financial ROR to All Resources	12%	25%	32%
	Financial ROR After Taxes	08%	18%	23%
	Economic ROR	-01%	10%	16%
Favorable Prices	Financial ROR to All Resources	45%	60%	67%
	Financial ROR After Taxes	31%	43%	49%
	Economic ROR	21%	34%	41%

Expansion is important to reduce overheads, improve preprocessing of seed, and justify carrying a parts inventory.

There is a tendency for a vicious cycle to develop around the issue of working capital. Given current prices, it will be very difficult for small expellers to pay the current interest rate of 23% for borrowed working capital unless they operate at near full capacity[232]. But to achieve high capacity utilization, most firms will require working capital loans.

To achieve the extraction rates assumed by the favorable scenario, millers must get good quality seed and observe excellent equipment maintenance. Lower seed prices can only be achieved if millers have the cash to buy large quantities of seed at harvest. Otherwise, competition from the larger millers may drive up seed prices to levels beyond what small millers can sustain. The ability to minimize losses on cake is also critical.

An economic analysis was also conducted. Adjustments were made to the prices of oil and labor to reflect their opportunity cost. Taxes embedded in the cost of containers and transportation were removed. The reduction in labor costs and taxes is more than offset by the lower value of the oil when priced at its import substitution equivalent.

---

[232] With the underlying rate of inflation at roughly 7.5%, this translates to a real cost of capital of approximately 15.5%. Borrowers who locked into long-term credit at 40% must refinance, or go under.

Economic returns are therefore lower than financial returns as seen in Table 9.8. If the social opportunity cost of capital is assumed to be in the 15-20% range, it is only under the most favorable price relations for extraction rate and seed price that the economic returns exceed their opportunity cost, and then only marginally if capacity utilization is low. Given the constraints on capacity utilization discussed earlier, the rapid expansion of small-scale expelling being promoted by donor efforts is not justified on economic grounds.

This analysis excluded investment in new building construction, and vehicles, both of which have been included in USAID-financed loan packages to small millers. Such additional investment may be necessary to the functioning of the firm in some circumstances, but will be difficult to finance at projected production levels. The added operating cost for diesel-powered equipment is also unsustainable[233]. This limits installation to areas along the main power lines and transportation routes.

9.2.3 The Returns to Rehabilitation of Large-scale Mechanical Processing

While rehabilitation of large-scale processing may not be a viable alternative for the cooperative sector, analysis of the returns to rehabilitation is central to understanding the likely future actions of returning Asian owners. The Bunker et al. (1991) analysis of the returns to investment in rehabilitation was adapted and updated to current prices for purposes of comparison with alternative technologies. Specific project-related components, such as financing arrangements, and cooperative bonus payments to farmers have been removed so that the basic financial and economic viability of the investment can be assessed. Three alternatives are analyzed. These include major rehabilitation for purposes of processing sunflower, the same rehabilitation for cottonseed processing, and a minor rehabilitation to enable the mill to begin operation at a minimal level without decortication or pre-cooking of the seed. Sensitivity analysis is

---

[233] A small diesel generator to facilitate proper emptying and shutdown of expellers during power outages, however, would probably pay for itself in reduced maintenance costs.

conducted on alternative levels of capacity utilization and price relationships.

The analysis assumes that an investment of approximately $1,300,000 in preprocessing equipment, filtration systems, infrastructure and renovation would enable one of the larger existing mills to achieve the capacity to process 25,000 mt of raw materials per year. The rehabilitated plant is designed to burn the hulls to generate electricity and steam, making the mill self-sufficient in energy. In contrast, the less extensive rehabilitation consists primarily of building, stores and office renovation, vehicle purchase, filtration and refining equipment.[234] Capacity utilization for the unimproved mill is assumed to be constrained by electricity failures and undecorticated seed and cake volumes. The mills differ in extraction rates and meal quality as a result of the pre-processing activities added by the more extensive rehabilitation.

The existence of a large stock of dormant fixed assets, primarily expellers, land, premises, storage facilities, and offices, reduces the level of required investment for the more extensive rehabilitation by more than 50%. Economic analyses of additional investment in existing processing capacity should be conducted on a "with project" minus "without project" basis. Only those incremental benefits in excess of what would have existed without the project can be counted as benefits of the new investment. In the case of the departed Asian mills, no information is available on the potential market for industrial properties or salvaged equipment. A number of these properties have been dormant for over 20 years. Most have been out of production since 1988 and are in such dilapidated shape that they cannot resume operation without significant investment. There are more than 100 idle expellers in Uganda, far more than are likely to be utilized in the foreseen future. Because of their age, and the high cost of transportation for such heavy equipment, these expellers would be difficult to sell outside the country. Most of the equipment, therefore, could only be valued as

---

[234] While the Bunker report itemizes the investments for the extensive rehabilitation, the information on the investment in the "unimproved mill" had to be reconstructed from the depreciation schedules. Total figures are accurate, but itemization is not possible.

scrap, and removal costs would outweigh much of that value, depending on the location of the mill.

For purposes of this analysis, the existing plant and equipment are assumed to have no alternative value. Depending upon the specific location and condition of the mill in question, however, this may not be the case. If an alternative market existed for a given property, the foregone sales revenue would need to be deducted from the net benefit stream in the first year, after adjusting for any costs incurred to put the property into salable condition. The impact is likely to be minimal compared to the scale of the investments being proposed.

The alternative price assumptions used for the sensitivity analysis are presented in Table 9.9. The base case scenario reflects observed conditions for mid-1993. The unfavorable scenario combines slightly higher seed price with lower extraction rates and lower prices for oil. The favorable scenario has a low seed price, high extraction rate and high price for oil. Values for the favorable and unfavorable scenarios are considered well within the range of possibility.

Oilseed prices are generally higher for the large-scale mill because of the cost of assembly and transportation from the main production areas. Oil prices, however, must be lower in order to compete with imports. Small mills are somewhat protected by the added cost of transporting oil to the rural areas.

The improved mill is supposed to extract 95% of the available oil from the decorticated seed, compared to 80% for the unimproved mill. Extraction rates from the Bunker report have been adjusted downward, however, because they seem overly optimistic about the oil content of the existing seed supply. Traditional Ugandan sunflower varieties contain only 16% oil and have a very hard seed coat, compared to roughly 40% for Sunfola and the new hybrids. Most sunflower in Uganda is highlymixed and the oil content of seed available for milling is estimated to be about 30% [235].

---

[235] Oil-content analysis of sunflower from 11 mills and farms where sunfola had been distributed ranged from 27% to 39% on a wet basis. On a dry basis (i.e., when all moisture in the seed had been removed by laboratory drying techniques) oil content of ranged from 31-40% of seed weight. Oil content is reported to be much lower in areas where sunfola is not yet available, but no analysis was obtainable.

Table 9.9 Technical Assumptions for Analysis of the Rehabilitated Asian Mill.

ITEM	"IMPROVED MILL"			"UNIMPROVED MILL"		
	Low	Base	High	Low	Base	High
Cost of sunflower: USh/kg	160	180	200	160	180	200
Cost of cottonseed:	100	120	140	NA	NA	NA
Maximum Capacity Utilization[a]	40%	60%	80%	18%	18%	18%
Lifetime of the mill: yrs	10	10	10	10	10	10
Extraction rate: lt/kg sunflower	0.26	0.30	0.37	0.22	0.26	0.30
Extraction rate: lt/kg cottonseed	.13	.17	.22	NA	NA	NA
Oil price: USh/lt (economic= 1130/lt)	1,300	1,400	1,500	1,300	1,400	1,500
Cake yield: kg cake/kg sunflower[b]	0.52	0.48	0.41	0.74	0.70	0.66
Capital Investment:	1,551,000,000			780,000,000		
Cake price: USh per kg	140[c]			50		
Waste (Oil and Cake losses)	0.8% (0.4% - cotton)			6.2%		
Sales Tax (on Oil only)	10%			10%		
Income Taxes	30%			30%		

[a] Capacity utilization scenarios for the first five years are as follows: low: 10%, 20%, 40%, 40%, 40%). Medium: (10%, 20%, 40% 60%, 60%). High: (10%, 20%, 40%, 60%, 80%). Production in all scenarios is constant at year five levels for years 6-10.

[b] Decortication of sunflower accounts for 23.25% of seed weight. Decortication of cottonseed accounts for 45.9%.

[c] Cake price higher than unimproved mill because of decortication and pre-cooking.

Capacity utilization is assumed to build slowly for the rehabilitated plant due to constraints in the seed supply. Utilization is projected to peak at 60% in year four of the base case scenario.

The results of the analysis are presented in Table 9.10. Returns to investment in the more extensive rehabilitation are quite high. The low capital requirements for a given level of capacity when rehabilitating existing facilities improves the return on investment. Even under unfavorable price assumptions and low capacity utilization, the financial returns after taxes probably exceed the real cost of capital when the improved mill is processing sunflower[236].

The economic returns at the lower extraction rate embodied in the unfavorable scenario, however, are probably less that the real social opportunity cost of capital. The lower opportunity cost of labor is not sufficient to offset the lower import substitution value of the oil because of the capital intensive nature of the technology. Most of these facilities are located in Kampala or Jinja. The import substitution value of the oil is even lower than for small mills, because it does not include the real costs of transportation and marketing involved in moving imported oil to the rural areas. Under more favorable assumptions, the economic returns to rehabilitation for sunflower processing are acceptable at all levels of capacity utilization[237].

Cottonseed processing with the improved mill is less profitable, however. At the current prices of cottonseed and oil, the returns are roughly equal to the real cost of capital. If the competition for available cottonseed pushes up the price, however, the returns rapidly

---

[236] These results differ significantly from Bunker et al. (1991) which reported a positive NPV at 25% interest but a negative IRR. The calculation of the IRR was incorrect. Depreciation is only included in the financial analysis for purposes of calculating income tax. The cost of initial project investment is incorporated in year one. Inclusion of depreciation as an operating expense double counts the capital cost. Since the IRR is that interest rate which would reduce the NPV to zero, a negative IRR implies a negative NPV at any positive interest rate.

[237] The initial costing by Bunker et al. expressed most variable costs on a per metric ton basis. These costs were updated to 1993 levels using the CPI. At low levels of production, the decline in certain costs, especially labor, may not be exactly proportional to output. The analysis may overstate the returns at lower utilization levels, but the difference is not expected to be significant.

Table 9.10 Returns to Investment in Rehabilitation of Existing Large Mills

SCENARIO		CAPACITY UTILIZATION Low	Medium	High
IMPROVED MILL PROCESSING SUNFLOWER				
Unfavorable Prices	Financial ROR to All Resources	23%	28%	31%
	Financial ROR After Taxes	16%	21%	23%
	Economic ROR	07%	11%	13%
Base Case	Financial ROR to All Resources	47%	54%	57%
	Financial ROR After Taxes	36%	41%	44%
	Economic ROR	25%	31%	34%
Favorable Prices	Financial ROR to All Resources	78%	85%	88%
	Financial ROR After Taxes	60%	66%	69%
	Economic ROR	47%	53%	57%
IMPROVED MILL PROCESSING COTTONSEED				
Unfavorable Prices	Financial ROR to All Resources	-28%	-26%	-49%
	Financial ROR After Taxes	-28%	-26%	-49%
	Economic ROR	-49%	-46%	-45%
Base Case	Financial ROR to All Resources	15%	20%	23%
	Financial ROR After Taxes	10%	15%	17%
	Economic ROR	-04%	00%	02%
Favorable Prices	Financial ROR to All Resources	47%	54%	58%
	Financial ROR After Taxes	36%	42%	46%
	Economic ROR	24%	30%	34%
UNIMPROVED MILL PROCESSING SUNFLOWER[a]				
Unfavorable Prices	Financial ROR to All Resources		-49%	
	Financial ROR After Taxes		-49%	
	Economic ROR		-70%	
Base Case	Financial ROR to All Resources		14%	
	Financial ROR After Taxes		10%	
	Economic ROR		-19%	
Favorable Prices	Financial ROR to All Resources		58%	
	Financial ROR After Taxes		43%	
	Economic ROR		17%	

[a] Lack of rehabilitation limits capacity utilization of the Unimproved mill to less than half of the lowest level for the Improved mill.

Source: Results of Analysis

turn negative. It is unclear how available cottonseed is likely to be in the next few years, given the move to privatization of the industry. If production expands and prices fall, cottonseed processing could become reasonably profitable. The economic returns to rehabilitation for cottonseed processing exceed the social opportunity cost of capital only under the more favorable assumptions concerning extraction rates and price of cottonseed.

There was insufficient information concerning the cost of investment, technical ratios, and production levels for a new large-scale processing plant to conduct a comparable financial and economic analysis. Unless substantial economies of size can be captured and higher extraction rates can be achieved, however, investment in additional new large-scale processing plants is unlikely to be profitable at current prices. Even if normal financial returns on investment can be achieved, the economic returns will probably be highly negative. Discussions with the management of existing firms indicate that variable production costs almost equal the CIF price of imported oil[238]. Without tariff protection local processors would be unable to earn a normal profit on their investment.

To cover the high investment costs, new plants will have to be able to capture a higher priced market than the rural Ugandan consumer. The largest Ugandan processor intends to do just that. Hydrogenation capacity was added to the plant in mid-1993[239]. The Kampala retail price of imported hydrogenated cooking fats averaged 60% higher than cooking oil in 1992-93, and the price gap has risen in recent months since price controls were removed in Kenya[240]. The Ugandan

---

[238] The CIF price of PL480 soybean oil in June 1993 was USh1,023 per liter. The CIF Kampala cost of palm oil imported from Singapore in three liter tins was USh1,300/liter. The CIF price per liter for larger containers would be less. The cost of raw materials, labor, container and variable inputs for cottonseed processing by the largest Ugandan firm was USh1,079 per liter when sold in 20 liter containers. When depreciation and sales tax are added, the cost rises to USh1,286.

[239] Most of the firm's oil production would be used as an input for the shortening, which is made from equal proportions of vegetable oil and palm stearine.

[240] Based on the retail price series collected by the PL480 Monetization Program.

manufacturer hopes to capture the local market and also export a substantial portion of the production to neighboring countries[241]. Processing of sesame oil to meet high-value niche market demand in Europe is another avenue being actively pursued. A potential market for 10 mt/day has been identified.

9.2.4 The Problem of Debt and Cash Flow

Insufficient data precluded the calculation of the financial ratios that analysts normally used to assess the efficiency and credit worthiness of a processing enterprise. General discussions with processors, however, highlighted their extreme cash-flow difficulties. Most donors finance only a portion of the initial capital investment. The local entrepreneurs are expected to provide land, buildings and installation expenses. The issue of working capital, however, is generally ignored to the jeopardy of the enterprise's economic viability.

For most processors the ratio of their current assets to current liabilities (known as the current ratio) is very low. Gittinger recommends that for a healthy processing enterprise the current ratio should be around 2. When the ratio drops below this level, the situation becomes unstable and consideration of refinancing of debt or supplemental loans or equity generally becomes necessary.

Enterprises with a low current ratio exist on a day-to-day basis and are forced to adopt uneconomic practices to survive. Inventories of raw materials are often so low that production efficiency is impaired. The firm may have to lower its sales price to ensure fast turnover and cash purchases. Inputs have to be purchased from importers in small lots and at high prices, foregoing the possibility of bulk discounts direct from overseas suppliers. Preventive maintenance is deferred with serious later consequences. All of these situations were frequently observed among Ugandan edible oil processors.

---

[241] Cost of production data for hydrogenated fats was not available because the plant was not yet on line.

The debt-equity ratio is another measure of credit worthiness that compares the proportion of total assets that is debt financed with the proportion that is financed out of owners' equity. The amount of equity in an enterprise acts as a "cushion" that allows a company to absorb initial losses or bad times. As Gittinger (1982, p. 208) explains, "Because debt carries a fixed rate of interest and fixed repayment of principal, too much debt may saddle a company with obligations it cannot meet when conditions are unfavorable."

The debt-equity ratio of Ugandan edible oil processors is generally very high. While there is no good rule-of-thumb for the debt-equity ratio, agro-processing enterprises generally need a strong equity base because they process commodities that fluctuate sharply in availability and price due to adverse weather conditions[242]. Many of the loans that have been provided for procurement of edible oil processing equipment will never be repaid, because these potentially viable enterprises lacked the managerial skills and equity working capital to operate efficiently and service their debt. Even if such debts are written off, cash flow difficulties may result in much of the capital equipment sitting idle for lack of working capital. Unless mechanisms are created either to inject working capital or to allow this equipment to be auctioned off to private investors with such capital, these investments will be a dead-weight loss to the Ugandan economy.

9.3 THE CHOICE OF TECHNOLOGY

Projects cannot be ranked directly on the basis of the ROR. The ROR only indicates in a general fashion whether one project contributes more to the national income relative to the resources used than another. Theoretically, all projects whose ROR exceeds the opportunity cost of capital should be implemented, as long as they are not mutually exclusive alternatives and sufficient capital is available to finance them. The owner of an existing mill cannot carry out both a major and a

---

[242] The conservative rule for a new enterprise is that equity should exceed debt. But in many developing countries equity capital is scarce, especially in the rural areas, and such a conservative rule may not meet national development objectives.

minor rehabilitation on the same mill, however. Given the difference in returns on investment, the analysis above showed that the more extensive rehabilitation is clearly the more profitable alternative. Based on the preceding analysis it would appear that investment in both ram press technology and rehabilitation of existing Asian mills is well justified. Investment in new small-scale expelling, however, will earn a return that is lower than the other two alternatives, and is likely to be less then the opportunity cost of capital. New investment in large-scale processing of oil for the rural market is unlikely to earn a positive economic rate of return.

Timmer (1990) stresses that the optimal choice of processing technology is a function of labor and capital costs. The following discussion employs analytical techniques developed to assess the choice of rice milling technique in Java (Timmer 1990). The analysis aims to examine the relative economics of alternative technologies in serving the edible oil needs of rural Uganda. The focus on rural oil needs is justified, considering that 89% of Uganda's population is rural and 69% of the edible oil is consumed in the rural areas.

An isoquant has been constructed that depicts the alternative oil processing techniques in terms of the relative capital/labor ratio employed to produce a given amount of value added. Four processing techniques are analyzed: the ram press, a small expeller, rehabilitation of existing large mills to incorporate pre-processing and a new large-scale mill that uses mechanical extraction. Solvent extraction and prepress-solvent extraction facilities were not considered because an economical size of facility would exceed the available supply of raw materials in Uganda.

The data and calculations for preparing the isoquant of value added by oil processing technique are presented in Table 9.11. The isoquant is presented in two dimensions, total investment cost and number of unskilled workers needed to run each facility. An isocost line can then be drawn tangent to the isoquant to determine the optimum capital/labor ratio for edible oil processing. Following Timmer, both capital and labor are presented as total costs rather than annual values. The total expected earnings of a laborer over a lifetime of 50

years[243] are therefore converted into a present value by discounting at alternative discount rates.

The first step in the calculation is to summarize the technical coefficients for capacity, investment cost and number of manual laborers required per shift for each type of technology. Step two is to standardize these coefficients in terms of numbers required to process one thousand tons of sunflower per year. The coefficients for each technology are adjusted to a comparable capacity. While it is not possible to install a fraction of a facility, this procedure makes the numbers more manageable while retaining their relative values for purposes of comparison.

The next step is to convert the thousand tons of sunflower input into a value of output. This requires determination of both the quantity of oil and cake produced and the value of those outputs. While extraction rates depend critically on the quality of the oilseed, as discussed earlier, an average rate is used in order to reflect the general trend for each technology, assuming comparable raw material inputs. The extraction rates used for this analysis are the base case assumptions used in the financial analysis. The ram press, with its lower capacity to exert pressure on the oilseed, is the only one of these technologies that is qualitatively different in nature. The others employ expellers of varying sizes. The more capital-intensive expeller facilities have demonstrably higher extraction rates, more as a result of the nature of the preprocessing of the raw materials than of the extraction efficiency of the larger expellers. The assumptions regarding extraction rates are summarized in the first two lines of Table 9.11.

The cake and oil values for each facility are shown in lines three and four of Table 9.11. Differences in the value of the cake result from the higher extraction rate, since decorticated low-oil-content cake is more storable and has a higher protein value for feeding. Although the oil produced also differs by the degree of refining to which it is subjected, price differentials are currently constrained by competition

---

[243] The choice of a 50-year working life follows Timmer's analysis. Given the high rates of future discounting, however, increasing or reducing this estimate by a decade has minimal impact.

Table 9.11 Derivation of a Unit Isoquant in Value Added From Oil Processing Assuming Equal Plant Utilization, and Equal Output and Input Prices.

The Choice of Milling Technique				
Data per Unit	Ram Press	Small Expeller	Rehabili-tated Asian Mill	New Large Mill
Extraction rate - oil	0.2184	0.26	0.3	0.32
Extraction rate - cake	0.76	0.51	0.48	0.46
Price oil	1400	1400	1400	1400
Price cake	50	100	140	140
Price seed	140	140	140	140
Crushing capacity (mt/yr)	28.8	150	6600	13500
Investment Costs (US dollars)	376	19,140	1,309,093	5,300,000
Operative laborers (# per shift)	4	7	150	95
Data per 1,000 Tons of Sunflower Input per Year				
Investment Cost (US dollars)	13,056	127,600	198,347	392,593
Operative laborers (number)	138.89	46.67	22.73	7.04
Oil output (tons)	218	260	300	320
Market price (USh/kg)	1,400	1,400	1,400	1,400
Cake output (tons)	760	510	480	460
Market price (USh/kg)	50	100	140	140
Value of Output (million USh)	343.8	415.0	487.2	512.4
Value Added (million USh)	203.8	275.0	347.2	372.4
Data per USh 10 million in Value Added per Year				
Investment cost (US dollars)	6,407	46,400	57,128	105,422
Operative laborers (number)	68.16	16.97	6.55	1.89

from imports and limited purchasing power on the part of rural consumers. Because of the high costs of transportation and marketing to the rural areas, the factory gate price of the better quality oil is essentially the same price as the rural processor can charge for the lower quality oil from the ram press.

As seen in the second section of Table 9.11, the physical and monetary conversions change one thousand tons of sunflower into USh 343.8 million worth of oil and cake by the ram press as opposed to USh512.4 million worth of products produced by the large pre-cook mechanical facility. Once the cost of the initial 1,000 mt of sunflower is deducted from the value of the products, the difference is even more dramatic, as seen in the last row of that section of the table. On the surface, such statistics would appear to strongly favor the larger processing technology.

The final stage of the analysis is to utilize the preceding information to calculate the investment cost and number of unskilled laborers needed to produce a given amount of value added using each of the technologies. The results of this conversion are shown in the last section of the table. These estimates of the cost of investment and number of laborers can then be used to form the x and y coordinates of the isoquant. The tangency of this isoquant with an isocost line comparing the cost of capital with the cost of labor then identifies the lowest cost technology for producing a given level of value added. Since a small number of technologies are used in the preparation of the isoquant, it takes on a linear-segmented form that results in only corner tangencies with the isocost line.

The slope of the isocost line is dependent on the assumptions regarding wages for unskilled labor and the discount rate. The appropriate social discount rate is difficult to determine for Uganda. Three alternative estimates of the discount rate, 12%, 18% and 24%, are used in this analysis. Figure 9.2 presents the choice of technology analysis assuming rural daily market wages for labor of USh 800 per day. Assuming 300 working days per year, this translates to an annual wage of $202/yr. Three technologies are compared, the ram press, the small expeller, and the new large mill. The analysis reflects the situation that existed in the mid-1980s when the existing Asian mills were run by

the Edible Oil and Soap Industry Ltd. (EOSIL) without any additional investment and edible oil prices were fixed by government. At that time entrepreneurs had only three investment choices. As the figure illustrates, the tangency point is clearly at the small mill. It is under these conditions that Uganda saw a massive expansion in small mills scattered around the country.

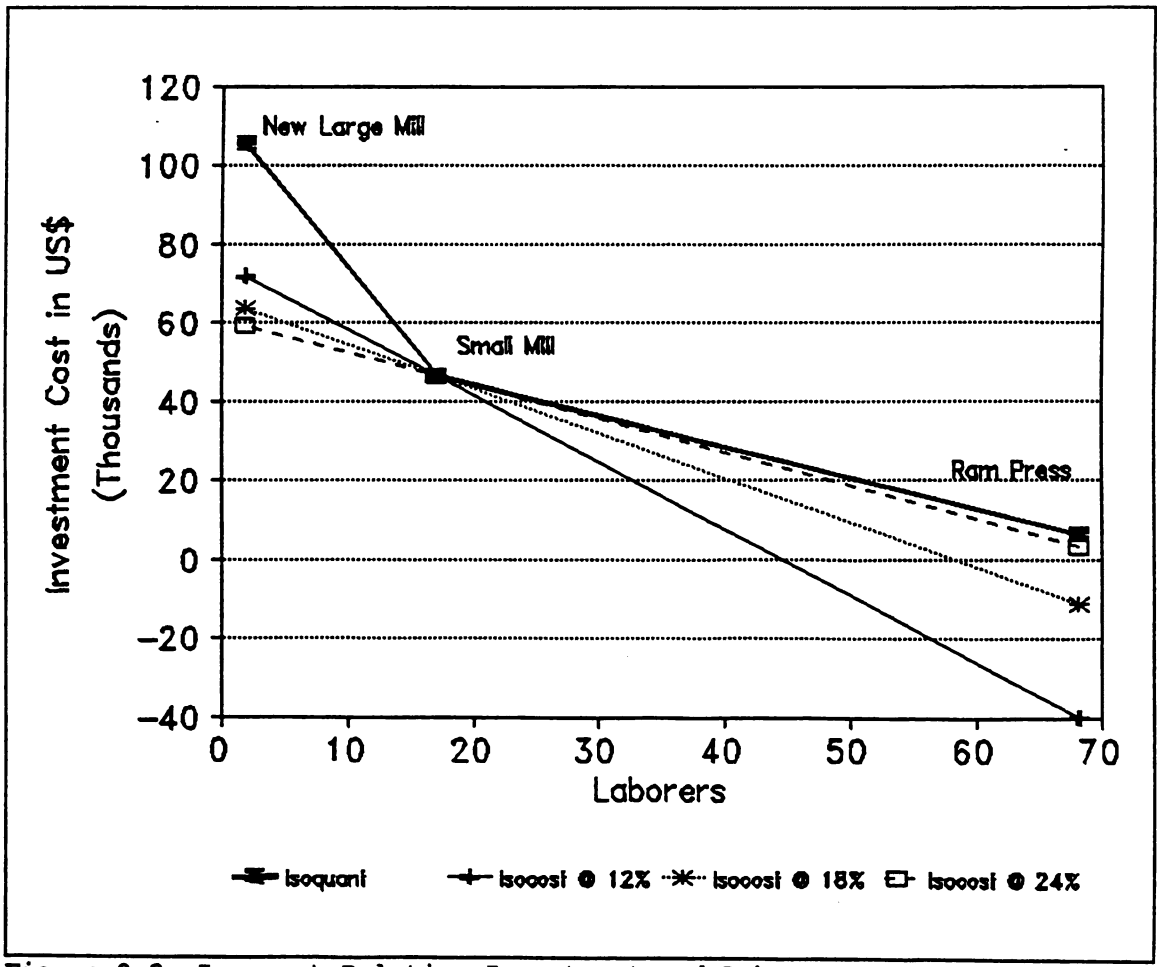


Figure 9.2 Isoquant Relating Investment and Labor Costs For Three Alternative Crushing Technologies, Assuming a Wage Rate of $202/year.

Earlier discussions pointed out that the opportunity cost for rural labor depends on the availability of wage employment throughout the year. The reduced demand for labor during the dry seasons results in less than full-employment opportunities for most casual laborers. These factors are taken into consideration in the sensitivity analysis. The same shadow wage rate used in the analysis of the economic ROR (10,000 USh per month) is used. This translates to an annual wage of

$101 at current exchange rates. The results are illustrated in Figure 9.3. At this shadow wage, the ram press becomes optimal at the higher discount rates of 18% and 24%, which are probably the most realistic. At a discount rate of 12% the small mill is slightly less costly.

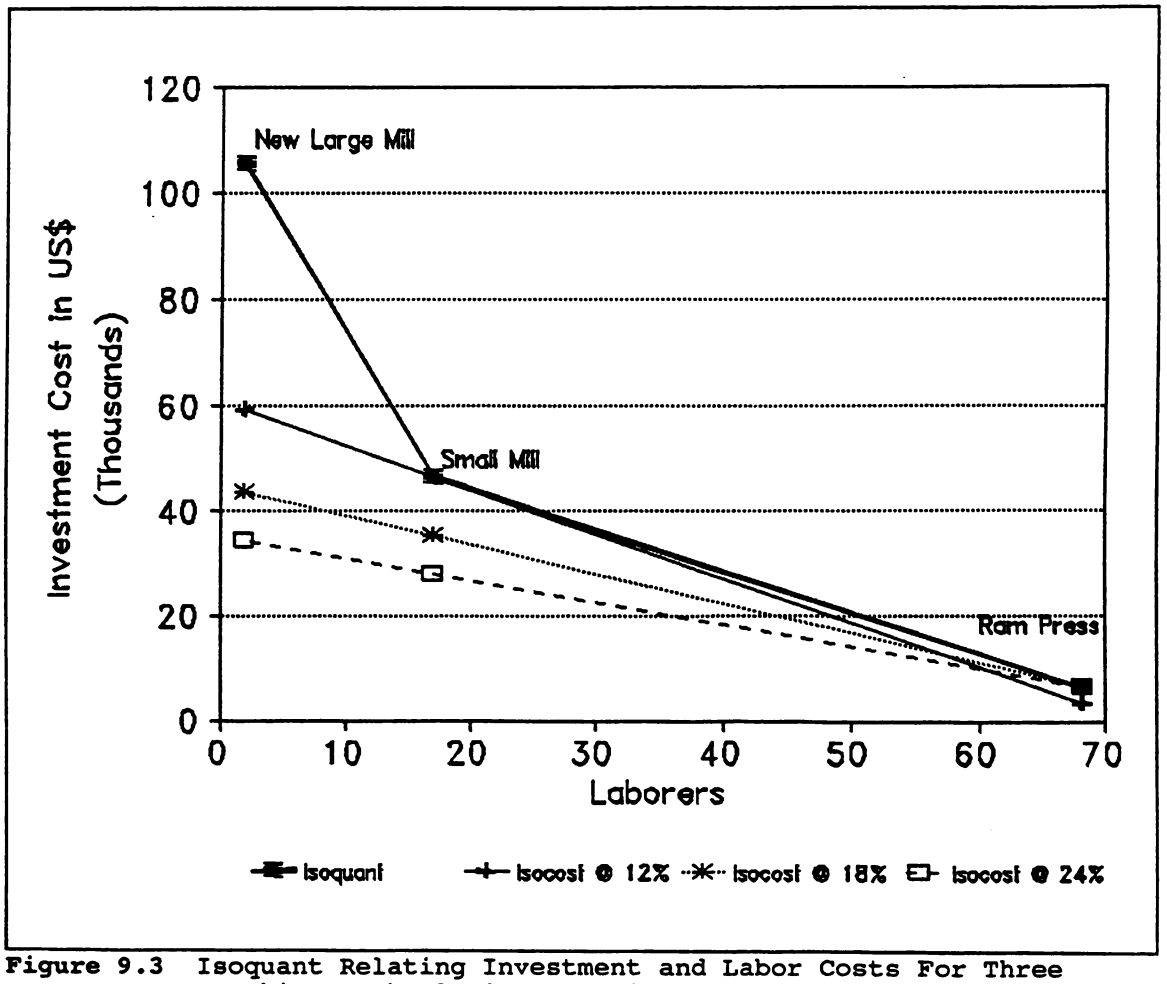


Figure 9.3 Isoquant Relating Investment and Labor Costs For Three Crushing Technologies Assuming a Shadow Wage Rate of $101/year.

Alternatively, if government were to impose a minimum wage law, social security taxes, or other benefits that significantly raised the cost of labor, the isocost line would become steeper. Figure 9.4 illustrates the impact of raising wages to $600 per year. This is the payment level actually proposed by the piece-rate system in the base case for the ram press. At this wage the new large mill now becomes optimal if the discount rate is 12%.

The previous analysis included a number of assumptions that are unrealistic given the Ugandan situation. A number of policy changes

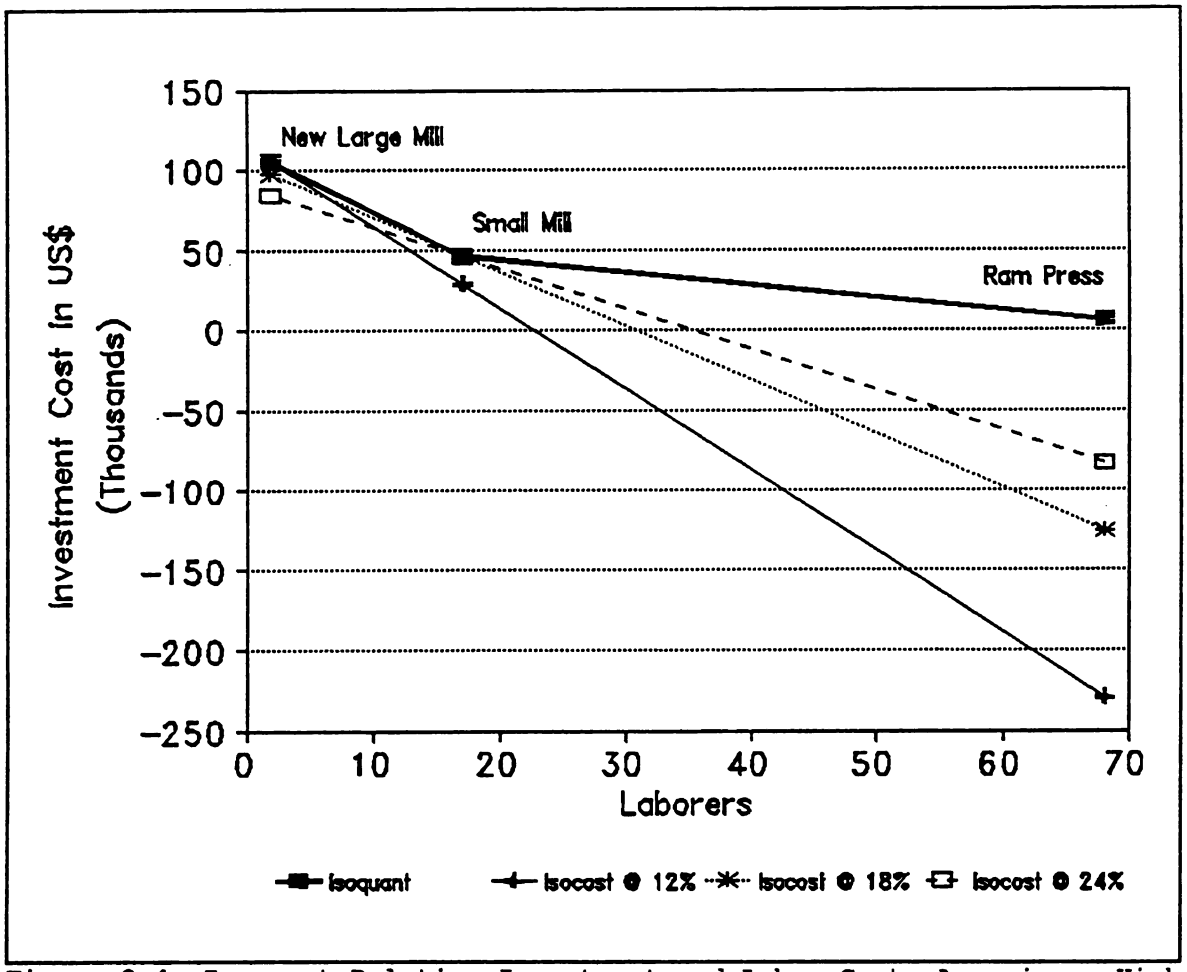


Figure 9.4 Isoquant Relating Investment and Labor Costs Assuming a High Minimum Wage of $600/year.

have taken place since the mid-1980s. Many former Asian mill owners are returning to claim their property. Decisions will need to be made as to whether to rehabilitate this stock of idle crushing capacity. In addition, price controls and foreign exchange controls have been lifted and competition from imported oils has become more intense. In the sensitivity analysis various scenarios are tested. The results under alternative scenarios are summarized in Table 9.12. The isocost graphs for each scenario are presented in Appendix 6.

The first adjustment to the analysis was to allow the possibility of rehabilitation of one of the old existing mills as an alternative investment. The third scenario modifies the initial assumption of equal input prices by recognizing that the rural processors have a price advantage in raw materials because of their location. It also incorporates the import parity price for the oil, which includes a

Table 9.12 The Lowest Cost Choice of Technology Under Alternative Analysis Scenarios.

Scenario	Wage Rate	12%	18%	24%
1 No rehabilitation of Asian mills possible. Equal number of hours of operation per year and equal prices for oil and seed for all technologies.[a]	$101/yr	Small Mill	Ram Press	Ram Press
	$202/yr	Small Mill	Small Mill	Small Mill
	$600/yr	Large Mill	Small Mill	Small Mill
2 Including the option of rehabilitation of an Asian mill. Equal number of hours of operation per year and equal prices for oil and seed.	$101/yr	Small Mill	Ram Press	Ram Press
	$202/yr	Rehabilitated	Rehabilitated	Rehabilitated
	$600/yr	Rehabilitated	Rehabilitated	Rehabilitated
3 Import parity price used as the price of oil including transportation to the rural area for the ram press and small mill. Prices of seed reflect the cost of transportation. Equal number of hours of operation per year.[b]	$101/yr	Ram Press	Ram Press	Ram Press
	$202/yr	Small Mill	Small Mill	Small Mill
	$600/yr	Rehabilitated	Rehabilitated	Rehabilitated
4 Expectation of two shifts per day for the new and rehabilitated large mills plus incorporation of replacement costs to bring all technologies to a 20 year investment period. Import parity pricing.[c]	$101/yr	Rehabilitated	Ram Press	Ram Press
	$202/yr	Rehabilitated	Rehabilitated	Rehabilitated
	$600/yr	Large Mill	Rehabilitated	Rehabilitated

[a] All technologies assumed to operate 2400 hours per year. Price of seed USh140/kg. Price of oil USh1,400/lt.

[b] Import parity price of oil USh940/lt in Kampala with container. Plus USh90 for transportation to rural area. Ram press adds USh100 per liter because it avoids the cost of containers. Cost of seed varies from 140 for the ram press to 180 for large urban mill.

[c] Life of ram press is five years under heavy use. Small mill and rehabilitated mill assumed to need replacement after 10 years. Replacement costs discounted to present value at 18%. Details of calculation found in Appendix 7.

savings differential because of the cost of transportation of oil to the rural market. The cost of containers is deducted from the final sales price for the oil produced by mechanized expellers to improve the accuracy of the estimation of value added by alternative technologies. This is not done for the ram press because these processors sell oil directly to final consumers who supply their own containers.

The final scenario is the most realistic. In addition to the modifications on pricing introduced in the preceding scenario, it also adjusts the assumptions related to capacity utilization and life of the asset. Total annual production for both of the large mill technologies was doubled in this scenario. Large urban mills operate most efficiently when they run at least two shifts per day. To assume that they operate an equal number of hours as the small mills underestimates the value added created by a given capital investment[244].

The economic life of the asset also differs between technologies. It is necessary to replace or replicate the investment a number of times to make the total life of the smaller technologies equal to the 20 year expected life of the new large mill. The present value of such future investment is therefore calculated and the total present value of the investment over the full twenty-year period is used as the capital cost of the technology in scenario four. The calculation table for value added under this scenario is included in Appendix 7.

The implications of alternative policies are highlighted by the results of the sensitivity analysis. The new large mill only becomes the optimal choice of technology when wages are higher than current equilibrium and discounted at 12%, which is probably lower than the actual social opportunity cost of capital. The ram press is the optimal choice at the shadow wage rate (for example in the rural areas where full-employment opportunities are not available) at a discount rate of 18% or higher. The introduction of the possibility of rehabilitating the former Asian mills captured the low cost position away from the small mills. Existing sunk costs allow the possibility of putting a large capacity on line with minimal capital requirements. The

---

[244] This is also true for the small mill, but for security and infrastructural reasons it is rarely feasible in Uganda.

recognition that large urban mills can feasibly operate two shifts per day while small rural mills cannot, further strengthens the advantage of the rehabilitated mill. Adjustment for length of life of the investment reduces the disadvantage of high capital investment on the new large mill, but not enough to make it the optimal choice except at a 12% discount rate. Under the current policy configuration, the analysis indicates that the ram press is the optimal choice for rural processing while rehabilitation of existing Asian mills dominates the choice of investment possibilities for the urban areas where wages are somewhat higher. The small mills are completely dominated as indicated by the irregular shape of the isoquant in scenario 4 (see appendix 6).

9.4 DRC ANALYSIS - IS DOMESTIC PRODUCTION OF EDIBLE OIL AN EFFICIENT USE OF RESOURCES?

Chapter Eight laid out the DRC calculations for a number of potential export crops produced in the non-perennial cropping areas of Uganda. That analysis identified beans, tobacco, sesame, and maize for the relief trade as annual crops with the greatest competitive advantage on the international market. The analysis did not include sunflower because there is no effective export demand for sunflower. Uganda's previous competitive edge in cotton was discussed. The need to improve ginning outturn and reduce marketing costs were pointed out as a possible means of returning to a competitive position even with current record low prices.

Once the cost of oil processing by alternative technologies has been assessed, it is possible to expand the DRC analysis to include import substitution of sunflower or cottonseed oil[245]. Would increased production of such import substitutes improve or hurt Uganda's foreign exchange position?

In Chapter Eight the export price was brought back to the farm gate by deducting the costs of transportation, marketing and processing from the border price. The financial analysis in the PAM matrix

---

[245] DRC analysis was not conducted for sesame and groundnuts, due to lack of accurate cost estimates and uncertainty over the value of the cake.

indicated the profits or losses to be made by farmers producing that particular commodity. By doing so, the analysis focussed attention on the incentives to farmers and the competitiveness of Uganda's agricultural production rather than its processing and marketing system. This is especially appropriate for grains and unprocessed oilseeds that are exported with minimal value added by the marketing chain. In assessing the competitiveness of edible oil processing, the analysis is shifted to the national level to facilitate sensitivity analysis of possible changes in costs and prices for processed outputs.

The DRC is calculated for the subsector as a whole, incorporating costs on the farm, in assembly, transportation, marketing and processing. The DRC is a one-shot picture as opposed to the ROR, which captures revenue and cost flows as they occur over time. The results are therefore dependent on use of an appropriate average value for cost and production levels[246]. The cotton ginning and marketing costs and farm level production costs used in this analysis are those calculated by the Agricultural Secretariat and used in the DRC analysis in Chapter Eight. Transportation and marketing costs are inferred from observed price margins at various levels as collected by the Agricultural Secretariat and the Ministry of Trade and Industry, Market News Service.

The choice of production level is especially significant in processing where low start-up production levels are likely to exaggerate the average cost of production in the long run. Processing costs and extraction rate assumptions are taken from the base case scenarios of the rate of return analysis for alternative technologies. Average costs per liter were calculated for each category of expenditure over the full ten-year analysis. Processing costs for the new large mill are based on information obtained in interviews with the major processor.

The adjustment from financial to economic values at the processing level is more extensive than that required for farm production. As pointed out in Chapter Eight, under current Ugandan foreign exchange and tax policies, there are few national macro policies that affect production incentives. The open market for foreign exchange eliminates

---

[246] As discussed in Chapter Two, the DRC analysis is not a marginal analysis and cannot predict the likely impact of major expansion at the margin.

the need for determining a shadow exchange rate. Financial costs are raised by taxation on fuel and transportation, but this is offset by the general exclusion of costing for land, which enters the economic analysis.

Given the high levels of urban unemployment in Uganda, urban wages exaggerate the opportunity cost of unskilled labor in processing. In the economic analysis unskilled labor was shadow priced in the same manner as discussed earlier in this chapter.

The capital-intensive nature of large-scale processing necessitates determination of a annual shadow price for capital. The shadow price of capital has two parts, the opportunity cost and the depreciation of the value of the asset due to wear and obsolescence. The opportunity cost of capital (OCC) is the cost to the economy of keeping money tied up in this particular investment. Both the opportunity cost of capital and depreciation (or replacement costs) are accounted for by using a capital recovery factor to estimate the annual equivalent value for a fixed input. It is used to determine the annual payment necessary to repay the initial investment over the economic life of the asset. This estimate of the annual cost of capital services includes both depreciation and interest payments. For the financial costing, the interest rate used in the calculation was set at the current interest rate of 23%. For the economic analysis the interest rate was set at 15%, which is approximately the real rate of interest at the present time. Investments in working capital have an opportunity cost, but no depreciation since they do not represent fixed physical assets.

The results of the analysis for sunflower are presented in Table 9.13. The analysis on sunflower was conducted for all four processing technologies. The base case PAM matrices for each technology are included in Appendix 8.

Because the DRC analysis is conducted at the national level, the Private Cost Ratio (PCR) indicates the financial profits or losses to all the actors in the production and processing chain. High profit ratios, therefore, can hide losses at either the farm or the processing level. In this case, previous analysis of the costs of production has already indicated a loss at the farm level in the production of both

Table 9.13 The DRC Ratio for Sunflower Processing Using Alternative Technologies

Scenario	Indicator	Ram	Small	Rehab	New
1 Base Case Assumptions from ROR analysis	Private Cost Ratio (Df+Lf)/(Rf-Tf)	.73	.79	.63	.69
	DRC Ratio (De+Le)/(Re-Te)	.84	.94	.73	.72
2 20% lower extraction rate as a result of low oil-content sunflower seed[a]	Private Cost Ratio (Df+Lf)/(Rf-Tf)	.83	.88	.76	.81
	DRC Ratio (De+Le)/(Re-Te)	1.00	1.10	.84	.86
3 International price for oil falls by 20%[b]	DRC Ratio (De+Le)/(Re-Te) PCR - No Change.	1.06	1.30	1.00	.98
4 Duties & taxes removed. Local processors get import price.	Private Cost Ratio (Df+Lf)/(Rf-Tf)	.91	1.00	.84	.87
	DRC - No Change.				
4 Value of cake cut by 50%[c]	Private Cost Ratio (Df+Lf)/(Rf-Tf)	.77	.85	.75	.76
	DRC Ratio (De+Le)/(Re-Te)	.93	1.07	.87	.85
5 No Market for cake at all	Private Cost Ratio (Df+Lf)/(Rf-Tf)	.82	.93	.84	.84
	DRC Ratio (De+Le)/(Re-Te)	1.01	1.20	1.02	.98
6 Rural presses transport Oil for sale in Kampala[c]	Private Cost Ratio (Df+Lf)/(Rf-Tf)	.95	.96	NA	NA
	DRC Ratio (De+Le)/(Re-Te)	1.10	1.21	NA	NA
7 Large mill extraction rate same as small expellers[d]	Private Cost Ratio (Df+Lf)/(Rf-Tf)	NA	NA	.84	.96
	DRC Ratio (De+Le)/(Re-Te)	NA	NA	.96	1.09

[a] Oil content measurements are not available for most mills. This is a real possibility in many areas.
[b] The most recent World Bank price projections are for a real price decline of 22% by 2005. No corresponding adjustment made to domestic price, so PCR not affected.
[c] Price of oil reduced to Kampala levels, price of a container and transportation added into costs.
[d] This reflects extraction rates large millers currently report getting rather than what experts say they should get.

sunflower and cotton if family labor is priced at the rural market wage rate. The relatively good PCR in most scenarios indicates that profits to other actors are more than adequate to make up for these losses. This analysis, however, does not have income taxes deducted, so it represents before tax profits to the entire system.

The base case DRC ratios are all very favorable indicating a strong return to the national economy from import substitution in sunflower oil. Kruse et al. (1992) argue that the single most significant factor for the profitability of oilseed crushing is the oil content of the seed. Calculation given a 20% lower extraction rate than assumed in the base case scenario, however, found that PCRs are attractive for all technologies and the DRCs are below unity with the exception of the small mills. While millers can compensate for low oil content by paying a lower price for poor quality seed, there is a considerable cost to bear in the long run in terms of high rates of wear and lower oil output per unit. Such addition costs, however, are not captured by this type of analysis.

The results of scenario three indicate that if import duties were removed, and local mills were to only receive the import price for oil, the PCRs are still below unity with the exception of the small mills, which are only marginally over. This suggests that with good management, local oil producers should be able to produce profitably even without import duties in the long run. Current losses may be more a function of poor management, low capacity utilization, and start-up difficulties than a basic unprofitability of the industry.

The current chronic over-supply in international edible oil production that has led to continued price declines is anticipated by the World Bank to continue, despite shorter stocks in 1993 due to bad weather conditions in the US. The World Bank (1993) predicts an overall real price decline of over 22% by the year 2005. This prediction is reflected in scenario 3 in which the import parity price was reduced by 20%. Even at this lower price, the extent to which the DRC for the ram press and the large mills exceeds unity is small. This difference might be overcome by improvements elsewhere in the system, such as an improved market for cake or higher extraction rates.

Discussions with many millers of all sizes had indicated that the price of oil was barely covering their production costs. These discussion had implied that firm profits were therefore highly dependent on the market for cake. Two scenarios were introduced to test the impact of a weak market for cake. In scenario 4 the sales value of the cake was cut in half. In scenario 5 it was eliminated entirely. Surprisingly, PCRs remain below unity in both cases, although the DRC exceeds one for all four technologies when the market for cake is removed entirely[247].

Scenario 6 addresses the question of whether small mills and ram presses can produce oil economically enough to bear the costs of transportation and marketing in the large urban areas in competition with the large mills. To test this, the financial and import parity prices of oil were reduced to Kampala levels and the cost of containers and transportation of oil to the urban market were added. While PCRs are still below one, DRCs of 1.09 for the ram press and 1.25 for the small expeller indicate that this would not be an efficient way to save foreign exchange.

The last scenario tests the impact of lowering the extraction rate for the large mills to the level assumed for the small mills when oil content is reduced by 20%. This extraction rate (.21 liters/kg) is actually closer to that currently being reported for sunflower crushing by the two largest mills, despite what experts say they ought to be getting. Whether the low oil extraction rate is due to terrible seed or inefficient processing, it is clear that at such low levels the new large mill becomes only marginally profitable financially and an uneconomic way to earn foreign exchange. This is one of the major reasons given by the largest private processor for abandoning sunflower crushing and shifting increasingly toward cottonseed. The difficulty in securing adequate raw materials and the poor market for sunflower cake are additional reasons. A note of caution is therefore necessary. While current price relations seem to favor sunflower processing as an

---

[247] Cake revenue enters the DRC analysis in the numerator as a reduction in the net domestic resource cost required to produce a given savings in foreign exchange.

efficient import substitute, problems of input supply and marketing cannot be assumed away.

Since cotton oil production requires refining, processing alternatives are limited to the rehabilitated mill versus the new large mill. The results of the DRC analysis for cottonseed oil differ in that cottonseed is a byproduct in the production of cotton lint. Farmers are not going to produce cotton for its seed alone. The DRC analysis is therefore calculated per kg of lint rather than per liter of oil in order to facilitate comparison to the DRC for cotton lint alone. While this changes the absolute numbers presented in the PAM matrices in Appendix 9, the resulting DRC and PCR are not affected.

Table 9.14 DRC Analysis for Cotton Processing in Uganda Including the Value of Oil and Cake

Scenario	Indicator	Type of Mill	
		Rehabili-	New
1 DRC analysis for only cotton lint using UNEX price ratios.	Private Cost Ratio (Df+Lf)/(Rf-Tf)	.96	
	DRC Ratio (De+Le)/(Re-Te)	.98	
2 Base Case Assumptions adding oil and cake to the analysis.	Private Cost Ratio (Df+Lf)/(Rf-Tf)	.84	.84
	DRC Ratio (De+Le)/(Re-Te)	.87	.84
3 International price for oil falls by 20%[a].	DRC Ratio (De+Le)/(Re-Te) PCR - No Change.	.91	.88
4 Duties and sales tax removed. Local processors get import price.	Private Cost Ratio (Df+Lf)/(Rf-Tf)	.90	.89
	DRC - No Change.		
5 Value of cake cut by 50%.	Private Cost Ratio (Df+Lf)/(Rf-Tf)	.87	.86
	DRC Ratio (De+Le)/(Re-Te)	.89	.87
6 No market for cake at all.	Private Cost Ratio (Df+Lf)/(Rf-Tf)	.89	.88
	DRC Ratio (De+Le)/(Re-Te)	.92	.89

[a] The most recent World Bank price projections are for a real price decline of 22% by 2005. No corresponding adjustment was made to domestic price, so PCR were not affected.

The DRC for cotton at the national level (rather than the farmgate) is presented in Table 9.14. This analysis takes as its base case the 1993 prices reported by four cooperative unions that are cooperating to export their lint independent of the Lint Marketing Board[248]. These Unions are the most efficient. They were able to improve the ginning outturn and reduce marketing costs enough to make marginal profits in 1992/93 despite record low international prices. These changes reflect the positive changes that may result from the pressure for economic efficiency under privatization.

The DRC analysis shows that inclusion of processing for oil and cake improves Uganda's comparative advantage in cotton production despite the additional costs involved. Base case extraction rates mirror current rates being reported by large millers even with current low quality of seed. There was no need, therefore, to reduce them further in the sensitivity analysis. Downward adjustments in the price of oil and value of cake had little impact on the results. While the DRC for cotton processing including oil is not as good as that reported for tobacco, beans or sesame in Chapter Eight, they indicate a solid competitive position even at this year's low prices. If real cotton prices rise by more than 20% in the next decade, as indicated by the latest projections (World Bank, 1993) this will more than offset projected declines in oil price, since lint comprises a greater proportion of the total value.

Further analysis of the economic benefits of edible oil production for import substitution are still needed with respect to possible processing of groundnuts. Until recently, only a few processors have tried to crish groundnuts for oil. It has simply been assumed that groundnuts were too expensive to crush economically. For this reason, there are no good estimates of the potential extraction rates for groundnut oil using alternative technologies. In West Africa, however, groundnuts are the most important raw material used in the production of edible oil for export. Existing explanations concerning the constraints

---

[248] Data obtained in private communication with UNEX, the export facilitating agency in the Uganda Cooperative Alliance.

to groundnut crushing in Uganda are not really convincing and the issue merits further exploration.

9.5 THE ROLE OF OILCAKE IN THE PROCESSING EQUATION

One of the biggest difficulties facing edible oil processing is the problem of cake marketing. Cake consumption is low in Uganda and is not projected to increase rapidly in the foreseeable future. As discussed in Chapter Five, most Ugandan feed mills were operating at less than 35% of capacity in 1990.

Coles (1968) estimated domestic consumption of cottonseed cake at 1,375 mt in 1965. This accounted for only 2% of the total production of 70,100 mt. The remaining 68,725 mt were exported during the 1950s and 60s, mainly to East Africa. Exports usually ranged from 50,000 to 70,000 mt with the peak at 74,137 mt in 1959. At present, however, most African and Indian Ocean countries are surplus in meal. While some exporters report Kenyan interest in oilcake, they complain that Kenya's current foreign exchange shortage impedes exports.

Ocean shipping routes and rates make Europe the most accessible non-regional market. The EC is the world's largest market for meal, but it imposes quality standards that small Ugandan mills cannot meet. Export marketing exhibits important economies of size that may necessitate that exports be coordinated to ensure better services and prices for transport, communications, documentation and financing. Careful analysis of the potential costs and returns to cake export are required before a judgment can be made as to its viability.

About 80% of the current feed production is used for poultry. Cotton seed meal may cause high mortality in poultry due to the presence of polyphenol gossypol. Dehulled sunflower meal has a higher feed value than cottonseed cake, and approaches the protein value of soybean meal. Undecorticated sunflower cake is difficult for monogastric animals to digest. This constrains demand, since the largest market for commercial feeds is for broilers and layers.

Commercial cattle fattening offers the best potential demand for undecorticated sunflower cake but this practice is extremely limited at present. Experience from West Africa seems to indicate that greater

economic returns to sunflower cake utilization might be obtained if local farmers were able to return to ox cultivation, using oilcake and groundnut hay to improve the performance of draft animals. The marginal value of protein supplements fed to draft animals used in cultivating cash crops is likely to be high relative to the other uses of seedcake. The political difficulties involved in restocking have already been mentioned, however.

The ideal method of soybean extraction on a small scale would be to run the soybeans through an extruder, which deactivates the trypsin inhibitor, before expelling. Investment in an extruder, however, adds $30,000 to the capital costs of a small mill (Kruse 1992). If the extruder is not used, the oil extraction rate from soybeans is very low and the meal is unsuitable for feed. Without high value cake, processing soybean cannot be profitable.

Bunker et al. (1990) mentioned the intriguing possibility of using oilcake as an organic fertilizer. This is a possibility that may well be worth further investigation.

CHAPTER TEN: CONCLUSIONS AND POLICY RECOMMENDATIONS

Several factors indicate that edible oil self-sufficiency is feasible for Uganda. Not only might such a development improve local nutritional standards but, at current prices and costs of production it would result in a considerable foreign exchange savings for the country. Given the large extent of Uganda's foreign exchange deficit, this is an important potential contribution to national economic stability and development. There are, however, serious institutional and coordination constraints that impede achievement of self-sufficiency. Active coordination of subsector participants at several levels will be necessary to break existing constraints and facilitate a more efficient utilization of productive resources. This does not in any way suggest that government should try to replace private enterprise in the edible oil subsector. Earlier attempts to do exactly this are largely responsible for the existing impasse. Strategic public sector facilitation combined with private sector cooperation and joint action on several levels is the most feasible way to break the current low level equilibrium.

10.1 KEY FINDINGS

This section briefly summarizes the key findings of the research. References to earlier tables and discussions are provided to help the reader find the details behind these conclusions in the body of the text.

10.1.1 Potential Strengths of the Edible Oil Subsector

Oils and fats are essential to human nutrition. At 2.2 kg/capita per year, Ugandan consumption is among the lowest in the world and well below recommended minimum levels (Chapter 3, Table 3.1). Low consumption of fats contributes to high levels of chronic undernutrition and the stunting of 45% of Ugandan children under age five. Per capita consumption will only rise if incomes rise, or if oils become more readily available and prices decline.

Though consumption in Uganda is low, this study has documented that total national demand for edible oil is substantially higher than previously estimated. Sixty nine percent of the demand for oil and eighty two percent of the demand for shortening is in the rural areas (Chapter Three).

Vegetable oil intake among the rural population can be increased by making oil more affordable and more readily available. This implies: low-cost packaging (i.e., bring your own containers), service pressing to allow farm families to process their oilseeds at low cost, decreasing the distance traveled to obtain oil, and increasing purchasing power through employment generation in the rural areas.

The major contribution of industrial production of edible oils lies in the potential for saving foreign exchange. The consumption analysis in Chapter Three showed that per capita consumption is responsive to income growth. The income elasticity of edible oils and fats in Uganda was found to range from .42 for traditional oils, to 1.69 for vegetable shortening (Table 3.4). Population increases and increased consumption due to rising incomes could lead to a foreign exchange requirement of $54 to $70 million per year by the end of the century (Table 3.3). This is equal to 31-40% of total 1992 national export earnings, and would represent a major foreign exchange drain on the economy. The potential importance of import substitution in edible oils highlights the need to analyze the economic viability of domestic oil processing and compare the benefits from import substitution to the opportunity cost of alternative uses of domestic resources.

The nationalization of the edible oil industry at the time of the Asian expulsion and the collapse of the cotton industry due to mismanagement of the cooperative ginning and marketing structures resulted in the closure of many early industrial processing facilities (Chapter Four). During the early 1980s the poor performance of the parastatal mills and the high cost of edible oil on the international market created incentives for investment in smaller scale technology for oil processing. By 1993 42 small mills had been installed and 27 more were expected by the end of 1994. Since 1988 two new large-scale mills have been installed. One is owned by the South Bukedi Cooperative Union

and the other by a private corporation that is the largest soap manufacturer in Uganda.

The structure of the edible oil processing sector was detailed in Chapter Five (Figure 5.7). Operating 300 days per year, at 8 hours per day, the 69 small expellers that will be installed by 1994 could provide 12,000 mt of edible oil per year by crushing high-oil-content sunflower. Small-scale processing of oilseeds could, therefore, contribute up to 56% of projected national edible oil demand by the year 2000[249]. This production would require 48,000 mt of high oil-content sunflower per year. Currently operational medium- to large-scale processing capacity could crush 117,000 mt of oilseeds per annum, making a total industry capacity of 168,250 mt/yr. Depending on the raw material being processed, this capacity could produce between 29,500[250] and 44,750 mt of oil per year. The capacity exists, therefore, to exceed the national demand for liquid cooking oil projected for the year 2,000[251]. Clearly the problem in the industry is not lack of processing capacity.

The cotton subsector is in a state of transition to privatization. The Lint Marketing Board's monopoly on cotton exports is being dismantled and cotton cooperatives are being forced to seek out joint ventures or face possible bankruptcy (Chapter 5 section 5.6 and Chapter 6 section 6.2.5). If cotton production were to increase to the CSDP target of 330,000 bales by 1993/94, this would result in approximately 94,776 mt of cottonseed being available for crushing each year[252]. This is less than the 1993 processing capacity of the existing new and

---

[249] This assumes that consumption of edible oil increases only due to population growth. If incomes rise by 2% per year, demand for liquid cooking oil would increase more than proportionately, reaching 27,233 mt/yr by the year 2000. If added demand due to income growth is considered, small mills could contribute 44% of national demand.

[250] The lower estimate assumes that all large mills crush only cotton seed, with an extraction rate of 15%. The higher estimate assumes processing of high oil-content sunflower with an extraction rate of 28%.

[251] If all of the repairable Asian mills were rehabilitated, they could add an additional 57,000 mt/yr of crushing capacity, but this would require a substantial investment in preprocessing and refining equipment.

[252] Based on 330,000 bales x 359 kg seed/bale less 20% for planting needs.

rehabilitated industrial mills. Given the ease of assembly afforded by purchase of large quantities of cottonseed directly from the ginneries, most of the industrial mills probably will prefer to process cottonseed. The availability of raw material for crushing will undoubtedly spur the rehabilitation of additional former Asian mills and competition for cottonseed is expected to be stiff[253]. If cotton revives, cottonseed oil could meet 2/3 of national oil demand in the year 2000.

Even if cotton does not revive, oil self-sufficiency in the year 2000 could be met by increasing sunflower production. Production of the 21,315 metric tons of oil projected for the Ugandan market by the year 2000 would require an area as large as 852,600 hectares if it depended entirely on cotton, or as little as 71,050 hectares if it were based on sunflower. While this would entail a considerable expansion of sunflower cultivation, it is possible. To achieve full oil self-sufficiency in the year 2000, sunflower area would have to increase to only half the area currently used for producing sesame. Projections of crop land needed to supply Uganda's food needs to the year 2000 were made by Bucyanandi et al. With their medium technology and medium demand increase scenario, the area required for foodcrops in the year 2000 was estimated at 4.3 million hectares. The addition of sufficient sunflower production to meet projected oil requirements would imply an increase in this estimate of only 1.7%.

There is strong potential for profitable oil pressing enterprises in rural areas with the village-level ram press technology. Logistical support will be required, however, to overcome constraints in seed supply, manufacture and repair of the technology and dissemination of information. Village-level processing provides rural employment opportunities and increased incomes through backward and forward linkages (repair services, seed and oil trade, and increased value of livestock). More importantly, the ram press provides an immediate incentive for farmers to adopt the high-oil-content soft-shelled sunflower variety.

---

[253] The analysis in Chapter Nine, however, showed that if sunflower seed could be made available in adequate quantities through the rural assembly system, sunflower processing would be substantially more profitable for large and rehabilitated mills than cottonseed processing.

Though world market prices for oil have been falling and are expected to continue downward, the high transportation costs caused by Uganda's landlocked location protect the domestic industry. CIF import parity prices are roughly double the world market price (Chapter 5, section 5.5).

Despite tariff duty evasion, domestic prices appear more than adequate to cover the costs of processing by the rehabilitated mills and the manual ram presses. With reasonable extraction rates and base case prices even the small mills could generate an after-tax financial rate of return of 18% (Table 9.8), which probably exceeds the opportunity cost of capital. Financial RORs are higher for the ram press and rehabilitated large mill (Table 9.4 and 9.10). While the small mills are clearly dominated in terms of the choice of the most efficient allocation of future investment, they could more than cover their variable cost of production. As fixed assets, existing mills only need to earn more than their variable costs in order for them to remain operational.

The analysis of Chapter Nine shows that under most scenarios the choice of technology is determined by capital costs. In the short- to medium-term, rehabilitation of former Asian mills is clearly the least cost investment alternative for increasing crushing capacity to provide edible oil for the urban markets (Table 9.12), given the lower capital costs required to rehabilitate existing processing capacity.

In the rural areas labor is more appropriately valued at a shadow price that reflects the limited availability of rural wage employment opportunities, and sunflower is the primary oilseed for processing. Under these conditions, the ram press is the most cost effective technology for processing cooking oil (Table 9.12).

Processing sunflower is also potentially more profitable than cottonseed for the industrial facilities, if existing constraints in seed quality and supply can be overcome. Rate of return analysis showed a financial return after taxes of 41% for sunflower as opposed to 15% for cottonseed processing by the rehabilitated large mill in the base case scenario. This assumes that preprocessing capacity has been installed to improve extraction rates and the value of the cake, and make the mill self-sufficient in energy (Table 9.10).

On the economic level, DRC analysis shows that the Ugandan economy gains by producing sunflower oil as an import substitute (DRC ratios of 0.72 to 0.99 in base case depending on choice of processing technology, Table 9.13). Processing cottonseed into oil also increases the benefits of producing cotton for export. The DRC ratio falls from 0.98 for lint alone to 0.86 when including oil processed by the new large mill (Table 9.14). Domestic production saves more foreign exchange than the opportunity cost of resources used in its production even when investment in new processing technology is included. When the current levels of excess capacity are considered, the benefits will be even greater than indicated.

Until recently, sesame seed has been too valuable as a new "non-traditional" export crop for any to find its way to crushing. With the collapse of international prices in early 1993, small millers became interested in crushing sesame for the first time. Approximately 157 mt of sesame oil was produced in 1992/93. The analysis in Chapter Nine indicates that manual crushing of sesame for local rural production is financially profitable under 1993 prices (a financial ROR of 48% in the base case scenario). The foreign currency savings from import substitution exceed the loss from lower exports under mid 1993 prices. The economic ROR is 56% in the base case (Table 9.6).

If sesame oil is acceptable to urban consumers and there is an adequate market for the cake as either animal or human food, expanded crushing of sesame by larger processors may be viable at current prices. More information on extraction rates and further market research is required to confirm this possibility. The highest returns from crushing sesame probably would result from successful export of sesame oil to high value niche markets in Europe. Entry into this market will require considerable marketing sophistication and is likely to be possible only for the most efficient of the large mills.

Crushing of sesame should be considered only after profitable opportunities for direct export have been exploited. The economic rates of return for sesame oil are highly negative when international export prices for sesame seed are high. The increase in the value of the seed when crushed is marginal given the costs of transportation and processing. Crushing sesame can be advantageous if it increases

utilization of the existing crushing capacity and helps to cushion the farmers from the vagaries of the international commodity markets by providing an alternative domestic market for surplus sesame. This is important, since the demand for whole sesame within Uganda is primarily limited to certain ethnic groups skilled in its preparation.

Based on the preceding information, self-sufficiency in edible oil production should not only be possible for Uganda, it would be advantageous to the economy as a whole.

10.1.2 Constraints Facing the Subsector

Serious institutional and coordination constraints at various levels impede the expansion of edible oil production. Simply removing all forms of direct government participation in edible oil processing is not sufficient to raise the performance of the subsector to desired levels.

Examination of the current structure of the edible oils processing industry reveals massive under-utilization of existing capacity. In 1992/93 the industry produced only 2,699 mt of oil, indicating an industry-wide capacity utilization of less than 10%. In 1992/93 the 19 operating small mills with a capacity greater than one mt/day worked an average of only 29 days each. Only 6 of the 21 mini mills operated in 1992/93 and they worked an average of only 69 days each. The cooperatively owned mill operated at less than 7% of capacity in 1992/93. Even the largest new private mill is having major difficulties securing adequate raw materials for crushing. The firm has resorted to periodic importation of cottonseed from Tanzania to supplement available Ugandan oilseeds. Over 20% of their production in 1992/93 was from imported cottonseed. The financial analysis demonstrated the importance of achieving reasonable levels of capacity utilization to reduce the costs of processing (Tables 9.4, 9.8, and 9.10).

The major constraint to increased capacity utilization is the supply of raw materials. While the national crushing capacity is approximately 168,250 mt/yr and could rise by an additional 57,000 mt/yr with rehabilitation of the silent Asian mills, 1992 production of

sunflower and cottonseed was less than 43,000 mt[254]. Sunflower is a relatively new crop. Farmers are not very familiar with its production and yields are low. Bird losses are high. Chapter Six demonstrated that returns to farm-family labor engaged in the production of sunflower and cotton are less than the rural wage rate. Farmer incentives have been inadequate to promote the expansion in production of these crops required to make full utilization of existing crushing capacity. The lack of grading and quality differentiation creates inadequate incentives for farmers to produce the high-oil-content sunflower varieties that would maximize the quantity of oil resulting from a given quantity of sunflower produced and crushed.

The extraction efficiency of all types of processing equipment is dependent on the quality of the oilseed and its preconditioning. Critical factors include moisture content, oil content, and seed cleaning. Price differentials based on seed quality are essential to create the right incentives for farmers and traders. Grades and standards for sunflower have not been established in Uganda. Testing for oil and moisture content is cumbersome when processors buy very small quantities from large numbers of scattered producers. Differential prices for high oil-content sunflower varieties have only recently introduced and generally offer inadequate incentives to encourage farmers to produce the desired quality and oil-content.

Planting seed for the high-oil-content sunflower varieties is not readily available. Most farmers plant retained seed that is genetically mixed due to cross pollination. Resulting low oil content constrains processor profits. The seed multiplication and distribution networks are very weak. The dire shortage of high-quality planting seed prompted the CAAS project to initiate its own seed multiplication effort in late 1992. This effort is only just getting started and mechanisms for distribution to interested farmers are not yet well established. The

---

[254] There is, however, an urgent need for better data collection on sunflower production. The Ministry of Agriculture statistics for sunflower are not available prior to 1991. Sunflower was not included in the 1990/91 Census of Agriculture. Sunflower production data is very tenuous. Actual yields under on-farm conditions are uncertain and may be exaggerated. The proportion of the projected production which was eaten by birds is also unknown.

sustainability of donor seed multiplication efforts such as those for CAAS and EIL is open to serious question.

Previous attempts by millers to distribute free seed in the hopes of being able to buy better quality sunflower at harvest have been poorly coordinated. Either the miller never came back to buy seed, or the farmers sold their sunflower elsewhere at harvest and the miller gained little advantage. Both sides are frustrated by this impasse.

Chapter Five discussed the constraints in the marketing system for oilseeds for crushing. Rural traders are not actively involved in sunflower trade. The mills set a fixed price that does not increase over the season to cover the costs of storage and capital. Purchasing by the large mills is erratic and unpredictable. No farmers' organizations to coordinate the assembly and marketing of sunflower exist.

A major unknown in this analysis is the future availability of cottonseed for crushing. The success of current moves to privatize cotton ginning and lint marketing will determine the incentives for cottonseed production. Under normal conditions, 15-20% of the cottonseed needs to be retained to meet planting needs[255]. During periods of rapid expansion this proportion would have to increase to accommodate the new acreage. This will temporarily restrict the availability of seed for crushing.

Many perplexing institutional design questions face the new Cotton Development Organization as it guides the transition to privatization of the cotton industry. The allocation of responsibility for seed multiplication and distribution to farmers; and the issue of control over surplus cottonseed for crushing are going to be particularly difficult to resolve. The institutional rules regarding who owns the seed and how it is to be sold, both to farmers for planting and to processors for crushing, are critical. The distribution of control and responsibility will determine the incentives for efficient allocation of cottonseed for planting and processing.

---

[255] KIT (1984) estimated that Ugandan cotton production would level off at 300,000 bales per annum corresponding to 108,000 tons of seed of which 80,000 to 90,000 would be available for crushing. This represents a planting rate of 16-25%. During the early 1970s crush accounted for 76-81% of estimated cottonseed production.

During the 1980s and early 90s, the policy of free seed distribution to cotton farmers and confusion over the ownership of cottonseed contributed to mismanagement of much of the cottonseed that could otherwise have been crushed. Between 1980 and 1986 less than 21% of the cottonseed generated by the ginning process in any given year was crushed[256]. Examples are abundant of cottonseed rotting away in cooperative stores for years, for lack of collection by LMB[257]. Planting rates are very high because farmers fear that seed has overstayed and lost viability.

The seed multiplication system for cotton needs to be completely revised. The extent of private sector interest in cotton processing and marketing is unclear. No one knows what role private entrepreneurs will play in seed multiplication and distribution. The shift to selling cottonseed is likely to be strongly opposed by farmers who are accustomed to getting free seed.

It also appears that much of the sunflower produced never gets crushed, implying exaggeration of production estimates and high losses on-farm and at the mill. Comparison of estimates of the production of sunflower and cottonseed with quantities crushed indicate that less than half the sunflower seed may have actually been crushed in 1992/93. Storage losses for sunflower both on-farm and on-site at the small mills are very high[258]. Existing market mechanisms for sunflower perform very poorly, especially in contrast to the export markets for food crops. Many farmers complain of being unable to secure a market for the

---

[256] The quantity of cottonseed was estimated based on the number of bales produced each year according to LMB records. The figure for quantity crushed was provided by EOSIL (Laker-Ojok, 1986). More recent figures are not available.

[257] In Lira, rotting cottonseed, which went uncollected for years, virtually destroyed several sheet-iron warehouses. In Packwach the Union experimented unsuccessfully with the use of cottonseed to fill potholes in the road, as a means of disposal for excess seed the LMB had failed to collect. South Bukedi, which had an oil mill sitting silent for lack of raw materials, was forced to sell its cottonseed to LMB for planting distribution in Lira.

[258] Some millers report throwing away tons of seed that had gone moldy during extended downtimes due to electricity outages and lack of spare parts. Others have held sunflower seed in storage for over a year, waiting for the arrival of imported equipment.

small quantities of sunflower they produce. Much is eaten by rats or chickens before it can be sold.

Lack of technical skills is a problem for most small mills. Poor maintenance leads to low extraction rates and excessive downtime due to mechanical breakdown. Spare parts are costly and difficult to obtain. The irregular supply of electricity is also a serious problem[259].

The management skills, financial resources, input supply, and technical resources needed to operate an expeller in the rural areas are not readily available. Even when management skills and financial resources are available, the weakness of existing extension services, seed supply, marketing systems, working capital credit for processors, electricity, maintenance and repair services, and spares parts supply are all serious constraints to profitable expeller operation. There is a large leap in expertise required to go from ram press repair to repair and production of wear parts for expellers. Until wear parts can be manufactured in quantity locally, they will be expensive.

The choice of technology analysis in Chapter Nine shows that the projected expansion of small-scale expelling being promoted by donor efforts is economically unjustified. Subsidized access to investment credit is supporting expansion of a technology that is not the least-cost production alternative. Commercial lenders should be very cautious about financing further expansion of this scale of investment. Any available credit would more profitably be directed toward provision of working capital for the best managed of the existing mills.

The marketing of oilcake is also problematic. The Ugandan livestock industry relies mostly on free range grazing. Stall feeding of draft animals was never widely practiced. Since 1986, draft cultivation has been severely curtailed by insecurity and cattle raiding. Export marketing of cake requires marketing sophistication, high quality standards and large quantities - all of which are difficult to coordinate within the fragmented Ugandan processing sector.

Government import duties and sales taxes on imports are being largely bypassed (Tables 5.1 and 5.2). Effective protection levels are

---

[259] The high cost of diesel, which faces a 130% excise duty, makes it uneconomical as an alternative power source. Gasoline is taxed at an even higher rate of 175%.

less than half the nominal protection rate implied by current import tax rates (Table 9.13). Competition sets a ceiling on prices that can be charged by local processors.

Incentive systems for management are very poor in cooperatively owned mills and many NGOs. Many local processors are so inefficient that even at the high international import parity prices, they barely cover costs.

10.1.3 Summary of the Constraints: the Vicious Circle Revisited

Chapter Six presented a simplified diagram illustrating the vicious circle of low productivity in the edible oil subsector (Figure 6.2). Subsequent discussions of the constraints in oilseed production, marketing and processing (summarized above) have raised additional issues that shed light on the subsector's poor performance. Figure 10.1 integrates these factors into a more comprehensive picture of the vicious circle of low productivity.

10.2 THE POTENTIAL FOR IMPROVED PERFORMANCE

10.2.1 Recent Changes in the Subsector

Several changes have taken place since 1990 that could have a bearing on the resurgence of the edible oil subsector in Uganda. Each is potentially important, but none is likely to be sufficient to break the vicious circle by itself. These changes include:

1. A high-oil-content open-pollinated sunflower variety was developed, tested and released by the Ministry of Agriculture in 1990.
2. Under the terms of the proposed World Bank Cotton Subsector Development Project, pressure for institutional reorganization of the cotton subsector has finally achieved a critical level. Legal moves to restructure the subsector were initiated in mid 1993. Issues of seed multiplication, prompt payment and ginning efficiency are being seriously addressed.

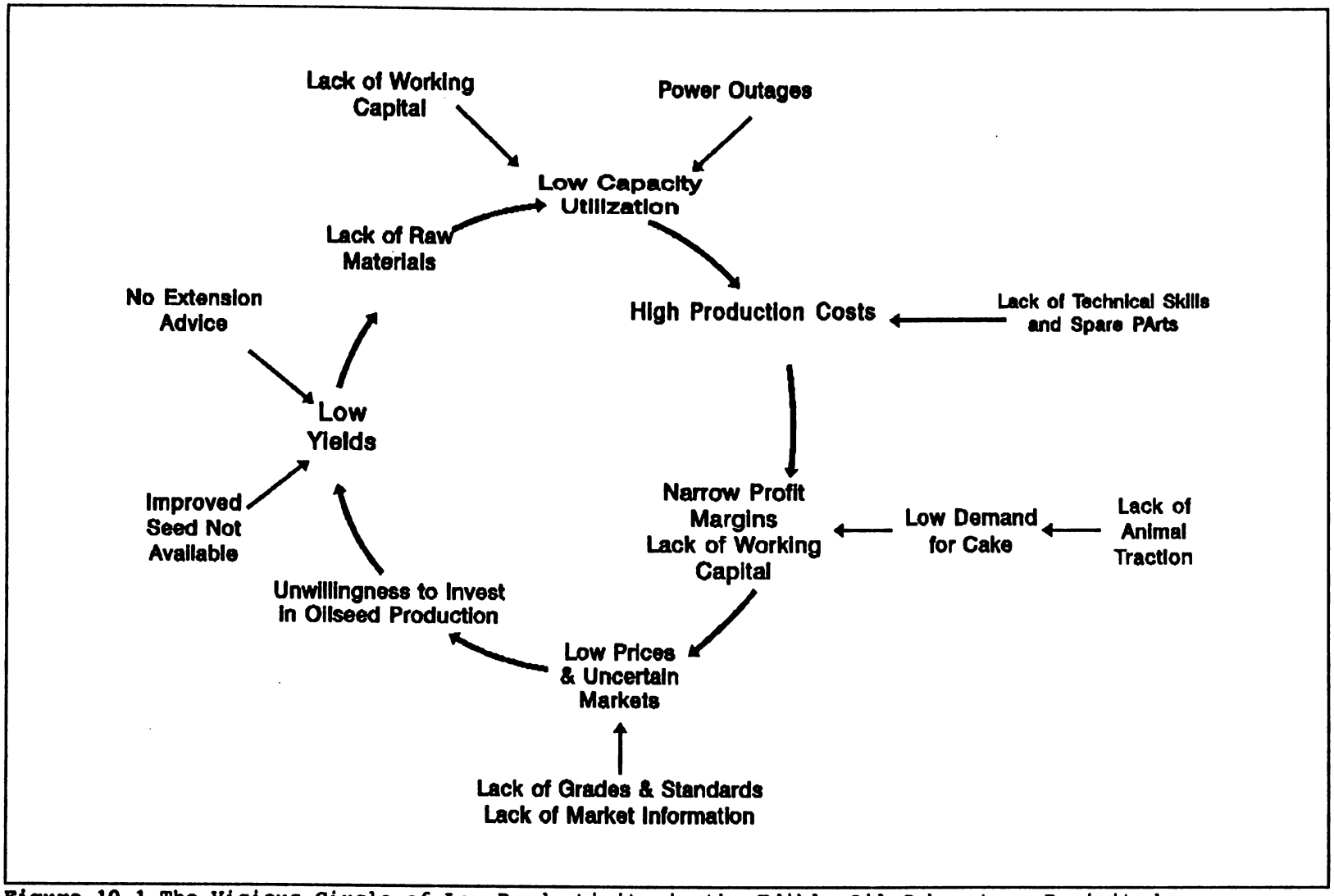


Figure 10.1 The Vicious Circle of Low Productivity in the Edible Oil Subsector: Revisited

3. The CAAS project has earmarked funds generated by the sale of PL480 oil for investment into sunflower seed multiplication, but as yet no sustainable system for distribution has been established.
4. A meeting of edible oil processors was held in August of 1993 and the participants voted to form a National Oil Millers Association. Such an association could serve as a vehicle for greater coordination in the subsector.
5. The return to relative stability in much of Northern Uganda holds out hope for increased production of oilseeds for processing. Disarming of the Karamajong cattle raiders is required before the large-scale return to draft cultivation can be possible.
6. A new project to promote the local manufacture and adoption of the ram press and high-oil-content sunflower varieties is being initiated by ATI with support from USAID and DANIDA. This project will take a subsector approach to addressing the constraints facing rural oil processing.

10.2.2 The Vicious Circle Broken

The vicious circle of low-level productivity in the edible oil subsector can be broken at several points. Coordination activities of sufficient magnitude could potentially initiate an upward spiral of improved efficiency and performance. Increased volumes of trade in the market would then stimulate further investments to increase productivity and improve coordination. Figure 10.2 illustrates the possible leverage points in the circle.

10.3 RECOMMENDATIONS

Subsector analysis emphasizes that the most cost effective way to improve the performance of a subsector is through activities that influence large numbers of subsector participants simultaneously. The concept is called leverage. The potential for leverage arises when large volumes of product pass through the hands of a small number of actors, when firms are clustered geographically, or when national

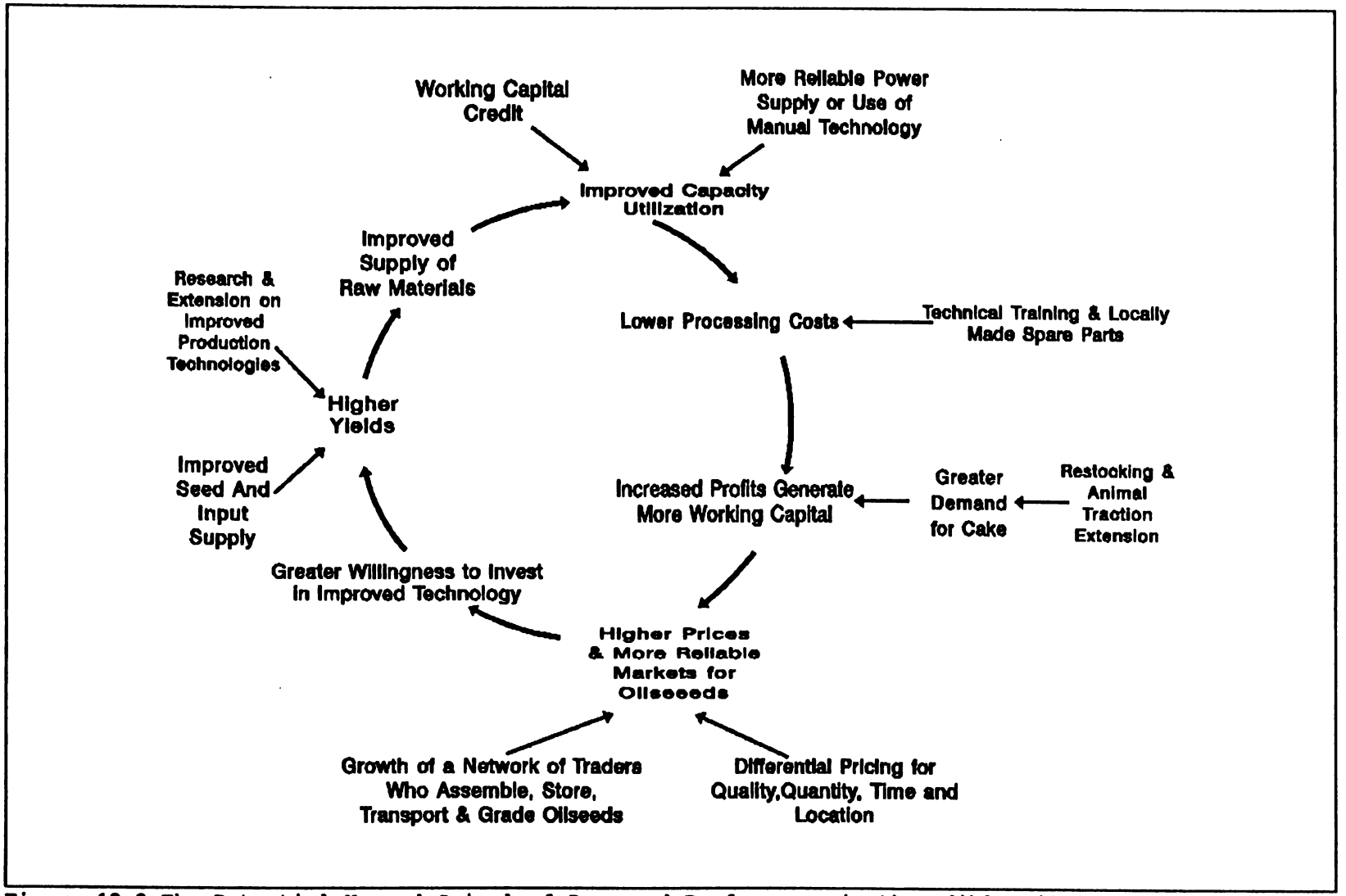


Figure 10.2 The Potential Upward Spiral of Improved Performance in the Edible Oil Subsector

policies affect a broad range of participants (Gemini 1991). Policies are a powerful lever because any intervention that results in policy change will influence many firms at once. The following recommendations were selected because of their potential to affect large numbers of participants in the subsector.

In Chapter Eight, the important role of BAT in coordinating national production, processing and marketing of tobacco was briefly discussed. In marketing terminology, firms such as BAT can be referred to as channel captains. The coordination role they play is recognized as contributing significantly to the coordination and performance of such subsectors. For a time it was hoped that Mukwano - the largest private sector oil processor - would play the role of channel captain for sunflower in the edible oil subsector in Uganda. This has not taken place. The firm was discouraged by the high costs of assembly and poor quality of available sunflower. Initial attempts at distributing seed to farmers were ill timed and largely unsuccessful. Marketing oil to the widely dispersed rural Ugandan market has shown only marginal profits. The costs of production are barely offset by oil prices and demand for seedcake as an ingredient in animal feed is low. The firm is now concentrating primarily on processing cottonseed because of the lower transaction costs in securing raw material supply. Increasingly, the firm is turning its attention to the production of high value products for urban consumers and potential export niche markets (i.e., vegetable shortening and sesame oil).

If cotton exports are to revive, the Cotton Development Organization and the World Bank financed CSDP project will have to play the role of channel captain. A national public-sector organization with the power of law is needed to change existing institutions and restructure the cooperatives and LMB. Problems are to be expected in the course of the structural transition, especially with regard to research, seed multiplication and cottonseed marketing, as discussed previously. Experience has shown that in Uganda project implementation by government has often failed, and observers remain skeptical. Even if cotton does revive, it will serve primarily the needs of the large processors and foster rehabilitation of the former Asian mills.

Without active coordination of sunflower production, marketing, and processing, most small mills are likely to go under. The large mills will continue to suffer from substantial excess capacity. This would represent a massive waste of invested resources and donor funds, especially given the potential contribution to foreign exchange savings through import substitution. The loss, however, is spread over many individuals and organizations. No one organization has sufficient incentive to invest the effort and resources required to get the subsector functioning more efficiently. These small farmers, traders and processors are operating in their individual short-term interest. The result, however, is an outcome that is less than optimal for themselves and the society as a whole. This is a classical social trap.

Escape from the trap will require active coordination to correct the problems in seed supply, working capital, marketing, grades and standards, and cake demand highlighted above. Coordination mechanisms could be instituted at various levels including traders, seed suppliers, donors, farmers, and millers. Elaboration of a specific strategy for coordination will require careful study and extensive discussions and negotiations among participants. The following is intended only to highlight some possible steps and point out the advantages that might be gained by improved coordination mechanisms.

The new millers association could potentially play several key roles in the subsector. The existence of an organization that represents millers from all over the country creates an important opportunity for leveraging donor investment in the subsector and improving coordination. Organization of edible oil processors may be an opportunity for the development of the first non-government controlled cooperative in Uganda. The critical question, however, is how this fledgling organization will be able to establish a mandate and financial base for operation. This issue requires more in-depth analysis of organizational issues, possibilities and pitfalls than is possible here. In this regard, lessons from the development of similar cooperative efforts elsewhere in the world would be very instructive.

There are many training, information dissemination and regulatory tasks that the association might take on. Training is perhaps the

easiest to organize and exhibits substantial economies of size. The existence of the association could facilitate feedback from members on their training priorities. Group training is also more cost effective than providing training on an individual basis. The association might be able to táp the resources (skills, offices, personnel, etc.) of agencies like the Uganda Cooperative Alliance to offer auditing services and training in management, marketing, accounting etc.

Hands-on training is also urgently needed in such technical skills as machinery installation, adjustment and maintenance. Through joint effort it might be possible for association members to share information on the performance of alternative technologies and techniques, coordinate and standardize future equipment purchases, or purchase spare parts at lower cost through bulk orders.

The low returns to labor from sunflower production have been repeatedly cited as an underlying cause of the existing shortage of raw material. If millers pay higher prices for sunflower in the short-run, this would encourage improved capacity utilization, lower processing costs and higher total profits from processing in the long-run. No individual miller can effect such a change. Rigidities in the marketing system block such price information from reaching farmers deep in the rural areas. A coordinated effort will be required to improve the flow of information and provide adequate incentives to farmers and traders. The most important function of the association may be to facilitate the establishment of product quality standards and differential pricing guidelines that recognize quality, quantity and timing of delivery. It will take a serious coordinated effort to get existing low-oil-content seed varieties out of production. A nation-wide information campaign, adequate supplies of working capital to purchase seed at harvest, recognized price differentials for variety and quality, and ready availability of high-oil-content seed are all required to accomplish this. One mechanism to encourage greater market coordination might be

the publication of demand and supply projections for oilseeds[260]. This might include advertisements from members quoting their raw material needs, especially with regard to location, timing, and quality.

Because of the large number of actors (both private and NGO), there will inevitably be differences in priorities and payoffs that may make it difficult and time-consuming for the association to reach binding decisions. The participation of non-governmental and non-profit organizations may help to prevent price collusion designed to extract rents from the consuming public. In order for decisions to be binding, the association will need to offer short-term positive benefits that are sufficiently attractive to induce millers to cooperate in their own long-term best interest. One possibility is that access to operating capital credit might be offered through the association but contingent on compliance with association guidelines. The same might hold true for access to training.

Some form of formal donor collaboration seems essential to the success of coordination efforts[261]. At a minimum, information sharing among donors related to the subsector is essential to avoid future repetition of past donor mistakes in selection of technology, design of projects and terms of the grants. Results of this study have shown that grants and subsidized credit for further development of processing capacity are unjustified. Government tax breaks for rehabilitation of existing capacity may be warranted, but only if the cotton industry revives and production exceeds existing processing capacity at that

---

[260] No such market projections are prepared at the present time. To do so would necessarily require the cooperation of the MAAIF and MTI. MAAIF has a network of Agricultural officers posted around the country. The MTI has regional marketing officers responsible for licensing traders and collecting market information. Neither has any expertise in preparing projections, however.

[261] A large number of donor agencies have been at least tangentially involved in the edible oils sector. These include AT International, AICF (Action Internationale Contre la Faim of France), AVSI (Italian NGO working in Kitgum), a number of Catholic dioceses, Economic Development Fund of the EEC, GTZ, International Kolping Society, Lutheran World Federation, Uganda Cooperative Alliance, USAID, Volunteers Overseas for Cooperative Assistance (VOCA), World Food Program, World Learning (formerly Experiment in International Living) and World Vision.

time. Most likely, investors will not need additional incentives since the cost of rehabilitation is low relative to its potential returns.

On a more positive note, donors should have a vested interest in seeing their earlier investment turned into viable productive enterprises. Coordination in donor financing policies will be necessary to present a united front in support of association guidelines. Donors are also in a better position to tap into external information sources than any individual association member. By channelling their efforts through the millers' association, donors could achieve greater returns on investments in training, credit, inputs and seed multiplication. Division of labor between donors could avoid duplication of efforts and working at cross purposes. Donors can serve as an intermediary link in the coordination chain. Not only are they a source of finance for the millers' association, but they can be an information link to the processors they have previously financed. Donors also might be able to act as a temporary link in the chain of a coordinated input delivery system.

Besides supporting procurement of processing equipment, several donors implement agricultural extension and participatory research programs. Oilseed research results from the Ministry of Agriculture are currently going to waste for lack of an extension medium for disseminating information to farmers. Individual small processors are not going to be able to provide such extension services, but the larger NGOs and donor agencies could assist with support in this area.

The establishment of a non-adversarial relationship between millers and traders is critical to the development of the subsector. Millers need to realize the services potentially offered by traders in terms of time and space utility. The involvement of large commodity traders in the sunflower trade could help reduce the costs of assembly, storage and transportation by making fuller use of existing storage, and transportation facilities. They also could play an important role in seed cleaning and grading, thus reducing operating and maintenance costs for processors. Assembly of seed is a necessary first step in oil-content analysis. It is impractical to try to test and grade the small quantities generally sold by individual small farmers. Processors must

offer recognized price differentials for quantity and quality to compensate traders for the transaction costs involved in assembly. Offering higher prices for larger quantities, would encourage both farmers associations and traders to participate in raw material assembly. Price incentives also need to be offered for holding seed and selling it later in the season. Even though the price of oil is not seasonal, millers need to recognize the costs involved in tying up their working capital and storage space by buying six month's supply at harvest.

There may also be interesting possibilities for cooperation between ram press operators, small millers, and large millers in the marketing of oilseeds such as sunflower. Processors at the smaller level could be employed to act as assembly agents for processors at the next level, processing what they can handle and selling the balance to larger millers. Farmers would then face a more integrated and certain market for their produce. This would encourage increased production of raw materials and improved capacity utilization throughout the oil processing industry. Trading commissions earned by smaller processors would provide them with additional income, improved cash flow, and greater access to working capital for their raw material procurement. Enforcement and trust would be essential to making such an arrangement work. This is an area where the level of benefits and penalties offered by the millers' association could be very important. There would be an additional incentive if millers knew donors would blacklist non-cooperating firms when it came time to applications for credit or further grant financing. Donors might even threaten to repossess equipment from non-complying grantees. Donors play an important role in most of the major financial institutions and might exert pressure for those institutions to call in defaulting loans.

Operational small mills need to be actively encouraged to run on sound business practices. Idle capacity should be resold as a stock of replacement parts, or instead of additional new investment. Questions of asset ownership for grant funded mills may need to be addressed in some cases to allow un-utilized equipment to be resold.

The absence of a sustainable seed multiplication and input distribution system is a major problem with repercussions far beyond the edible oil subsector. This topic deserves greater attention than can be given here[262]. Current efforts by the CAAS project and EIL to multiply and distribute high-oil-content sunflower seed are laudable but unsustainable. A sustainable solution can only be obtained by securing coordination between the sunflower research program of the Ministry of Agriculture, Animal Industries and Fisheries, the three seed multiplication schemes and the millers' association. To plan their seed multiplication efforts, the seed schemes need an assured market for the seed. (They have no effective seed distribution system and are currently largely dependent on seed sales to various NGO relief efforts.) Donor funds earmarked for sunflower seed multiplication could be channeled through the association as firm orders to the seed schemes. Revenues from seed sales through association members would form the basis of a revolving seed fund. Extreme care is needed in the design of the incentive structures for the system, however, to ensure that seed gets into the hands of farmers and that the fund actually revolves. In the long-run, such a system would be more sustainable than efforts that bypass the formal seed multiplication schemes.

There are many roles which farmers' associations could play to improve the performance of the subsector. Coordination of planting time and locations to reduce bird losses and avoid cross pollination is only possible if farmers are organized. Cooperation between sunflower and honey producers can lead to important mutual benefits. Farmers' organizations could act as countervailing force, engaging in joint action to pressure millers and to ensure profitable pricing. If organized, farmers could do their own bulking and wholesaling to capture the benefits of storage and trade speculation. Farmers' cooperatives also might sell agricultural inputs such as rhizobium and seed. Another major area is participatory research; including farm-level testing of varieties and cultivation practices and experimentation with using

---

[262] For an in-depth discussion of the organization of the input supply system in Uganda see Laker-Ojok, 1992.

sunflower cake as a fertilizer or mulch to return nutrients to the soil and control weeds.

Unfortunately, formal cooperatives in Uganda have eluded member control and lost the farmer's confidence. Informal organizations are springing up in some locations but they are too small to provide the coordination services required by the subsector. Larger commodity-oriented organizations for sunflower and sesame might, however, be encouraged to grow up in conjunction with the expansion of the ram press technology.

Existing government has a critical role to play in strengthening agricultural research, and extension related to oilseeds production. Some efforts to this effect, such as the creation of the new National Agricultural Research Organization have already been discussed. Agricultural and agri-business credit is going to be another vital issue for the edible oil sector, not only in terms of production credit, but crop finance and working capital credit have been identified as critical constraints to the subsector. Government also needs to fill an important facilitating role. Facilitation is important for the maintenance of peace and security, the development and maintenance of transportation and communications infrastructure, and the provision of market information. Market information services should include current domestic and export prices as well as supply and demand projections that would encourage arbitrage over time and space.

The issue of import protection and tariff enforcement is a tricky one. Analysis results reported in Chapter Nine indicate that if operating efficiently, Ugandan processors should be able to compete at the current import parity price levels. These prices represent substantially less import protection than is implied by existing import duties and sales taxes, due to widespread tax evasion. Price competition from imports is stiff when viewed from the perspective of inefficient mills operating at low levels of capacity utilization. Many of the inefficiencies, however, are caused by coordination problems in the subsector rather than the failure of the individual processing firm. The infant industries argument would, therefore, seem to apply, given the potential for improved performance as the volume of production in

the subsector increases. This would suggest that protection levels should gradually be reduced as the subsector develops, with sales taxes on both imports and domestic production eventually equalized. Caution is necessary, since establishment of a powerful milling association could eventually lead to entrenchment of vested interests that promote continued protection in order to extract rents from the consuming public.

More effective enforcement of current import regulations and taxes rather than increased duty levels is recommended. Improved enforcement of import duty and sales tax collection is needed to eliminate the existing atmosphere of corruption and to generate additional revenues to finance investments in infrastructure and services. Loopholes that allow unrefined oil for soap manufacture to come in tax free and then find its way into the edible oil market need to be closed. Quality standards for imported oil should be enforced to protect Ugandan consumers.

Several issues related to taxation need to be clarified. The present system is highly unpredictable. Improved transparency of the taxation system is needed to encourage economic rationality and forward planning by participants at every level of the subsector. Taxation policy related to ram press operators also needs to be resolved.

Agricultural research is another major area for government and donor investment. Improved production practices can make a major contribution toward raising yields, improving returns on farm labor and increasing raw material supply. Research topics that should be explored include: 1) crop rotations to control disease and improve soil fertility, 2) rhizobium inoculation for groundnuts as well as soybeans, 3) the use of oilcake as a mulch or fertilizer, 4) bird control strategies, and 5) further variety testing for both oil content and yield. Research will be more effective if it can be coordinated with millers' association and/or farmers' associations. Such associations can then transmit results and inputs to farmers and provide feedback to researchers.

Regional and bilateral trade agreements that would remove barriers to trade and guarantee markets might be explored - especially for

oilcake and animal feeds. There is a problem of lack of foreign exchange for cake in Kenya. Local processors are unwilling to take payment in PTA currency, which may indicate bureaucratic problems with the system of trade incentives offered under the PTA.

10.4 LIMITATIONS OF THE STUDY AND QUESTIONS FOR FURTHER RESEARCH

The primary objectives of this study were to provide a comprehensive and systematic description of the edible oil subsector, estimate the current and projected demand for edible oil products, assess the cost of producing edible oil in Uganda and evaluate the relative costs and benefits of domestic edible oil production as an import substitution activity. This study highlighted the need for active coordination efforts to improve the performance of the edible oil subsector. Many issues related to the specifics of how such coordination efforts should be organized and financed require additional investigation. The following questions for further research are organized into questions regarding national policy, oilseed production, marketing, and processing.

10.4.1 Outstanding Issues Regarding Coordination

Coordination is the major area requiring further research. Of particular interest would be investigation into alternative organizational and incentive structures, and the legality of grades and standards, trade association agreements, price fixing, etc. It is important to learn from the problems that some smaller NGOs have faced in trying to organize farmer associations for sunflower production. It also would be useful to search for lessons from organizations that have attempted to fill the coordination role in other countries and commodities, whether successful or unsuccessful.

The most important question is, "Who will make the effort and investment required to initiate the process of organizing active coordination mechanisms?" No single processor is likely to be able to capture sufficient benefits to justify the private investment of time

and resources. The concentration of processing capacity among a few Asian business leaders might justify their initiation of coordination measures that directly affect large-scale processors. Whether an existing donor project will have the vision and perseverance to spear-head the coordination process on behalf of the small processors and farmers, however, is difficult to predict.

10.4.2 Questions Regarding On-farm Production

1. What are the actual yields and costs of production for sunflower, and how can they be improved? How can bird losses be minimized?
2. What is the potential for using oilcake as a fertilizer/mulch to return nutrients to the soil? Is there any danger of disease or aflatoxin involved in such a practice?
3. What can be done to improve seed supply and distribution systems so that small-scale operators have access to existing varieties of higher-oil-content seed? Attention needs to focus on the design of mechanisms to create a cost-effective and sustainable system of seed multiplication and distribution.
4. Additional research is needed on appropriate animal traction technology (feed mixes, plow and tool bar designs, cultivation practices etc.) and the returns on investment in animal traction and stall feeding. What mix of crops in the rotation best supports the shift to animal traction investment? Can this lead to a significant jump in agricultural productivity? What is the inter-relationship between stall-feeding, animal traction performance and returns to edible oil processing? Attention should focus on the gender issues involved in the transition to animal traction, especially given the existing division of labor that allocates much of the responsibility for weeding and harvesting to women. Unless the weeding and harvest constraint is

broken, animal traction may create additional leisure for men while increasing the already heavy labor burden on women[263].

5. What is the potential of using rhizobium inoculation on groundnuts? What yield and soil nutrient benefits might result?
6. What are the most serious constraints to increased groundnut production? Why do the high returns to groundnut production not induce a substantial increase in production and subsequent decline in the domestic price?

10.4.3 Marketing Questions

Marketing questions include issues related to the marketing of oil, as well as the marketing of oilseeds.

1. This study analyzed only the income elasticity of edible oils and fats. Further investigation into the price elasticity of demand would be useful in analyzing the likely consumption response and subsequent nutritional impact of changes in domestic prices.
2. Little information was gathered on the oil distribution networks and the retail marketing of oil in the rural areas. This information may be valuable to the design of effective marketing techniques for processors as production increases.
3. Further information on the intra-household distribution of edible oil consumption is required before interventions to improve nutrition can be designed or evaluated.
4. The most important raw material marketing issues relate to the level of price differentials needed to compensate for time and space utility, and the design of contract enforcement mechanisms. How can price differentials be encouraged over the season to

---

[263] Although animal drawn planters and weeders exist, they have never been widely adopted in Uganda, even at the height of animal traction for opening land. Carr (1982) argues that the government policy of subsidized tractor services undermined the additional research and extension needed to break this important bottleneck in Uganda.

compensate traders for the cost and risks of storage and improve the availability of sunflower throughout the year?

5. Can simple tests be identified that would facilitate grading of oilseeds by oil-content, moisture content, and foreign matter?
6. How can sunflower producers be organized to reduce the costs and risks of assembly and marketing from many small farmers, facilitate improved grades and standards, and ensure adequate incentives for quality and oil-content?
7. The question of improved storage design to reduce losses in sunflower is also a serious issue.

10.4.4 Processing Issues

1. Technical questions that need to be addressed relate to: the potential for local manufacture of spare parts, the actual level of extraction rates obtainable with alternative machinery configurations, equipment adjustment for optimal extraction rates with sesame and groundnuts, and ram press design.
2. What is the best way to facilitate commercial private sector manufacture of appropriate oil processing equipment while ensuring adequate quality control to encourage adoption?
3. What is the best mechanism to provide sustainable access to low-cost repair services for both ram presses and small expellers.
4. How can spare parts best be availed in an efficient and timely manner given the variety of expellers currently operating in the country?
5. What are the best mechanisms for providing credit (in a sustainable and commercial manner) to encourage adoption of the ram press, especially by women?
6. What is the most efficient mechanism to provide needed working capital to existing small commercial expellers?
7. The economics of groundnuts and sesame pressing needs further study. More information on extraction rates using alternative technologies is required.

APPENDICES

Appendix 1: Edible Oil Mills in Uganda

Appendix 1.1 Large New and Former Asian Oil Mills in Uganda

NAME	OWNERSHIP	DISTRICT	TYPE OF EXPELLERS	NO.	DONOR OR FINANCEER	OIL 1992 (MT)	CAPACITY MT /DAY	OIL 1991 (lts)
Mukwano Enterprises	PRIVATE	KAMPALA	ANDERSON	3	PRIVATE	1,825	60	272000
Nyakesi Oil Mill	COOP	TORORO	SKET	6	E.GERMANY	85	30	33111
SUBTOTAL LARGE MILLS N=2				9		1910	90	305111
FORMER ASIAN MILLS (THOSE THAT ARE COOPERATIVELY RUN HAD NOT YET BEEN RECLAIMED BY FORMER OWNERS)								
Busiro Oil Mill	UNCLEAR	IGANGA	LARGE	2		0	0	0
Busoga Growers	COOP	IGANGA	ROSEDOWN	12			36	36000
Damodar Jinabhai Co	PRIVATE	JINJA	ROSEDOWN	15		120	100	0
EMCO Refineries	PRIVATE	JINJA	ROSEDOWN	24		0	80	0
Iganga Industries	UNCLEAR	JINJA	ROSEDOWN	10		0	60	0
Bunyoro Growers	COOP	KAMPALA	KRUPP	4		6		
Jupiter	PRIVATE	KAMPALA	ROSEDOWN	7		0	40	0
Nyangi Cooperative	COOP	KAMPALA	HEB	2		0	48	0
Oil Man. Industries	UNCLEAR	KAMPALA	DEST.79	0		0	0	0
Peter Kirumba Mill	UNCLEAR	KAMPALA	DEST.79	0		0	0	0
Kaliro Oil Mill	UNCLEAR	KAMULI	DEST.79	0		0	0	0
N. Mbale Oil & Soap	COOP/LMB	MBALE	ROSEDOWN	5		0	30	0
New Alliance	UNCLEAR	MBALE	ROSEDOWN	5		0	30	0
New Budaka	UNCLEAR	MBALE	ROSEDOWN	5		0	54	0
United Cotton Merchants	UNCLEAR	SOROTI	ROSEDOWN	5		18	20	0
A.B. Coop Union	COOP	TORORO	ROSEDOWN /BOUGH	8		0	30	0
Abacak Oil Mill	PRIVATE	TORORO	ROSEDOWN	5		0	30	0
SUBTOTAL N=17				109		144	558	36000

Appendix 1.2 Medium Sized Oil Mills in Uganda

NAME	OWNERSHIP	DISTRICT	TYPE OF EXPELLERS	NO.	DONOR OR FINANCEER	OIL 1992 (MT)	CAPACITY MT /DAY	OIL 1991 (lts)
MEDIUM SIZED MILLS								
ST Mary's Ediofe	CHURCH	ARUA	ITALIAN (MIG)	1	CATHOLIC	33	1.4	24074
Gulu Diocesan Farm	CHURCH	GULU	CARERA	2	CATHOLIC	18	4	6600
Kolping Society	NGO	HOIMA	BAUARTEN	2	KOLPING	36	5	6000
Intraco Co (U) LTD	PRIVATE	JINJA	CHINESE	2	PRIVATE	77	6	100
Jinja Amalgamated	PRIVATE	JINJA	CARERA	1	PRIVATE	5	5	10000
Musenze Industries	PRIVATE	JINJA	TIGER BABY	2	UCB (IDA)	22	10	
Ocodung Agencies	PRIVATE	JINJA	CHINESE	1	PRIVATE	13	1.5	4908
Kabale Diocese	CHURCH	KABALE	CARERA	2	CATHOLIC	0	2	463
E. African Ind(U) Ltd	PRIVATE	KAMPALA	TINYTECH CHINESE	6	PRIVATE	58	12	0
Compas Ltd	PRIVATE	KAMPALA	CHINESE	2	PRIVATE	9	3.5	8800
Kagando Hospital	NGO	KASESE	HANDER	1	TEARFUND	4	2	2224
Basamy Oil Industries	PRIVATE	KITGUM	HANDER	2	UCB (IDA)	22	5	18000
Kitgum Diocese	CHURCH	KITGUM	CARERA	1	CATHOLIC	18	2	15000
Akonyikori Mill	PRIVATE	LIRA	CARERA	2	PRIVATE	136	7.5	75000
Resources Estates	PRIVATE	LIRA	HANDER	2	UCB(IDA)	12	3	5000
Wills International	PRIVATE	MITYANA	UNITY INDIAN	2	UCB (USAID)	6	10	0
Ntawo C.O.U.	CHURCH	MUKONO	??	2	COU	0	4	0
Ateki Farmers	PRIVATE	MASINDI	HANDER	2	UCB (IDA)	11	5	6601
Afya Estates	PRIVATE	MBALE	TINYTECH	1	UCB (IDA)	18	4	0
Solot Food Industries	PRIVATE	SOROTI	CHINESE	1	PRIVATE	13	1	250
Father John's	CHURCH	TORORO	CHINESE	2	CATHOLIC	33	4	23333
SUBTOTAL N=21				39		543	98	206354

Appendix 1.3 Small Oil Mills in Uganda

NAME	OWNERSHIP	DISTRICT	TYPE OF EXPELLERS	NO.	DONOR OR FINANCEER	OIL 1992 (MT)	CAPACITY MT /DAY	OIL 1991 (lts)
SMALL PRESSES - SIMON ROSEDOWN MINI 40 OR COMPARABLE								
Aminekitte Oil Mill	CHURCH	APACH	GERMAN	1	COU	0	0.56	0
Nabyeso TTC	SCHOOL	APACH	MINI40	1	WFP	0	0.3	0
Baracara Coop. Soc.	NGO	ARUA	MINI40	1	LWF	0	0.3	801
Onyama NTC	SCHOOL	GULU	MINI40	1	WFP	0	0.3	0
Nkuruba Mill - Virika	CHURCH	KABAROLE	MINI40	1	CATHOLIC	0	0.3	0
Kyakatara Rural Dev.	NGO	KABAROLE	MINI40	1	CATHOLIC	0	0.3	0
Mulago Kiribedda	PRIVATE	KAMPALA	KOMET	1	UCB (EEC)	9	0.3	9600
Karamoja Seed Scheme	CHURCH	KOTIDO	MINI40	1	TEAR FUND	0	0.3	
COU Angoma	CHURCH	KITGUM	MINI40	1	COU	0	0.3	
Bukedea Mission	CHURCH	KUMI	MINI40	1	OXFAM	1	0.4	130
Kazo Church Kachwambara	CHURCH	KUMI	MINI40	1	OXFAM	0	0.4	500
Kumi Leprosy Center	NGO	KUMI	MINI40	1	OXFAM	0.2	0.4	0
Vision Terudo	NGO	KUMI	MINI40	1	OXFAM	0	0.4	1728
Wabusana Millers & Weavers Coop	COOP	LUWERO	MINI40	1	??	0.1	0.1	2400
Kiryatabwala General Merchants	PRIVATE	MASAKA	MINI40	1	PRIVATE	0	0.3	8400
Mosewa Trading Co.	PRIVATE	MASAKA	KOMET	1	UCB (EEC)	1	0.3	0
Nyamitanga Tech Inst	SCHOOL	MBARARA	MINI40	1	WFP	0	0.3	
Biyaya COU	CHURCH	MOYO	MINI40	1	LWF	0	0.3	0
Katonga Farm Ltd	PRIVATE	MPIGI	SMALL	1	PRIVATE	0	0.32	0
Village Technology Workshop	CHURCH	SOROTI	MINI40	1	HANDS IN SERVICE	14	0.7	2403
Bukedi College	SCHOOL	TORORO	MINI40	1	WFP	0	0.3	0
SUBTOTAL N=21				21		25	7	25962

Appendix 1.4 Oil Mills Ordered But Not Yet Installed In Uganda

NAME	OWNERSHIP	DISTRICT	TYPE OF EXPELLERS	NO.	DONOR OR FINANCEER	OIL 1992 (MT)	CAPACITY MT /DAY	OIL 1991 (lts)
MILLS APPROVED BUT NOT INSTALLED YET								
Nebbi Food Handlers	GROUP	NEBBI	INDIAN	1	CATHOLIC	0	2	0
Kinakulya Coop Soc	COOP	KIBOGA	MINI40	1	CAAS	0	0.3	0
Luwero Soap & Oil	PRIVATE	LUWERO	UNITED	2	UDB (USAID	0	10	0
Akaki & Sons Veg Oil	PRIVATE	APACH	MINI40	1	EDF	0	0.3	0
Agali Awamu Women's	GROUP	JINJA	MINI40	1	EDF	0	0.3	0
Nawanende Farmer's Assoc.	GROUP	KAMULI	MINI40	1	EDF	0	0.3	0
Namasagali Enter.	PRIVATE	KAMULI	MINI40	1	EDF	0	0.3	0
Kapchorwa United Oil	PRIVATE	KAPCHORWA	MINI40	1	EDF	0	0.3	0
Olilim Pala Oil Mill	PARIVATE	LIRA	??	1	EDF	0	0.3	0
Alimugonza Women's	GROUP	MASINDI	MINI40	1	EDF	0	0.3	0
Bukoli Women's Assoc.	GROUP	IGANGA	MINI40	1	EDF	0	0.3	0
Kalawinya	PRIVATE	KITGUM	HANDER	2	UCB (IDA)	0	5	0
Break & Partners	PRIVATE	LIRA	UNITED	2	UCB/USAID	0	10	0
Magemesso	PRIVATE	IGANGA	KOMET	1	UCB (EEC)	0	0.3	0
Kibinge	PRIVATE	MASAKA	UNITED	1	UCB/USAID	0	10	0
?? name not available	PRIVATE	KUMI	UNITED	1	UCB/USAID	0	10	0
Gulu Orphan Assoc.	GROUP	GULU	INDIAN	7	W. VISION	0	2.8	0
Compas Ltd	PRIVATE	for sale	CHINESE	6		0	9	0
Kennex Oil Mill	PRIVATE	GULU	INDIAN	2		0	4	0
Kawoko Gen. Agencies	PRIVATE	MASAKA	PAKISTANI	2		0	16	0
New Good Hope	CHURCH	SOROTI	GERMAN	1		0	4	0
SUBTOTAL MILLS NOT YET INSTALLED N=29				37		0	62	0
GRAND TOTAL SMALL-MEDIUM N = 71		29 DISTRICTS		97		568	191	232316
GRAND TOTAL ALL MILLS OF EVERY SIZE				215		2622	839	573427

Appendix 2: Calculation of the Opportunity cost of Land for 1992

THE RETURNS TO FAMILY LABOUR FOR EXPORT AND COMPETING CROPS FOR PURPOSES OF CALCULATING THE 1992 OPPORTUNITY COST OF LAND.

CROP	YIELD Kg/Ha	FARM PRICE Shs/Kg	VALUE OF OUTPUT 000'Sh/Ha	VARIABLE COST 000'Sh/Ha	REVENUE LESS VARIABLE COST 000'Sh/Ha	FAMILY LABOUR day/Ha	COST OF FAMILY LABOUR 000'Sh/Ha	RETURNS TO LAND 000'Sh/Ha
Cotton	645	340	219	103	116	160	112	4
Maize	1625	120	195	136	59	89	62	(3)
Groundnuts	700	550	385	163	222	197	138	84
Soybeans	800	250	200	62	138	123	86	52
Simsim	375	400	150	38	112	130	91	21
Sunflower	650	160	104	27	77	107	75	2
Cassava	5750	50	288	135	152	200	140	12
Finger Millet	1,375	200	275	90	185	178	125	60
Sorghum	1,400	100	140	65	75	160	112	(37)
Beans	700	220	154	69	85	125	88	(2)
Tobacco (fire)	800	620	496	277	219	291	204	15
Sweet potatoes	4000	60	240	95	145	110	77	68

Mean Value of Land/Ha = 23,047. Value of land assuming fallow yields zero return and occupies 3 years out of six in the rotation = 11,524. This value is divided by the average yield for each crop to get the value of land per kg.

Appendix 3: Calculation of the Rate of Return to Investment in Manual Oil Pressing

Appendix 3.1 Base Case Scenario Calcualtion of the Financial Rate of Return to Investment in the Capu Press

	Yr.0	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10
Equipment	494,250		36,750	12,500	36,750	0	49,250	0	36,750	12,500	0
Land	0	0	0	0	0	0	0	0	0	0	0
Buildings	0	0	0	0	0	0	0	0	0	0	0
Working Capital	455,000	0	0	0	0	0	0	0	0	0	(455,000)
Total Capital	949,250	0	36,750	12,500	36,750	0	49,250	0	36,750	12,500	(455,000)
Lubrication	0	0	0	0	0	0	0	0	0	0	0
Repairs	0	44,500	44,500	44,500	44,500	44,500	44,500	44,500	44,500	44,500	44,500
Seed	0	910,000	910,000	910,000	910,000	910,000	910,000	910,000	910,000	910,000	910,000
Cleaning seed	0	33,800	33,800	33,800	33,800	33,800	33,800	33,800	33,800	33,800	33,800
Commercial pressing labor	0	234,000	234,000	234,000	234,000	234,000	234,000	234,000	234,000	234,000	234,000
Service pressing labor	0	46,800	46,800	46,800	46,800	46,800	46,800	46,800	46,800	46,800	46,800
Fuelwood	0	41,600	41,600	41,600	41,600	41,600	41,600	41,600	41,600	41,600	41,600
Transport of oil	0	95,160	95,160	95,160	95,160	95,160	95,160	95,160	95,160	95,160	95,160
Transport of cake	0	0	0	0	0	0	0	0	0	0	0
Total variable costs	0	1,361,360	1,361,360	1,361,360	1,361,360	1,361,360	1,361,360	1,361,360	1,361,360	1,361,360	1,361,360
Sale of oil	0	1,987,440	1,987,440	1,987,440	1,987,440	1,987,440	1,987,440	1,987,440	1,987,440	1,987,440	1,987,440
Sale of cake	0	247,000	247,000	247,000	247,000	247,000	247,000	247,000	247,000	247,000	247,000
Service fee (oil)	0	99,372	99,372	99,372	99,372	99,372	99,372	99,372	99,372	99,372	99,372
Service fee (cake)	0	24,700	24,700	24,700	24,700	24,700	24,700	24,700	24,700	24,700	24,700
Total revenues	0	2,358,512	2,358,512	2,358,512	2,358,512	2,358,512	2,358,512	2,358,512	2,358,512	2,358,512	2,358,512
Salvage value											
Net cashflows	(949,250)	952,652	915,902	940,152	915,902	952,652	903,402	952,652	915,902	940,152	1,407,652
IRR (fin)	0.99										

Appendix 3.2 Base Case Calculation of the Economic Rate of Return to Investment in the CAPU Press

	Yr.0	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10
Equipment	491,750		36,750	10,000	36,750	0	46,750	0	36,750	10,000	0
Land	0	0	0	0	0	0	0	0	0	0	0
Buildings	0	0	0	0	0	0	0	0	0	0	0
Working Capital	546,000	0	0	0	0	0	0	0	0	0	(546,000)
Total capital cost	1,037,750	0	36,750	10,000	36,750	0	46,750	0	36,750	10,000	(546,000)
Lubrication	0	0	0	0	0	0	0	0	0	0	0
Repairs	0	44,500	44,500	44,500	44,500	44,500	44,500	44,500	44,500	44,500	44,500
Purchase of seed	0	1,092,000	1,092,000	1,092,000	1,092,000	1,092,000	1,092,000	1,092,000	1,092,000	1,092,000	1,092,000
Cleaning of seed	0	40,560	40,560	40,560	40,560	40,560	40,560	40,560	40,560	40,560	40,560
Commercial pressing labor	0	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800	124,800
Service pressing labor	0	0	0	0	0	0	0	0	0	0	0
Fuelwood	0	49,920	49,920	49,920	49,920	49,920	49,920	49,920	49,920	49,920	49,920
Transport of oil	0	114,192	114,192	114,192	114,192	114,192	114,192	114,192	114,192	114,192	114,192
Transport of cake	0	0	0	0	0	0	0	0	0	0	0
Total variable costs	0	1,421,472	1,421,472	1,421,472	1,421,472	1,421,472	1,421,472	1,421,472	1,421,472	1,421,472	1,421,472
Sale of oil (com'l)	0	1,924,978	1,924,978	1,924,978	1,924,978	1,924,978	1,924,978	1,924,978	1,924,978	1,924,978	1,924,978
Sale of cake (com'l)	0	296,400	296,400	296,400	296,400	296,400	296,400	296,400	296,400	296,400	296,400
Total revenues (fin)	0	2,221,378	2,221,378	2,221,378	2,221,378	2,221,378	2,221,378	2,221,378	2,221,378	2,221,378	2,221,378
Net cashflows (fin)	(1,037,750)	755,406	718,656	745,406	718,656	755,406	708,656	755,406	718,656	745,406	1,301,406
IRR (economic)	0.71										

Appendix 4: Calculation of the Rate of Return to Investment in Small Expellers

Appendix 4.1 Base Case Calculation of the Financial ROR to Small Scale Expelling

YEAR	0	1	2	3	4	5	6	7	8	9	10
					(all values in '000 USh)						
Oil sales		29,221	43,831	43,831	43,831	43,831	43,831	43,831	43,831	43,831	43,831
Cake sales		3,825	5,738	5,738	5,738	5,738	5,738	5,738	5,738	5,738	5,738
Total Revenue		33,046	49,569	49,569	49,569	49,569	49,569	49,569	49,569	49,569	49,569
Sales tax		2,656	3,985	3,985	3,985	3,985	3,985	3,985	3,985	3,985	3,985
Net revenue		30,389	45,584	45,584	45,584	45,584	45,584	45,584	45,584	45,584	45,584
Sunflower seed		12,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000
Packaging		2,435	3,653	3,653	3,653	3,653	3,653	3,653	3,653	3,653	3,653
Bags		1,377	2,066	2,066	2,066	2,066	2,066	2,066	2,066	2,066	2,066
Salaries		858	987	987	987	987	987	987	987	987	987
Labor & askaris		552	648	648	648	648	648	648	648	648	648
Shipping		1,547	2,320	2,320	2,320	2,320	2,320	2,320	2,320	2,320	2,320
Equip maint & repair		723	868	1,013	1,157	1,302	1,302	1,592	1,736	1,881	2,025
Worm replacement				2,000		2,000		2,000		2,000	
Building maint & repair		411	411,441	411,441	493,730	576,018	658,306	740,594	822,883	822,883	822,883
Electricity		759	1,134	1,134	1,134	1,134	1,134	1,134	1,134	1,134	1,134
Administration		1,500	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250
Marketing		517	775	775	775	775	775	775	775	775	775
Contingency @ 5% of op. Exp.		1,134	1,656	1,763	1,674	1,786	1,697	1,808	1,720	1,827	1,734
Income tax (30%)		1,292	2,564	1,889	2,447	1,746	2,304	1,603	2,161	1,486	2,070
Investment	(22,694)	0	0	0	0	0	(4,440)	0	0	0	0
Working capital	(6,000)	(3,000)	0	0	0	0	0	0	0	0	9,000
Net cash flow	(28,694)	2,284	8,252	6,676	7,979	6,343	3,206	6,009	7,312	5,736	16,100
Financial ROR after taxes		0.18									
Before tax returns	(28,262)	3,575	10,817	8,565	10,426	8,088	5,510	7,612	9,473	7,221	18,169
ROR to all resources		0.25									

Appendix 4.2 Base Case Scenario Calculation of the Economic Rate of Return to Small Oil Expelling

YEAR	0	1	2	3	4	5	6	7	8	9	10
					(all values in 000 USh)						
OIL SALES (IMPORT SUBSTITUTION VALUE)		22,013	33,019	33,019	33,019	33,019	33,019	33,019	33,019	33,019	33,019
OIL MEAL SALES		3,825	5,738	5,738	5,738	5,738	5,738	5,738	5,738	5,738	5,738
TOTAL REVENUE		25,838	38,757	38,757	38,757	38,757	38,757	38,757	38,757	38,757	38,757
SUNFLOWER SEED		12,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000
PACKAGING		2,435	3,653	3,653	3,653	3,653	3,653	3,653	3,653	3,653	3,653
BAGS		1,377	2,066	2,066	2,066	2,066	2,066	2,066	2,066	2,066	2,066
SALARIES		858	987	987	987	987	987	987	987	987	987
DAY LABOR & ASKARIS		432	480	480	480	480	480	480	480	480	480
TRANSPORTATION (PACKAGES)		928	1,392	1,392	1,392	1,392	1,392	1,392	1,392	1,392	1,392
EQUIP MAINT & REPAIR		723	723	723	723	723	723	723	723	723	723
WORM REPLACEMENT		0	0	2,000	0	2,000	0	2,000	0	2,000	0
BUILDING MAINT & REPAIR		411	411	411	411	411	411	411	411	411	411
ELECTRICITY		759	1,134	1,134	1,134	1,134	1,134	1,134	1,134	1,134	1,134
GENERAL ADMINISTRATION		1,500	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250
MARKETING @ 2% OF SALES		517	775	775	775	775	775	775	775	775	775
CONTINGENCY @ 5% OF OP. EXP.		281	1,594	1,694	1,594	1,694	1,594	1,694	1,594	1,694	1,594
TOTAL EXPENSES		5,910	33,465	35,565	33,465	35,565	33,465	35,565	33,465	35,565	33,465
NET INCOME		(5,884)	5,292	3,192	5,292	3,192	5,292	3,192	5,292	3,192	5,292
INVESTMENT	(22,694)						(4,440)				
WORKING CAPITAL	(6,000)	(3,000)									9,000
NET CASH FLOW	(28,694)	116	5,292	3,192	5,292	3,192	852	3,192	5,292	3,192	14,292
ECONOMIC RATE OF RETURN	0.07										

Appendix 5: Calculation of the Rate of Return to Investment in Rehabilitation on Former Asian Mills

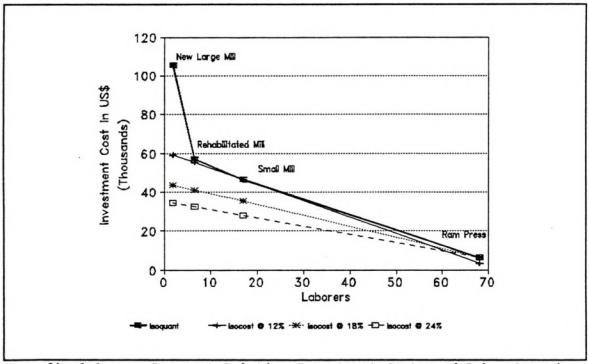
Appendix 5.1 Base Case Calculation of the Economic Rate of Return to Investment in Rehabilitation of an Asian Mill for Crushing Sunflower

YEAR	0	1	2	3	4	5	6	7	8	9	10
					(all values in million USh)						
OIL SALES		781	1,561	3,122	4,683	4,683	4,683	4,683	4,683	4,683	4,683
MEAL SALES		169	338	676	1013	1013	1013	1013	1013	1013	1013
SOAP STOCK SALES		1	2	4	6	6	6	6	6	6	6
RAW MATERIALS COST		450	901	1,801	2,702	2,702	2,702	2,702	2,702	2,702	2,702
SALES TAX (10%)		71	142	284	426	426	426	426	426	426	426
MARKETING COSTS		29	57	161	201	201	201	201	201	201	201
OIL PACKAGING		58	115	231	346	346	346	346	346	346	346
MEAL PACKAGING		43	87	174	261	261	261	261	261	261	261
TRANSPORT		18	36	72	108	108	108	108	108	108	108
MAINTENANCE MATERIALS		15	30	61	91	91	91	91	91	91	91
MAINTENANCE LABOR		6	12	24	36	36	36	36	36	36	36
CHEMICALS		4	8	16	23	23	23	23	23	23	23
LABOR		3	7	14	21	21	21	21	21	21	21
MISCELLANEOUS		23	46	92	138	138	138	138	138	138	138
MANAGEMENT COSTS		4	8	16	24	24	24	24	24	24	24
ADMIN SUPPLIES		24	24	24	24	24	24	24	24	24	24
ADMIN S+B		14	14	14	14	14	14	14	14	14	14
REPLACEMENT OF WEAR PARTS			20		20		20		20		20
INVESTMENT	1,551	0	0	0	0	0	0	0	0	0	0
WORKING CAPITAL	225	225	450	450	0	0	0	0	0	0	1,351
NET BENEFITS	(1,776)	(37)	(56)	369	1,268	1,288	1,268	1,288	1,268	1,288	2,619
IRR	0.31										

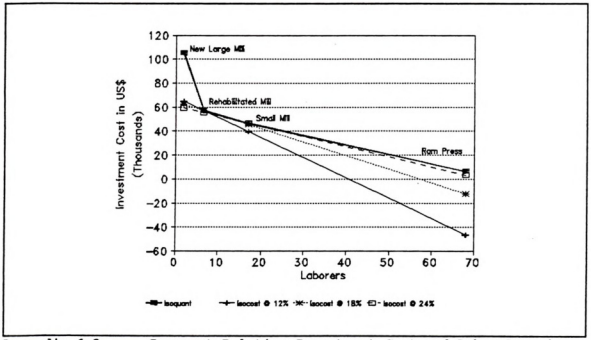
Appendix 5.2 **Base Case Calculation of Financial ROR to Investment in Rehabilitation of Asian Mill for Sunflower Processing**

YEAR	0	1	2	3	4	5	6	7	8	9	10
					(all values in million USh)						
OIL SALES		1,051	2,101	4,203	6,304	6,304	6,304	6,304	6,304	6,304	6,304
MEAL SALES		169	338	676	1013	1013	1013	1013	1013	1013	1013
SOAP STOCK		1	2	4	6	6	6	6	6	6	6
RAW MATERIALS COST		450	901	1,801	2,702	2,702	2,702	2,702	2,702	2,702	2,702
SALES TAX (10%)		96	191	382	573	573	573	573	573	573	573
MARKETING COSTS		37	73	194	250	250	250	250	250	250	250
OIL PACKAGING		75	150	300	450	450	450	450	450	450	450
MEAL PACKAGING		43	87	174	261	261	261	261	261	261	261
TRANSPORT		30	60	120	179	179	179	179	179	179	179
MAINTANANCE MATERIALS		15	30	61	91	91	91	91	91	91	91
MAINTANANCE LABOR		6	12	24	36	36	36	36	36	36	36
CHEMICALS		4	8	16	23	23	23	23	23	23	23
LABOR		5	11	22	33	33	33	33	33	33	33
MISCELLANEOUS		32	63	127	190	190	190	190	190	190	190
MANAGEMENT COSTS		6	13	25	38	38	38	38	38	38	38
ADMIN SUPPLIES		24	24	24	24	24	24	24	24	24	24
ADMIN S+B		14	14	14	14	14	14	14	14	14	14
PARTS REPLACEMENT			20		20		20		20		20
INCOME TAXES (30%)		78	199	443	695	712	707	713	707	713	707
INVESTMENT	(1,551)	0	0	0	0	0	0	0	0	0	0
WORKING CAPITAL	(225)	(225)	(450)	(450)	0	0	0	0	0	0	1,351
RETURNS TO ALL RESOURCES	(1,776)	158	334	1,149	2,439	2,459	2,439	2,459	2,439	2,459	3,790
FIN. ROR ALL RES.	0.54										
RETURNS AFTER TAXES	(1,776)	79	135	706	1,744	1,747	1,732	1,746	1,732	1,746	3,083
FIN. ROR AFTER TAXES	0.41										

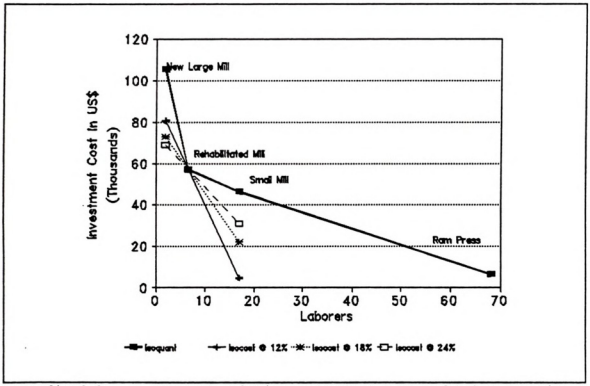
Appendix 6: Isocost Graphs for Sensitivity Analysis of the Choice of Technology



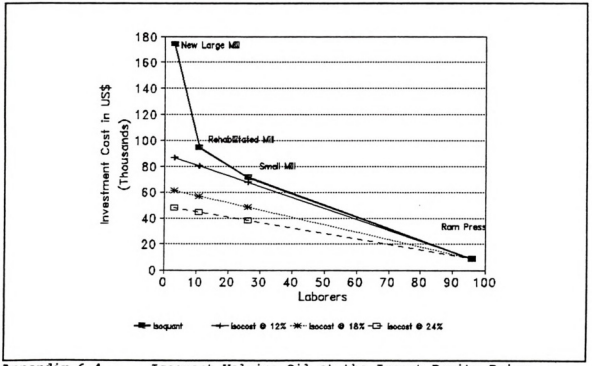
Appendix 6.1 Isoquant Relating Investment Costs and Labor Assuming a Shadow Price for Labor of $101/Year.



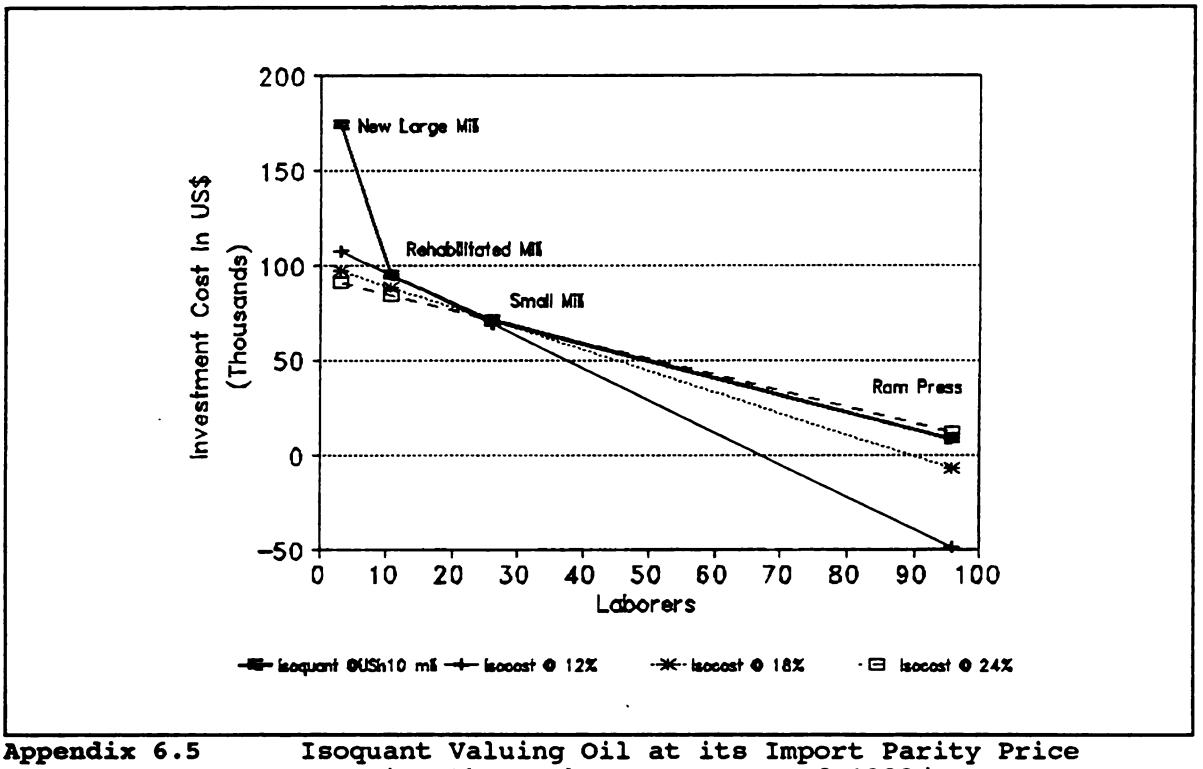
Appendix 6.2 Isoquant Relating Investment Cost and Labor Assuming Rural Market Wage Rate of $202/yr



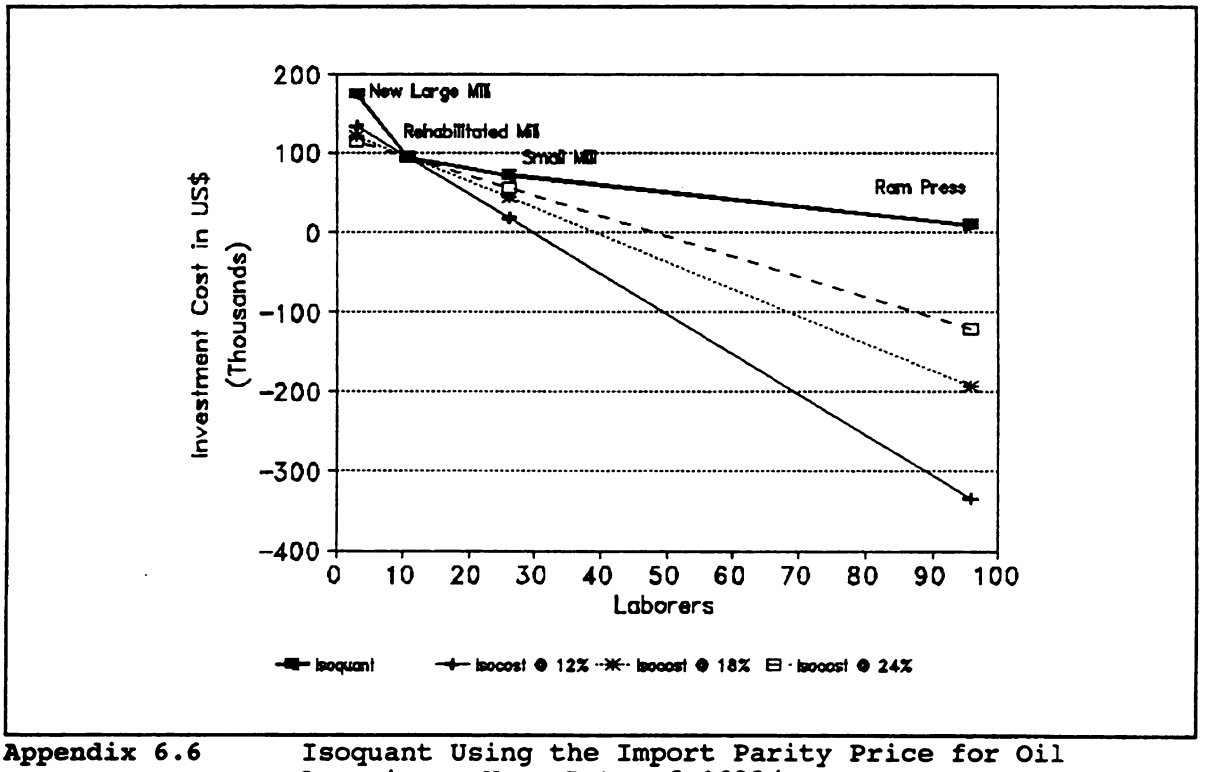
Appendix 6.3 Isoquant Relating Investment Cost and Labor Assuming A Wage of $600



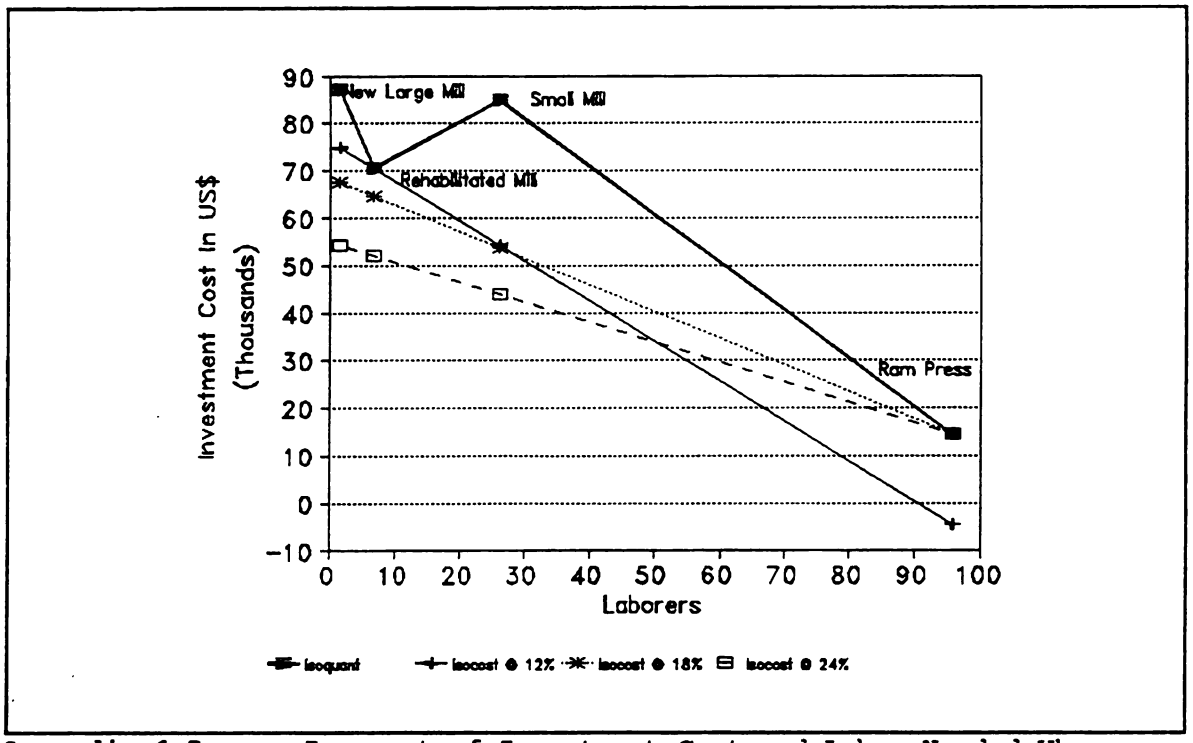
Appendix 6.4 Isoquant Valuing Oil at the Import Parity Price Assuming a Shadow Wage Rate of $101/year



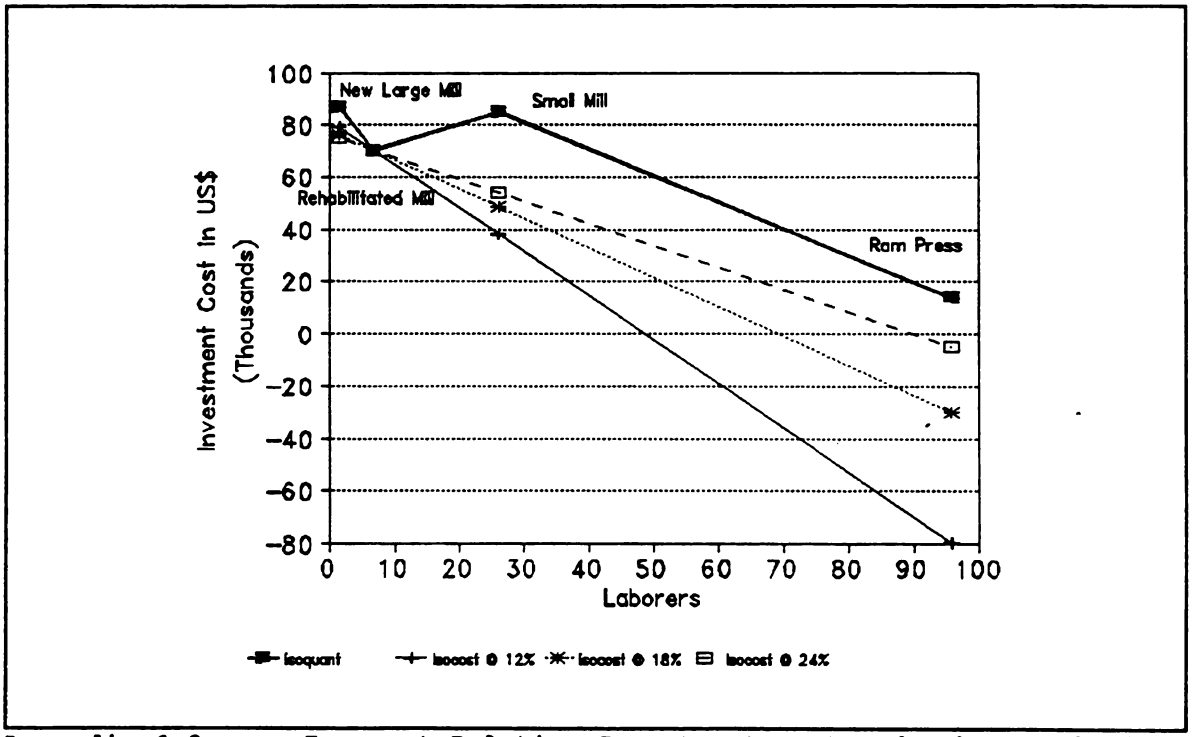
Appendix 6.5 Isoquant Valuing Oil at its Import Parity Price Assuming the Market Wage Rate of $202/year



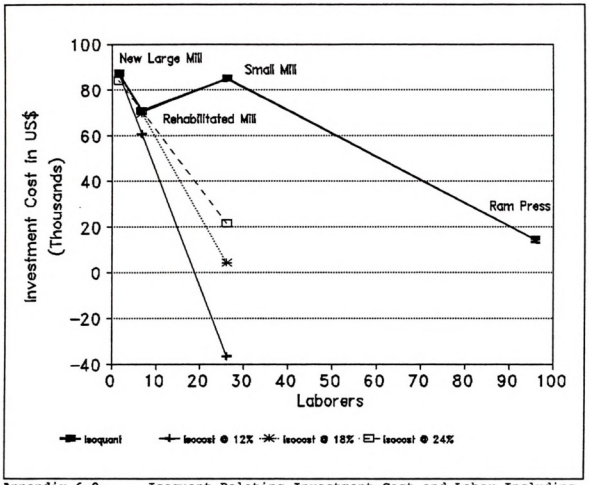
Appendix 6.6 Isoquant Using the Import Parity Price for Oil Assuming a Wage Rate of $600/year



Appendix 6.7 Isoquant of Investment Cost and Labor Needed When Replacement Costs Are Included: Assuming a Wage Rate of $101/Year



Appendix 6.8 Isoquant Relating Investment Cost and Labor Including Replacement Cost of Equipment, Assuming a Wage rate of $202/Year



Appendix 6.9 Isoquant Relating Investment Cost and Labor Including Replacement Cost for Equipment, Assuming a Wage Rate of $600/Year

Appendix 7: Calculation of the Unit Isoquant in Value Added Under Scenario Four

Appendix 7.1 Derivation of the Unit Isoquant Given Longer Plant Life and Double Shifts for Larger Mills and Import Parity Price for Oil

The Choice of Milling Technique				
Data Per Unit	Ram Press	Small Expeller	Rehabili-tated Asian Mill	New Large Mill
extraction rate- oil	0.2184	0.26	0.3	0.32
extraction rate-cake	0.76	0.51	0.48	0.46
price oil	1130	1030	940	940
price cake	50	100	140	140
price seed	140	160	180	180
Crushing capacity (mt/yr)	28.8	150	10560 (Two Shifts)	27000 (Two Shifts)
Investment Costs (US dollars)	603	22,797	1,559,214	5,300,000
Life of Equipment	5 years	10 years	10 years	20 years
Operative laborers (# per shift)	4	7	150	95
Data per 1,000 Tons of Sunflower Input per Year				
Investment Cost (US dollars)	20,943	151,980	147,653	196,296
Operative laborers (number)	138.89	46.67	14.20	3.52
Oil output (tons)	218	260	300	320
Market price (USh/kg)	1,130	1,030	940	940
Cake output (tons)	760	510	480	460
Market price (USh/kg)	50	100	140	140
Value of Output (million USh)	284.8	318.8	349.2	365.2
Value Added (million USh)	144.8	178.8	209.2	225.2
Data per USh 10 million in Value Added per Year				
Investment cost (US dollars)	14,464	85,000	70,580	87,165
Operative laborers (number)	95.92	26.10	6.79	1.56

Appendix 8: Policy Analysis Matrices for Sunflower Oil

Appendix 8.1 Sunflower Oil Policy Analysis Matrix for the Ram Press

ASSUMPTIONS:
YIELD = 650 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.

	FINANCIAL	ECONOMIC	DIFFERENCE
FOREIGN REVENUE	0	1,094	(1,094)
DOMESTIC REVENUE	1,610	210	1,400
TOTAL REVENUE	1,610	1,304	306
TRADEABLES	58	58	0
LABOR	893	710	183
DOMESTIC FACTORS	200	359	(159)
TOTAL COST	1,151	1,127	24
PROFIT	459	177	282

Value Added (Financial) Rf-Tf	1,552
Value Added (Economic) Re-Te	1,246
Profitability Coefficient Pf/Pe	2.59
Subsidy Rate to Producers (Pf-Pe)/Re	0.22
Nominal Protection Coefficient	
a) Outputs Rf/Re	1.23
b) Tradeable Inputs Tf/Te	1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)	1.25
Private Cost Ratio (Df+Lf)/(Rf-Tf)	0.70
Domestic Resource Cost Ratio (De+Le)/(Re-Te)	0.83

Appendix 8.2 Sunflower Oil Policy Analysis Matrix for the Small Expeller

ASSUMPTIONS:
YIELD = 650 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.

	FINANCIAL	ECONOMIC	DIFFERENCE
FOREIGN REVENUE	0	1,094	(1,094)
DOMESTIC REVENUE	1,596	232	1,364
TOTAL REVENUE	1,596	1,326	270
TRADEABLES	332	326	5
LABOR	615	564	51
DOMESTIC FACTORS	389	427	(38)
TOTAL COST	1,336	1,318	19
PROFIT	260	9	251
Value Added (Financial) Rf-Tf			1,264
Value Added (Economic) Re-Te			1,000
Profitability Coefficient Pf/Pe			30.04
Subsidy Rate to Producers (Pf-Pe)/Re			0.19
Nominal Protection Coefficient			
a) Outputs Rf/Re			1.20
b) Tradeable Inputs Tf/Te			1.02
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			1.26
Private Cost Ratio (Df+Lf)/(Rf-Tf)			0.79
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			0.99

Appendix 8.3 Sunflower Oil Policy Analysis Matrix for the Rehabilitated Asian Mill

ASSUMPTIONS:
YIELD = 650 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.

	FINANCIAL	ECONOMIC	DIFFERENCE
FOREIGN REVENUE	0	1,040	(1,040)
DOMESTIC REVENUE	1,497	224	1,273
TOTAL REVENUE	1,497	1,264	233
TRADEABLES	286	282	4
LABOR	468	485	(17)
DOMESTIC FACTORS	356	289	67
TOTAL COST	1,110	1,056	54
PROFIT	386	208	179
Value Added (Financial) Rf-Tf			1,210
Value Added (Economic) Re-Te			982
Profitability Coefficient Pf/Pe			1.86
Subsidy Rate to Producers (Pf-Pe)/Re			0.14
Nominal Protection Coefficient			
a) Outputs Rf/Re			1.18
b) Tradeable Inputs Tf/Te			1.02
Effective Protection Coefficient (Rf-Tf)/(Re-Te)			1.23
Private Cost Ratio (Df+Lf)/(Rf-Tf)			0.68
Domestic Resource Cost Ratio (De+Le)/(Re-Te)			0.73

Appendix 8.4 Sunflower Oil Policy Analysis Matrix for the New Large Mill

ASSUMPTIONS:
YIELD = 650 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS.

	FINANCIAL	ECONOMIC	DIFFERENCE
FOREIGN REVENUE	0	1,040	(1,040)
DOMESTIC REVENUE	1,474	201	1,273
TOTAL REVENUE	1,474	1,241	233
TRADEABLES	319	259	61
LABOR	484	457	27
DOMESTIC FACTORS	318	308	10
TOTAL COST	1,122	1,024	98
PROFIT	352	217	135

Value Added (Financial) Rf-Tf	1,154
Value Added (Economic) Re-Te	982
Profitability Coefficient Pf/Pe	1.62
Subsidy Rate to Producers (Pf-Pe)/Re	0.11
Nominal Protection Coefficient	
a) Outputs Rf/Re	1.19
b) Tradeable Inputs Tf/Te	1.23
Effective Protection Coefficient (Rf-Tf)/(Re-Te)	1.18
Private Cost Ratio (Df+Lf)/(Rf-Tf)	0.69
Domestic Resource Cost Ratio (De+Le)/(Re-Te)	0.72

Appendix 9: Policy Analysis Matrices for Cottonseed Oil

Appendix 9.1 Cotton Policy Analysis Matrix at the National Level: Uganda 1992

ASSUMPTIONS:
YIELD = 650 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. SEED SUBSIDY IS INCLUDED IN MARKETING COSTS. PRICE SUBSIDY IS 60SH/KG LINT. NO LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS. USING UNEX GINNING OUTTURN AND MARKETING COSTS. GINNING OUTTURN IS 38.5%

	FINANCIAL	ECONOMIC	DIFFERENCE
REVENUE	1,283	1,283	0
TRADEABLES	188	188	0
LABOR	779	779	0
DOMESTIC FACTORS	270	292	(22)
TOTAL COST	1,236	1,258	(22)
PROFIT	47	25	22

Value Added (Financial) Rf-Tf	1,095
Value Added (Economic) Re-Te	1,095
Profitability Coefficient Pf/Pe	1.87
Subsidy Rate to Producers (Pf-Pe)/Re	0.02
Nominal Protection Coefficient	
a) Outputs Rf/Re	1.00
b) Tradeable Inputs Tf/Te	1.00
Effective Protection Coefficient (Rf-Tf)/(Re-Te)	1.00
Private Cost Ratio (Df+Lf)/(Rf-Tf)	0.96
Domestic Resource Cost Ratio (De+Le)/(Re-Te)	0.98

Appendix 9.2 Cotton Policy Analysis Matrix Including the Value of Oil Processed in a Rehabilitated Asian Mill

ASSUMPTIONS:
COTTON YIELD = 645 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. PROCESSING LABOR SHADOW PRICED AT THE RURAL MARKET WAGE. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS. GINNING OUTTURN AT 38.5%.

	FINANCIAL	ECONOMIC	DIFFERENCE
FOREIGN REVENUE	1,284	1,566	(282)
DOMESTIC REVENUE	413	68	345
TOTAL REVENUE	1,697	1,634	63
TRADEABLES	300	288	12
LABOR	786	784	2
DOMESTIC FACTORS	395	392	3
TOTAL COST	1,481	1,463	17
PROFIT	217	171	46

Value Added (Financial) Rf-Tf	1,398
Value Added (Economic) Re-Te	1,347
Profitability Coefficient Pf/Pe	1.27
Subsidy Rate to Producers (Pf-Pe)/Re	0.03
Nominal Protection Coefficient	
a) Outputs Rf/Re	1.04
b) Tradeable Inputs Tf/Te	1.04
Effective Protection Coefficient (Rf-Tf)/(Re-Te)	1.04
Private Cost Ratio (Df+Lf)/(Rf-Tf)	0.84
Domestic Resource Cost Ratio (De+Le)/(Re-Te)	0.87

Appendix 9.3 Cotton Policy Analysis Matrix Including the Value of Oil Processed in a New Large Mill

ASSUMPTIONS:
YIELD = 645 KG/HA. NO FOREIGN EXCHANGE PREMIUM. TAXES ADD 45% TO THE FINANCIAL COST OF COLLECTION AND 20% TO FINANCIAL MARKETING COSTS. NO INPUT SUBSIDIES OR LABOR MARKET DISTORTIONS. VALUE OF LAND ADDED TO ECONOMIC COST OF DOMESTIC FACTORS. GINNING OUTTURN = 38.5%.

	FINANCIAL	ECONOMIC	DIFFERENCE
FOREIGN REVENUE	1,284	1,566	(282)
DOMESTIC REVENUE	413	68	345
TOTAL REVENUE	1,697	1,634	63
TRADEABLES	317	282	35
LABOR	796	794	1
DOMESTIC FACTORS	358	351	7
TOTAL COST	1,471	1,428	43
PROFIT	227	207	20

Value Added (Financial) Rf-Tf	1,380
Value Added (Economic) Re-Te	1,352
Profitability Coefficient Pf/Pe	1.10
Subsidy Rate to Producers (Pf-Pe)/Re	0.01
Nominal Protection Coefficient	
a) Outputs Rf/Re	1.04
b) Tradeable Inputs Tf/Te	1.12
Effective Protection Coefficient (Rf-Tf)/(Re-Te)	1.02
Private Cost Ratio (Df+Lf)/(Rf-Tf)	0.84
Domestic Resource Cost Ratio (De+Le)/(Re-Te)	0.84

BIBLIOGRAPHY

BIBLIOGRAPHY

Abbott, John Cave and J.P. Makeham. Agricultural Economics and Marketing in the Tropics. Intermediate Agriculture series. Hong Kong: Commonwealth Printing Press, 1984.

Abt Associates. Uganda Non-Traditional Export Commodity Rapid Appraisal Agricultural Marketing Improvement Strategies Project, USAID. 1992.

Abt Associates. Rapid Appraisal of Cowpea Marketing in Niger, Phase I Report. AMIS Project. Washington D.C.: USAID, 1988.

Agricultural Secretariat. Report on the Review of Producer Prices for the Export Crops-1992/93. Kampala: Bank of Uganda. 1992.

Agricultural Secretariat. Report on the Review of Producer Prices for Export Crops 1991/92. Kampala, Uganda: Bank of Uganda. 1991a.

Agricultural Secretariat. Comparative Advantage and Competitiveness of Uganda's Agricultural Exports. Kampala: Bank of Uganda, 1991b.

Ahimbisibwe, J. K, L. Msemakweli, et al., "A Baseline Survey of Uganda's Edible Oil Production and Sugarcane Jaggeries: Final Report. " Consultancy report prepared for Experiment in International Living-Agro Processing and Manufacturing Promotion project. Mimeo. 1988

Ahmed, Raisuddin and Narendra Rustagi. Agricultural Marketing and Price Incentives: A Comparative Study of African and Asian Countries. Rome: FAO. 1985.

Alibaruho, G. "Regional Supply Elasticities in Uganda's Cotton Industry and the Declining Level of Cotton Output." Eastern Africa Economic Review. Vol. 6, (December 1974), pp. 35-56.

Anyanga, Walter. "Progress in Simsim Breeding and the Constraints." Mimeo. 1993.

Ashworth, Vincent A. Food Crop Production and Marketing. Uganda Agricultural Sector Memorandum Working Paper. Kampala, Uganda: World Bank. 1991.

Askari, Hossein and John Cummings. "Estimating the Agricultural Supply Response with the Nerlove Model: A Survey" International Economic Review, June 1977, Vol. 18, No. 2; pp. 257-292. 1977.

Appropriate Technology International. "Uganda Oilseed Processing: Rural Enterprise Support Services, UPRESS Project Proposal." Washington D.C.: ATI. September 1993.

Bain, Joe. Industrial Organization. 2d ed. New York: John Wiley and Sons, 1968.

Bernsten, Richard and John Staatz. "The Role of Subsector Analysis in Setting Research Priorities." Paper presented at the Symposium on the Impact of Technology on Agricultural Transformation in Africa, October 14-16, 1992. photocopied.

Bijman, Jos; Kees van den Doel; and Gerd Juune. The Impact of Biotechnology on Living and Working Conditions in Western Europe and the Third World. Dublin: European Foundation for the Improvement of Living and Working Conditions. 1986.

Bond, Marian E. "Agricultural Responses to Prices in Sub-Saharan African Countries." IMF Staff Papers. Vol 30, 4, pp. 703-726. 1983.

Boomgard, James, Stephen Davies, Steve Haggblade, and Donald Mead. A Subsector Approach to Small Enterprise Promotion and Research. GEMINI Working Paper no. 10. Washington D.C.: Development Alternatives Inc., 1991.

Boomgard, James, Stephen Davies, Steve Haggblade and Donald Mead. Subsector Analysis: Its Nature, Conduct and Potential Contribution to Small Enterprise Development. Michigan State University Department of Agricultural Economics International Development Papers. Working Paper No. 26. East Lansing, MI.: Department of Agricultural Economics, Michigan State University, 1986.

Brett, E.A. "Cost Effective Services for the Rural Poor: Policy and Institutional Reform in Uganda." Report to ESCOR, ODA. Mimeo. 1992.

Brett, E. A. "Cooperatives and Development in Uganda" in Raymond Apthorp, ed., Rural Cooperatives and Planned Change in Africa, Geneva, UNRISD. 1970

Brett, E. A. Problems of Co-operative Development in Uganda. United Nations Research Institute for Social Development, Geneva. 1970.

British Cotton Growing Association. Cotton Subsector Development Project Preparation: Main Report and Annexes. Kampala: Government of Uganda and World Bank. 1993.

Brown, James G. Agroindustry Profiles *Oilseeds*. EDI working Papers. Agriculture and Rural Development Division of the Economic Development institute of the World Bank. Washington D.C.: The World Bank. 1991.

Bua, Anton and Walter Anyanga. "Simsim Improvement in Uganda." Mimeo. 1993.

Bucyanayandi, Tress and Luther Tweeten. Uganda Accelerated Foodcrop Production Strategy. Kampala, Uganda: Ministry of Agriculture and Manpower for Agricultural Development Project, USAID. 1990.

Buker, R.J and G.W. Denton. "Sunflower Production in Uganda." A Crop Production Guide prepared for the Ministry of Agriculture; sponsored by USAID/MFAD project, Kampala, Uganda. 1991.

Bunker, A.R., R.R. Perry, R.R. Read, and J. Ahimbisibwe. Strategy for Development of the Edible Oil Industry in Uganda. Consultancy Report for the Uganda Cooperative Alliance Ltd. under the USAID CAAS Project. Washington D.C.: Agricultural Cooperative Development International. 1991.

Burgess, D.A. "A Report on the Economic Comparison of the Bielenberg Hand Operated Ram Press and the KIT Hand Operated Spindle Press." A consultancy report prepared for the Zambia Agribusiness Management and Support Project (ZAMS). Lusaka: USAID. 1991.

Busch, Lawrence. "Science, Technology and Agricultural Subsector Development: A Position Paper." East Lansing, MI: Department of Sociology, MSU. 1990.

Busolo-Bulafu, C. M. "Groundnut Improvement Program in Uganda." From ICRISAT. Proceedings of the Fourth Regional Groundnut Workshop for Southern Africa, 19-23 March 1990, Arusha, Tanzania. Pantancheru, India: ICRISAT. pp. 55-59. 1990.

Busolo-Bulafu, C. M., Walter Anyanga and Y. Obong, "Sub Project No. 6: Groundnut and Simsim Research and Development, Annual Report for 1992." Forthcoming in Namulonge Research Station Annual Report. 1992.

Busolo-Bulafu, C. M. and Walter Anyanga. "Groundnut and Simsim Research and Development." Mimeo. No Date. Apparently 1992.

Busolo-Bulafu, C. M. and Y. Obong. "Groundnut Improvement Program." in Namulonge Research Station Annual Report, 1991. Theresa Sengooba, ed. Kampala: Ministry of Agriculture, Animal Industries and Fisheries. pp.93-102. 1992.

Carl Bro International a/s. Interim Report on Policies for the Grain Marketing Sector. Volume II: Main Report. Volume III. Subject Matter Reports. Consultancy report prepared for DANIDA under the terms of the Uganda Master Plan and Investment Program for the Grain Marketing Sector. Photocopy. 1992.

Carr, Stephen. The Impact of Government Intervention on Smallholder Development in North and East Uganda. A.D.U. Occasional Paper No. 3. London: Wye College (University of London) Agrarian Development Unit. 1982.

Caves, Richard. American Industry: Structure, Conduct, Performance. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1987.

Chambers, Robert. Rapid Rural Appraisal: Rationale and Repertoire. Institute of Development Studies Discussion Paper 155. Brighton, UK: IDS, University of Sussex, 1980.

Chew, David C. "Internal Adjustments to Falling Civil Service Salaries: Insights from Uganda" World Development, Vol. 18, No. 7, pp. 1002-1014. 1990.

Cleaver, Kevin M. The Impact of Price and Exchange Rate Policies on Agriculture in Sub-Saharan Africa. World Bank Staff Working Papers Number 728. Washington D.C.: The World Bank. 1985.

Coles, Diana M. S. The Vegetable Oil Crushing Industry in East Africa. Makerere Institute of Social Research Occasional Paper No. 4. Nairobi, Kenya: Oxford University Press, 1968.

Commonwealth Team of Experts, The Rehabilitation of the Economy of Uganda (2 volumes). London: The Commonwealth Secretariat. 1979.

Coppee Courtoy/Agrer. Feasibility Studies on The Rehabilitation and Development of Seed Farms, Food Crops & Oil Seed Projects. Volume I Main Report. Vol. III Annexes F- J. Brussels, Belgium: Min. of Agriculture and African Development Bank. 1989.

Crown Agents. Uganda Cotton Sector Study. Agricultural Services Unit, Crown Agents in Association with British Cotton Growing Association. London: ODA. 1983.

Davies, Stephen P. "The Evolution of the Textile Subsector in Egypt: Development Implications." Ph. D. diss., Michigan State University, 1988.

Development Alternatives, Inc. "A Field Manual for Subsector Practitioners." Bethesda Maryland: The GEMINI Project. Draft Working Paper, 1991.

East African Customs and Excise. Annual Trade Reports of Tanganyika, Uganda and Kenya. Commissioner of Customs and Excise. Various years.

Eicher, Carl K. "Leading Issues in Strengthening Agricultural Research Systems in Africa." Revised version of a keynote Address presented at the "International Conference on Agricultural Research in Sub-Saharan Africa" published in the Proceedings issue of the African Academy of Sciences, Nairobi: 1991.

Enger, Warren J., Derrick A. Burgess and J.K. Ahimbisibwe. Uganda Oilseed Production and Processing Sector Analysis. Report for Cooperative Agriculture and Agribusiness Support Project. Washington D.C.: Ronco. 1989.

EPADU. "The Report of the Task Force Committee on Edible Oil Industry in Uganda." Kampala: Ministry of Planning and Economic Development. 1990

FAO. Utilization of Tropical Foods: Tropical Oil-seeds. FAO Food and Nutrition Paper 47/5. Rome: FAO, 1989.

FAO. Trade Yearbook. Rome: FAO. Various years. 1970-1991.

FAO. FAO Food Balance Sheets: 1984-86 Average. Rome: FAO, 1991.

FAO. "Palm Oil Production in Uganda." Photocopy. Rome: FAO. 1988.

FAO. Report of the fourteenth session of the Intergovernmental Group on Oilseeds, Oils and Fats to the Committee on Commodity Problems. Rome: FAO, 1980.

FAO. Dietary Fats and Oils in Human Nutrition: Report of an Expert Consultancy. FAO Food and Nutrition Series No. 20. Rome: FAO. 1980.

FAO. Handbook on Human Nutritional Requirements. FAO Nutritional studies No. 26. (Also reprinted as WHO Monograph Series No. 61.). Rome: FAO, 1974.

FAO Technical Cooperation Programme. Agricultural Sector Review and Programming Mission, Uganda: Mission Findings and Recommendations. Rome: FAO, 1990.

Farrington, John (ed.). Biotechnology Agricultural Biotechnology: Prospects for the Third World. London: ODI. 1990. p. 30-31.

Frank Fehr and Co. Ltd. Annual Review for 1982 of Oilseeds, Oils, Oilcakes, and Other Commodities. London: 1983. pp. 48-50.

Frederick, Kenneth Dyer. "The Role of Market Forces and Planning in Uganda's Economic Development, 1900-1938." Eastern Africa Economic review., Vol. 1 (June 1969), pp. 47-62.

French, Ben C. "The Analysis of Productive Efficiency in Agricultural Marketing: Models, Methods, and Progress." in A Survey of Agricultural Economics Literature. Vol. 1: Traditional Fields of Agricultural Economics. Edited by Lee R. Martin. Minneapolis: University of Minnesota Press. 1977.

Galton-Fenzi, J.D. "Project Report to Determine the Potential of Expanding Sesame Production in the Gambia." Consultancy report for USAID under P.S.A. Agreement No. 92A-565-8678. Banjul: USAID. Photocopy. 1993.

Gittinger, J. Price. Economic Analysis of Agricultural Projects. Baltimore and London: Johns Hopkins University Press, 1982.

Green, Reginald Herbold. Magendo in the Political Economy of Uganda: Pathology, Parallel System or Dominant Sub-mode of Production? IDS Discussion Paper 164. Brighton, UK: Institute for Development Studies. 1981.

Hall, M. "Agricultural Development in the Coffee-Banana Zone of Uganda." Unpublished Ph.D. Thesis. University of East Africa. 1971.

Hazelwood, A. "Trade Balances and Statutory Marketing in Primary Exporting Countries," The Economic Journal, March 1957.

Helmberger, Peter G., Gerald Campbell and William D. Dobson. "Organization and Performance of Agricultural Markets." in A Survey of Agricultural Economics Literature. Vol. 3: Economics of Welfare, Rural Development and Natural Resources in Agriculture, 1940's to 1970's. Edited by Lee R. Martin. Minneapolis: University of Minesota Press. 1981.

Hittle, Carl. Soybean Development in Uganda: Volume I & II. A Report Sponsored by USAID/MFAD Project. Kampala, Uganda: USAID. 1987.

Holtzman, John S. Rapid Reconnaissance Guidelines for Agricultural Marketing and Food System Research in Developing Countries. MSU International Development Papers. Working Paper No. 30. East Lansing, MI: Department of Agricultural Economics, Michigan State University, 1986.

Holtzman, J.S., R.D. Abbott, and G. Martin. "The Marketing Improvement Strategies Project: Diagnosing Marketing System Constraints, Identifying Opportunities and Prescribing Policy Changes and Pilot Innovations." Journal of International Food & Agribusiness Marketing, pp. 29-39., 1989.

Hyden, Goran. No Shortcuts to Progress: African Development Management in Perspective. Berkeley: University of California Press. 1983.

Hyman, Eric L. "Oilseed Production and Processing in Malawi." Draft paper for Appropriate Technology International, Washington D.C. September 1993a.

Hyman, Eric L. Production of Edible Oils for the Masses and By the Masses: The Impact of the Ram Press In Tanzania. in World Development, Vol. 21, No. 3. pp. 429-443. 1993b.

Hyman, Eric L. A Comparison of Labor-Saving technologies for Processing Shea Nut Butter in Mali. in World Development, Vol. 19, No. 9. pp. 1247-1268. 1991.

Hyman, Eric L. "An Economic Analysis of Small-Scale Technologies for Palm Oil Extraction in Central and West Africa." in World Development, Vol. 18, No. 3. pp. 455-476. 1990.

IMF. International Financial Statistics. Bureau of Statistics of the IMF. Various years.

International Cotton Advisory Committee. Cotton: Review of the World Situation. Washington D.C.: International Cotton Advisory Committee. September-October 1993.

International Cotton Advisory Committee. "Survey of the Cost of Production of Raw Cotton," Oct. 1988.

James. A. T. "Plant Tissue Culture: Achievements and Prospects." Proceedings of the Royal Society of London. 222:134-45. 1984.

Jameson, J.D. ed. Agriculture in Uganda. 2nd ed. London: Oxford University Press. 1970.

Jitta, Jessica, Michael Migadde, and John Mudusu. "Determinance of Malnutrition in Under-Fives in Uganda: An In Depth Secondary Analysis of the Ugandan\ DHS (1988/89) Data." Ministry of Health, Entebbe and Child Health and Development Center, Makerere University, Kampala. 1992. [Photocopied.]

Katabarwa, Namara. "The Impact of Structural Adjustment Programmes On Agricultural Production in Uganda." Unpublished MSc. Thesis. Makerere University. 1993.

Kenya. Kenya Statistical Abstracts. 1991.

Kininklijk Instituut Voor De Tropen. Towards a National Food Strategy. Vol. I. Main Strategy Report and Vol II. Supporting Technical Reports. Amsterdam, The Netherlands: Royal Tropical Institute, 1984.

Kristjanson, P., M. Newman, C. Christensen & M. Abel. Export Crop Competitiveness: Strategies for Sub-Saharan Africa. Main Report and Appendices. ARAP Technical Report No. 109. Final Report of the African Cash Crop Competitiveness Strategy Study. Agricultural Policy Analysis Project, Phase II. Sponsored by U.S.A.I.D., Bureau of Science and Technology. Prepared by Abt Associates. Washington, D.C.: Bureau of Science and Technology, United States Agency for International Development, 1990.

Kruse, Greg, Bernadette Lubozhya and Jamie Raile. "The Potential for Small-Scale Oilseed Processing in Zambia." A consultancy report prepared for the Zambia Agribusiness Management and Support Project (ZAMS). Lusaka: USAID. December, 1991.

Kruse, Greg and Derrick Burgess. "Oilseed Processing in Uganda: A Small Scale Approach." a consultancy report by Ronco Consulting Corporation for USAID, Kampala. Kampala: Uganda Cooperative Alliance. October 1992.

Laker-Ojok, Rita. "The Rate of Return to Agricultural Research in Uganda: The Case of Oilseeds and Maize." Consultancy report prepared for USAID under the MSU Food Security Project. Mimeo. 1993a.

Laker-Ojok, Rita. "The Potential Returns to Oilseeds Research In Uganda: the Case of Groundnuts and Sesame." Consultancy report prepared for USAID under the MSU Food Security Project. Mimeo. 1993b.

Laker-Ojok, Rita. "The Organization of Input Delivery to Small Farmers in Uganda". A Paper prepared for the Economic and Social Committee for Overseas Research of the ODA. 1992. [Photocopied].

Laker-Ojok, Rita. "The Edible Oil Industry and Its Relationship to Economic Development in Northern Uganda." A consultancy report prepared for OXFAM Uganda. 1986. [Photocopied].

Lele, Uma, N. Van de Walle, and Mathurin Gbetibouo. Cotton in Africa: An Analysis of Differences in Performance. MADIA Discussion Paper #7. Washington D. C.: The World Bank. 1989.

Leonard, David. "The Political Realities of African Management" Working Paper Number 18. Binghamton NY: Institute for Development Anthropology. 1984.

Liedholm, Carl and Donald C. Mead. "Dynamics of Microenterprises: Research Issues and Approaches." Draft Gemini Working Paper, August 1990.

Lint Marketing Board. "Report on our tour of cotton unions in eastern and northern Uganda." Memo. 1986a.

Lint Marketing Board. "Report on the availability of cottonseed for planting in northern and eastern Uganda." Memo. 1986b.

Lint Marketing Board. Annual Report. Uganda Argus, Kampala. Various years. 1965-1986.

Lint Marketing Board. "Report of the taking-over of the oil milling industry in Uganda by the Lint Marketing Board." Memo. 1974.

Mamdani, Mahmood. "Uganda: Contradictions of the IMF Programme and Perspective." Development and Change., Vol. 21, pp. 427-467. 1990.

Mamdani, Mahmood. Politics and Class Formation in Uganda. London: Heinemann. 1976.

Marion, Bruce W. The Organization and Performance of the U.S. Food System. D.C. Heath and Company, 1986.

Marion, Bruce W. "Food System Organization and Performance: Towards a Conceptual Framework," American Journal of Agricultural Economics., Vol.62, No. 2., May 1980.

Marion, Bruce. "Application of the Structure, Conduct, Performance Paradigm to Subsector Analysis." N.C. 117 Working Paper No. 7. Madison, Wisconsin. November 1976.

Matin, Kazi; Sandy Cuthbertson; David Vincent and Jaber Ehdai. "Uganda; an Agenda for Trade Policy Reform." Washington, D.C.: Trade Policy Division, Country Economics Dept. The World Bank. April 1990.

Mayer Zald, "Review Essay: the New Institutional Economics," American Journal of Sociology, 93 (1987): 701-08.

McDiarmid, Orville John. Unskilled Labor for Development: It's Economic Cost. Baltimore: The John Hopkins University Press/World Bank, 1977.

McLaughlin, Edward W. "Buying and Selling Practices in the Fresh Fruit and Vegetable Industry: Implications for Vertical Coordination." Ph. D. diss., Michigan State University, 1983.

Mehta International Limited. "Uganda oilseed project." Vol. I - III. 1981.

Ministry of Agriculture and Co-operatives. Report on Uganda Census of Agriculture, Volume III. Entebbe: Uganda Government. 1966.

Ministry of Agriculture and Co-operatives. Report of Uganda Census of Agriculture. Vols. I & II. Entebbe: Uganda Government. 1965.

Ministry of Agriculture and African Development Bank. Feasibility Studies on The Rehabilitation and Development of Seed Farms, Food Crops & Oil Seed Projects. Vol. I. Main Report. Brussels, Belgium: Coppee Courtoy/Agrer, 1989.

Ministry of Agriculture, Animal Industries and Fisheries. Report on Uganda National Census of Agriculture and Livestock (1990/1991) Volume II. Holding Characteristics. Entebbe: The Republic of Uganda. December 1992.

Ministry of Agriculture, Animal Industries and Fisheries. Report on Uganda National Census of Agriculture and Livestock (1990/1991) Volume III. Crop Areas, Yields and Production. Entebbe: The Republic of Uganda. December 1992.

Ministry of Commerce, Cooperatives and Marketing. Exporters and Importer's Guide. Entebbe: The Republic of Uganda. 1991.

Ministry of Co-operatives and Marketing. "Loose Minutes to the Minister." Planning Unit memo. 1986.

Ministry of Finance and Economic Planning. Key Economic Indicators: 13th Issue: April 1993. Entebbe, Uganda: The Republic of Uganda. April 1993.

Ministry of Finance and Economic Planning, Background to the Budget, 1993/94. Entebbe: Uganda Government. June 1993.

Ministry of Finance and Economic Planning. Background to the Budget 1992-1993. Kampala, Uganda: The Republic of Uganda. 1992.

Ministry of Planning and Economic Development, Statistics Department. Report on the Uganda National Household Budget Survey (1989-90). Entebbe: Ministry of Planning and Economic Development, Republic of Uganda. 1991.

Ministry of Planning and Economic Development, Statistics Department. Provisional Results of the 1992 Population and Housing Census. Entebbe: Ministry of Planning and Economic Development, Republic of Uganda. 1991.

Ministry of Planning and Economic Development. The Way Forward: Macroeconomic Strategy 1990-1995. Kampala: Government of Uganda. 1990.

Ministry of Planning and Economic Development. Rehabilitation and Development Plan - 1989/90 - 1991/92, Vol 1. Entebbe: Government Printer, 1989.

Ministry of Planning and Economic Development. "Rural Food Consumption Survey." Entebbe, Uganda: Statistics Division, Ministry of Planning and Economic Development. 1968. Mimeo.

Ministry of Planning and Economic Development and FAO. Uganda National Food and Nutrition Policies and Programmes. Accra, Ghana: Joint FAO/WHO/OAU Regional Food and Nutrition Commission for Africa, 1984.

Monke, Eric A. and Scott R. Pearson. The Policy Analysis Matrix for Agricultural Development. Cornell University Press, Ithaca, NY: 1988.

Morris, Michael L. "Determining Comparative Advantage Through DRC Analysis: Guidelines Emerging From Cimmyt's Experience." CIMMYT Economics Program Working Paper. July 1989. Photocopied.

Mugeto, J. et al. A Technical Manual on Processing of Oilseeds Using Ram Press: A Technology Package for the Dissemination of the Bielenberg Ram Press. Njoro, Kenya: Egerton University/IDRC Rural Processing of Oilseeds Project. 1991.

Mwanje, Edison E. "Supply Response and Technology Adoption of Selected Ugandan Maize Farmers: Econometric Analysis and Policy Implications." Unpublished MSc. Thesis. Makerere University. 1993.

Nabuli, Mustapha K., and Nugent, Jeffery B. "The New Institutional Economics and its Applicability to Development." World Development, Vol. 17, No. 9, pp. 1333-1347. 1989.

Nalwoga-Kitale, Justine. "Soybean Supply Response to Prices and Risk: A Regional Econometric Analysis." Unpublished MSc Thesis. Makerere University. 1992.

Nanteza-Walusimbi, Flora. "The Supply Response of Simsim Farmers to Price and Other Economic Factors." Unpublished Special Project. Makerere University. 1992.

National Inputs Coordination Unit. Report on Agricultural Inputs Situation Kampala: Bank of Uganda, Agricultural Secretariat. 1992.

National Inputs Coordination Unit. Agricultural Inputs: Review of Present Situation and Revision of Projections for 1991/92-1993/94. Kampala: Bank of Uganda Agricultural Secretariat. 1991.

National Inputs Coordination Unit. Report on Agricultural Inputs Situation in Uganda. Kampala: Bank of Uganda, Agricultural Secretariat. 1990.

Ngategize, Peter K. The Production, Marketing and Policy options for Simsim (Sesame) in Uganda. Kampala: Export Policy Analysis and Development Unit (EPADU) Ministry of Planning and Economic Development. 1991.

Nsereko, Joseph. Selected Causes of Agricultural Problems in a Peasant Society with examples from Uganda. Nairobi: Kenya Literature Bureau. 1979.

North, Douglas C. Institutions, Institutional Change and Economic Performance. Cambridge: Cambridge University Press. 1990.

Odwongo, W., F. Karyeija and E. Mwesigwa. A Survey on Simsim Production in Northern Uganda, Its Marketing and Potential for Export Diversification. Kampala: Bank of Uganda, Agricultural Secretariat. 1991.

Ogbu, Osita M. and Mathurin Obetibouo. "Agricultural Supply Response in Sub-Saharan Africa: A Critical Review of the Literature." African Development Review. 1990. pp. 83-98.

Ogodola, Wilfred, and Molson Kaliisa. Study on Traditional Farm Storage and Food Reserves at Different Levels in Uganda. IGAD. 1989.

Oil World. Oil World Annual 1993. ISTA Mielke GmbH. March 1993.

Opio-Odongo, J. M. A. "Agricultural Co-operative Movement and the Emasculation of Producer-Members in Uganda" (Kampala: Makerere University) Mimeo. 1985.

Oryard, Patrick. "Rehabilitation of Oil and Soap Industry." Edible Oil and Soap Industry memo. (Undated, apparently 1984).

Oryokot, Paulo and Russ Read. "Feasibility Study of the Proposed Lango Cooperative Union Oil Mill, Palango." Kampala: Uganda Cooperative Alliance, Research, Planning and Development Department. DRAFT. 1990.

Pearson, Scott and Eric Monke. Using the Policy Analysis Matrix (PAM) to Monitor and Evaluate the Rural-Urban Marketing Program (RUMP). Washington D.C.: International Food Policy research Institute. December 1988.

PORIM (Palm Oil Research Institute of Malaysia). Annual Report 1985. Slangor, Malaysia: PORIM. 1985.

Recon International LTD. "Edible Oil Market Survey in Uganda: Final Report." Consultancy report for Uganda Cooperative Alliance and Agricultural Cooperative Development International. Kampala: Recon. 1990.

Ricardo, D. 1817. The Principles of Political Economy and Taxation. reprint, London: J.M. Dent and Son, 1965.

Rugumayo, Edison and Moses Kalyebara. "Agricultural Processing Machinery Testing and Manufacturing Project APMP Quarterly Narrative Reports." Kampala: The Experiment in International Living. Various Issues, 1990 through 1993.

Rukandema, F.M. "The Economics of Cotton Production in Uganda." Eastern Africa Journal of Rural Development. 1976 pp. 1-36.

Russell, Andrew. "Draft Technical Report. Tinytech Oil Mill: Project B74b01. Production Trials. Visit to Zimbabwe 19 April - 29 May 1990." Rugby U.K.:Intermediate Technology Development Group. June 1990.

Scheithauer, R. and K. Dripchak. Economics of Vegetable Oil Processing. Prepared for the Biofuels and Municipal Waste Technology Division Office of Renewable Technology, U.S. Department of Energy. Vienna, VA: Jaycor. 1988.

Scherer, F. M., Industrial Market Structure and Economic Performance. 2d ed. Rand McNally, Chicago, 1980.

Schoonmaker Freudenburger, Karen. "The Ram Press for Sesame in the Gambia? A Preliminary Study to Inform the Design of a Project." Washington D.C.: Appropriate Technology International. 1993.

Scott, James C. The Moral Economy of the Peasant: Subsistence and Rebellion in Southeast Asia. New Haven: Yale University Press. 1976.

Sergeant, Andrew and John Macartney. Opportunities for Non-Traditional Agricultural Exports from Uganda. Vol. 4 - Cereals, Beans and Oil Crops. Kampala: Export Policy Analysis & Development Unit, Ministry of Finance and Economic Planning. May 1993.

Seruyange, Kaye Patrick. "The National Consumption of Groundnut in Uganda, 1970-86." A Special Project Submitted to The Faculty of Agriculture and Forestry, in Partial Fulfillment of the Requirements for the Degree of BSC in Agriculture, Makerere University. Kampala: Makerere University. 1991.

Shaffer, James D. "Food System Organization and Performance: Toward a Conceptual Framework." American Journal of Agricultural Economics. Vol.62. No. 2. May 1980.

Shaffer, J.D. "On the Concept of Subsector Studies." American Journal of Agricultural Economics, Vol. 55., 1973.

Shaffer, James D., Michael Weber, Harold Riley, and John Staatz. Influencing the Design of Marketing Systems to Promote Development in Third World Countries. MSU International Development Papers Reprint No. 2. East Lansing, MI: Department of Agricultural Economics, Michigan State University, 1987.

Sidhu, D. S. "An Analysis of demand and supply for foodstuffs in Uganda." Consultancy report prepared for FAO. Mimeo. June 1984.

Sosnick, Stephen. "Operational Criteria for Market Performance," in Paul L. Farris, Ed. Market Structure Research: Theory and Practice in Agricultural Economics. pp. 81-125. Ames, Iowa: Iowa State University Press, 1964.

Ssebuliba, Ruth. "Sunflower Production Problems and Profitability." A paper presented at the National Oil Miller's Conference. August 20th, 1993. Kampala, Uganda.

Sserunkuma, Dick, William Ekere and Charles Tumwebaze. "The Effects of Unstable and Declining Production on Prices and Consumption of Legumes in Uganda." Kampala: Makerere University, Department of Agricultural Economics. Mimeo. 1993.

Staatz, John M. "The New Agricultural Economics: Applications of Transactions Cost/Institutional Analysis to Agricultural Economics," Seminar Paper presented to the Scientific Society for Finish Agriculture and Faculty of Agriculture and Forestry, University of Helsinki, 1988, Mimeo.

Stryker, J. Dirk. "Comparative Advantage and Public Policy in West African Rice." in Pearson, Scott R., J. Stryker and C. Humphreys Rice in West Africa: Policy and Economics. pp.396-431. Stanford: Stanford University Press, 1981.

Teme, Bino and Duncan Boughton. "Preliminary analysis of the Maize Subsector and Principal Questions." Bamako, Mali: Technical Committee for the System of Production Program and Rural Economy, 1992. [Photocopied.]

The New Vision, "Letters to the Editor" July 22, 1993. p.2.

The New Vision, "1993/94 Budget Speech." June 26, 1993. p.4.

Thiam, Tan Bock. Cost of Palm Oil Production in Major Producing Countries. 1987 International Oil Palm/Palm Oil Conference, Kuala Lumpur, Malaysia. 1987.

Thompson, Arlo. An Assessment of Sunflower Production Potential and A Research Plan for Uganda. Kampala, Uganda: USAID. 1988.

Timmer, Peter C. "Choice of Technique in Rice Milling in Java." in Eicher, Carl K. and John M. Staatz (ed.). Development Agricultural Development in the Third World. Baltimore and London: Johns Hopkins University Press. 1990.

Tropical Products Institute. Oils and Oilseeds. Crop and Product Digests, No. 1. London: Tropical Products Institute. 1971.

Tsakok, Isabelle. Agricultural Price Policy: a Practitioner's Guide to Partial-Equilibrium Analysis. Ithaca, NY: Cornell University Press, 1990.

Uchendu, Victor and K.R.M. Anthony. Agricultural Change in Teso District, Uganda (A Study of Economic, Cultural and Technical Determinants of Rural Development). Nairobi: East African Literature Bureau. 1975.

Uganda Customs and Excise. Annual Trade Report. Commissioner of Customs and Excise, Kampala. Various years.

Uganda Government. Statistical Abstract for Uganda. Statistics Division, Ministry of Planning and Economic Development. Government Printer, Entebbe. Various years. 1960-1980.

USAID. "Strategic Framework for Agricultural Technology Development and Transfer in Sub-Saharan Africa". (draft) Washington, D.C.: Africa Bureau, USAID, 1992.

USDA Foreign Agricultural Service. World Oilseed Situation and Market Highlights. Washington, D.C.: USDA. 1990.

Vanegas, Manuel. "Price Structure and Its Effects on Food and Agricultural Production." Invited Paper presented at the First National Scientific Conference on Food and Agriculture "Towards an Agricultural Revolution" 10-15 Dec. 1990. Kampala: Makerere University. 1990.

VOPS News. Volume 1. No. 3. p. Njoro, Kenya: Vegetable Oil/Protein System Programme, Egerton University. September 1992.

Vura, G. B. Chota. "Information concerning edible oil and soap factories which were nationalised." Letter to the Hon. Minister of Co-operatives and Marketing. LMB Files. 1986.

Ward, William A. "Economic Valuation and Efficiency Shadow Pricing: Domestic Price Numeraire." Course Notes CN-2 Rev May 76; World Bank Economic Development Institute. Washington D.C.: International Bank for Reconstruction and Development. 1976.

West, Don. Framework for Analyzing the Competitiveness of the Agri-Food Sector. Working Paper 3-93. Competitiveness Division Agri-Food Policy Directorate, Policy Branch. Ottowa, Ontario: Agriculture Canada. June 1993.

Williamson, Oliver. Markets and Hierarchies: Analysis and Antitrust Implications. New York: Free Press, 1975.

Witala, Fred. "Overview: Uganda oil processing and importation." USAID, Kampala. Mimeo. 1984.

Wood, B. J. "Growth and Production of Oil Palm fruits." in F. D. Gunstone, ed. Palm Oil. N.Y.: John Wiley and Sons, 1987.

World Bank. Revision of Primary Commodity Price Forecasts and Quarterly Review of Commodity Markets. Washington D.C.: The World Bank. June 1993.

World Bank. World Development Report. Washington D.C.: The World Bank. 1991a.

World Bank. Price Prospects for Major Primary Commodities, 1990-2005. Volume II: Agricultural Products, Fertilizers and Tropical Timber. Washington D.C.: The World Bank. 1991b.

World Bank. Price Prospects for Major Primary Commodities, 1988-2000. Washington D.C.: The World Bank. 1989.

World Bank. Progress Towards Recovery and Prospects for Development. IBRD, Report No. 5595-UG. World Bank. 1985.

Wrigley, C. C. Crops and Wealth in Uganda: A Short Agrarian History. Kampala: East African Institute of Social Research. 1959.

Young, Crawford, Neal P. Sherman and Tim H. Rose. Cooperatives and Development: Agriculture and Politics in Ghana and Uganda Madison: University of Wisconsin Press. 1981

Zadek, Simon. Evaluation Study of the Overseas Development Administration Small-Scale Oil Seed Expeller Programme. Evaluation Report EV 488. London: Evaluation Department, Overseas Development Administration and Maendeleo. 1989.

Zulberti, Carlos. The Economics of Oilseed Production and Processing for Edible Oil and Protein Cake in Kenya. Working Paper No. 1. Vegetable Oil/Protein System Project Working Paper Series. Njoro, Kenya: Egerton University, Research and Extension Division. 1988.

Zulberti, C. and J. Lugogo. The Vegetable Oil/Protein System in Kenya: Project Description. Working Paper No. 2. Vegetable Oil/Protein System Programme Working Paper Series. Njoro, Kenya: Egerton University, Research and Extension Division. 1989a.

Zulberti, C. and J. Lugogo. The Vegetable Oil/Protein System in Kenya: Summary Report - Phase I. Vegetable Oil/Protein System Working Paper No. 10. Njoro, Kenya: Research and Extension Division, Egerton University. 1989b.

Zulberti, C. J. Lugogo, and J. Muthaka. "Towards a Long Term Strategy for the Development of the Vegetable Oil/Protein sub-sector in Kenya". Draft photocopy. Njoro, Kenya: Egerton University, Research and Extension Division. 1992.

MICHIGAN STATE UNIV. LIBRA
3129301020076