COMPARATIVE ADVANTAGE, TRADE FLOWS AND PROSPECTS FOR REGIONAL AGRICULTURAL MARKET INTEGRATION IN WEST AFRICA: THE CASE OF COTE D'IVOIRE AND MALI

By

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ABSTRACT

COMPARATIVE ADVANTAGE, TRADE FLOWS AND PROSPECTS FOR REGIONAL AGRICULTURAL MARKET INTEGRATION IN WEST AFRICA: THE CASE OF COTE D'IVOIRE AND MALI

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Within the general framework of regional economic integration in West Africa, this study evaluates if actual trade flows between Côte d'Ivoire and Mali, and between them and the rest of the world are consistent with these countries' comparative advantage in producing and marketing cotton, maize, millet/sorghum, and rice.

Using the domestic resource cost coefficient as a measure of comparative advantage, the study finds that Côte d'Ivoire's maize exports to Mali, and the latter country's millet/sorghum exports to the former, are consistent with comparative advantage. Furthermore, the results show that although Mali produces paddy efficiently, its rice generally reaches its competitive limit in southern Mali. As such, the Malian rice is not competitive in Côte d'Ivoire. This may explain why trade flows of local rice between the two countries have not been recorded and that these nations rely on imported rice to satisfy their excess demand of rice.

In contrast to cereals, the study indicates that Côte d'Ivoire has a comparative advantage in cotton. However, this country does not export its cotton to Mali because

selling it on the world market is more profitable not only economically, but also financially.

Trade flows of these commodities are also assessed under different scenarios, including devaluation of the CFA franc, alternative opportunity costs of labor and investments policies aimed at increasing on-farm yields, improving processing technologies for cotton and rice, and lowering transport costs between markets. The results suggest that local rice would generally be, under nearly all scenarios, noncompetitive in the coastal markets. As such, importing rice from the world market would be the most efficient way of supplying these markets.

The study also assesses farmers' incentives to generate marketable surpluses. Although most commodities generate positive financial profitability, it appears that the returns to household labor are generally lower than the daily market wage rate in both countries.

To the memory of Alpha Oumar Barry, my father who taught me that hard work and patience are the key to success in life

and

To all the people dedicated to improving living conditions in Africa

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TABLE OF CONTENTS

CHA

CHAPTER

CHAPTER

AP

BI

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AIRD	Associates for International Resources and Development
BCEAO	Banque Centrale des Etats de l'Afrique de l'Ouest (Central Bank of Francophone West African Countries Using the CFAF)
CCCE	Caisse Centrale de Coopération Economique (French Economic Cooperation Fund)
CEAO	Communauté des Etats de l'Afrique de l'Ouest (West African Economic Community)
CFA	Communauté Financière Africaine (Financial Community of Francophone West African States, except Guinea and Mauritania)
CFAF	CFA Franc (Currency Unit of the CFA Zone)
CFDT	Compagnie Française de Développement des Textiles (French Company for the Development of Textiles)
CIDT	Compagnie Ivoirienne de Développement des Textiles (Ivorian Company for the Development of Textiles)
CIF	Cost, Insurance and Freight
CILSS	Comité Inter-Etats de Lutte Contre la Sécheresse au Sahel (Organization of Sahelian States for Coping with Drought)
CMDT	Compagnie Malienne de Développement des Textiles (Malian Company for the Development of Textiles)
CIDV	Compagnie Ivorienne pour le Développement des Cultures Vivrières (Ivorian Company for the Development of Food Crops)
CIF	Cost Fret and Insurance (check)
CGPP	Caisse Générale de Péréquation des Prix (Ivorian Price Stabilization Boards in charge of harmonizing the price of bread, rice, and sugar throughout the country)

CSSPPA	Caisse de Stabilization et de Soutien des Prix des Produits Agricoles (Boards of Agricultural Price Stabilization and Support, in charge of cocoa and coffee exports)
DRC	Domestic Resource Cost
DNAE	Direction Nationale des Affaires Economiques
DRSPR	Département de la Recherche sur les Systèmes de Production Rurale (Research Department of Rural Production Systems at the Malian Institute of Rural Economy)
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization
FCCD	Fund for Cooperation, Compensation and Development
FCD	Fonds Communs de Développement (Community Development Fund)
FOB	Free On Board
GDP	Gross Domestic Product
GNP	Gross National Product
HUICOMA	Huile des Compagnies Maliennes (Malian Oil Companies)
IDESSA	Institut des Savanes
IER	Institut d'Economie Rurale (Malian Agricultural Research Institute)
IMF	International Monetary Fund
INRA	Institut National de la Recherche Agronomique (French Agronomic Research Institute)
IRAM	Institut d'Application des Méthodes de Développement (French Consulting Firm)
MARA	Ministère de l'Agriculture et des Ressources Animales (Ivorian Ministry of Agriculture and Animal Resources)
MIS	Market Information System

NEPC	Net Effective Protection Coefficient
NNPC	Net Nominal Protection Coefficient
NPC	Nominal Protection Coefficient
OCPV	Office de Commercialisation des Produits Vivriers (Ivorian Food Crops Marketing Agency)
OECD	Organization of Economic Cooperation and Development
OER	Official Exchange Rate
OPAM	Office des Produits Agricoles du Mali (Malian Agricultural Marketing Agency)
ORS	Opération Riz Ségou (Rice Development Agency in the Segou Region, Mali)
OSCE	Office Statistique des Communautés Européennes
PRMC	Programme de Restructuration du Marché Céréalier (Cereals Market Restructuring Program in Mali)
SATMACI	Société d'Assistance Technique pour la Modernisation Agricole de la Côte d'Ivoire (Ivorian Agency for Agricultural Modernization in the Middle Forest Zone)
SER	Shadow Exchange Rate
SODEPALM	Société pour le Développement des Palmiers (Ivorian Palm Development Agency)
SODERIZ	Société pour le Développement de la Riziculture (Ivorian Rice Development Agency)
TCR	Taxe de Coopération Regionale (Regional Cooperation Tax)
UNB	Université du Bénin (Benin University)
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development

WAMU	West African Monetary Union
WARDA	West African Rice Development Association

CEA

PREFACE

This study was completed before the recent devaluation of the CFA franc. The CFA franc was devalued on January 12, 1994 by 100 percent vis-a-vis the French franc to which it has been pegged since its inception in 1948.

CHAPTER I

INTRODUCTION

West Africa represents one of the most fragmented regions in the world. It is composed of a multitude of countries, each inhabited in general by fewer than 10 million people. Each domestic market is thus small in size. Moreover, it is small in terms of purchasing power, which may be measured by the Gross National Product (GNP) per capita, averaging about US$ 350 in 1990 (World Bank, 1991a).

The GNP per capita of the West African countries, one of the lowest in the world in the 70s, fell during the 80s in part because of the decline in commodity prices in the international market on which these countries have depended to earn foreign exchange needed to finance their economic and social development. As a result, the economies of the individual countries performed poorly.

Owing to the sluggish economies, the West African leaders have increasingly voiced their desire to foster the exchange of factors of production and goods among their countries in order to be less dependent on the international market. Regional economic integration was believed to be, in addition to gaining stronger bargaining power during international negotiations, a means to bring about scale economies that are needed to make the West African products competitive.

It is within this framework that several organizations were built to foster economic integration. Important among these organizations are the Economic Community of West African States (ECOWAS) and the Economic Community of West Africa (CEAO), whose objectives and operations are discussed in the next chapter. Despite the creation of these regional economic groupings, official intra-regional trade appears to be still low and the bulk of the overall trade of the West African countries is still overwhelmingly done with the international market.

1.1 Problem Statement and Research Objectives

It has often been argued that the low level of intraregional trade in developing countries in general, and specifically in Africa, is due to the high degree of similarity in the economic structure of the individual countries, owing mainly to a similar resource endowment (Chou, 1967; World Bank, 1991b). As such, there is limited complementarity among the countries and the potential for specialization in production to spur trade among them is restricted. Thus, as argued by Chou (1967, p. 354), "they cannot be complementary without a dynamic economic transformation so that they will specialize in production and become bigger trade partners". Before this transformation takes place, these countries' trade is bound to be with the world market.

This argument put forward by Chou was downplayed by O'Connell (1987) and even challenged by a growing body of evidence. Badiane (1988), using production data

from six West African states to yield indices[1], showed that the production patterns across these states were different and that the resource bases of these countries differed. Even if similar goods are produced in the different countries, production costs differ across countries and could be the source of intraregional trade.

Another group of contenders, refuting Chou's contention, argued that a great deal of trade takes place among West African countries, but this trade is under-counted by official statistics. Within this line of reasoning, Burfisher and Missiaen (1987) estimated that more than 40 percent of intraregional trade is unrecorded because not only governments lack the personnel and resources to capture these transactions, but they take place in an informal manner across porous borders. This is the reason why they termed these cross-border transactions "informal intraregional trade."

Other analysts, agreeing with the argument that intraregional trade is under-counted by official statistics, contend, however, that informal intraregional trade in West Africa is not based upon complementarity among the countries. It is rather induced by price differentials stemming from the divergent and sometimes contradictory macroeconomic, trade and pricing policies enacted in each country (INRA/IRAM/UNB, 1991). The influence of these policies on intraregional trade in the context of West Africa was documented by Badiane (1992), who emphasized the importance of the real exchange rate in driving trade.

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[1]/ The production similarity index between two countries is given by the following formula: $SQ_{a,b} = 100* \sum(\mathrm{Min}(Y_{ia},Y_{ib}))$, where Y_{ia} and Y_{ib} are the shares of product i in total agricultural production of countries a and b. An index of 100 is equivalent to a complete similarity in the production structure, while a value of the index close to zero means completely dissimilar production patterns in the two countries.

In light of the arguments outlined above, each group of contenders appears to focus on the determinants of intraregional trade in West Africa. The debate over intraregional trade is between those who contend it depends upon comparative advantage and those who say that it is driven by price differentials emanating from differences in macroeconomic policies. Based on this debate, one of the challenges in this study is to assess the driving forces of intraregional trade. Once these driving forces are understood, it may be possible to identify the factors that inhibit the expansion of this trade.

In order to explore fully the issue of intraregional trade, two countries are chosen: Côte d'Ivoire and Mali. The rationale behind this choice is that these countries differ in terms of geographical location, followed distinct development policies and are at different levels of economic development. Despite these differences, they share some characteristics.

Côte d'Ivoire extends from the southern Sudanian belt to the coastal region, where rainfall levels are high. Owing to these rainfall levels, Côte d'Ivoire has relied upon its agricultural sector to generate the bulk of its foreign exchange earnings, which contributed to developing an industrial base and reliable infrastructure, thus ranking this country among the middle-income countries. The development of the industrial sector was facilitated by the liberal investment policies and the export-oriented strategy adopted by the Ivorian government soon after independence. Thanks to these policies, some light industries were established and some of their manufactured products (processed coffee, soap, shoes, etc.) are exported to Mali and other neighboring countries.

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In contrast, Mali ranks among the poorest nations in the world and has a poor industrial sector. Mali lies in the Sudanian and Sahelian belts, where rainfall is erratic and uncertain. Agricultural production is thus volatile. As a result, Mali imports agricultural commodities from the neighboring countries and the international market during the poor rainfall years. Despite this volatile rainfall pattern, which is less volatile in the south, Mali exports cotton to the world market and is ranked among the leading cotton exporters in West Africa. Mali also exports livestock to neighboring countries, especially Côte d'Ivoire, and these exports are higher during good rainfall years.

Despite the differences between Côte d'Ivoire and Mali, the most important sector in both countries is agriculture, which accounted for nearly 50 percent of GDP in 1990 in both countries (World Bank, 1991a). Among other things, these countries share a similar history of colonial dependence, which has helped to establish the same currency (CFA Franc), even though Mali withdrew from the CFA Franc zone in the mid 60s and rejoined it in 1984. Sharing the same currency undoubtedly contributes to facilitating payments of transactions between these countries. Trade between the two countries is undertaken by the Dioulas, an ethnic group which, along with the Senoufos, is common to both countries.

Given this background, the main objectives of this study are as follows:

1. To evaluate each country's comparative advantage in producing and marketing agricultural products, such as cotton, maize, millet/sorghum and rice;

2. To determine the direction of these commodities' trade flows as predicted by the theory of comparative advantage;
3. To compare these theoretical trade flows with the actual patterns of agricultural trade in order to explain the similarities or differences between them. This is intended to examine the interaction between macroeconomic and trade policies, and the pattern of actual flows;
4. To assess trade flows under alternative policy measures.
5. To identify and examine the barriers and constraints that hinder the expansion of intraregional trade. This expansion of intraregional trade assumes that it can provide an impetus to economic growth through specialization, which contributes to more efficient resource allocation and an increase in income.

1.2 Organization of the Dissertation

The dissertation is organized into seven chapters, including this chapter. Chapter II reviews the literature on regional economic integration and examines the objectives and mode of operation of the regional integration schemes in West Africa to shed light on the performance of these schemes.

Chapter III presents the conceptual framework that underlies the analysis of comparative advantage. It focuses on a particular measure of comparative advantage, the domestic resource cost, and its underlying assumptions, with a survey of the literature on this measure.

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Chapter IV summarizes the data collection and describes not only the different farming systems for cotton, maize, millet/sorghum and rice found in Côte d'Ivoire and Mali, but also the marketing systems of these commodities. In addition, Chapter IV lays out the assumptions of this study.

Chapter V measures the comparative advantage of each country in different markets located in both countries and compares trade flows, as predicted by each country's comparative advantage, with the actual trade flows. The aim of this comparison is to explain the reason why actual trade flows are similar or different from those predicted by theory. Then, it examines the direction of trade flows under alternative scenarios, such as increased on-farm yields and milling ratios that could result from higher investments in research and milling facilities. These scenarios also include reduced transfer costs from one market to another, alternative exchange-rate policies, and different opportunity costs of resources.

Chapter VI discusses the incentive system faced by farmers and whether they make financial profits to yield surpluses that can enhance trade. Then, farmers' incentives are analyzed under alternative scenarios.

Chapter VII summarizes the major findings of this study and draws some policy implications. This chapter also explores future research relevant to enhancing intraregional trade.

CHAPTER II

REGIONAL ECONOMIC INTEGRATION IN WEST AFRICA: PERFORMANCE AND PROSPECTS

The goal of this chapter is to lay out the theory of regional economic integration, as approached by traditional analysis and its critics. In addition, regional economic integration will be discussed within the West African context to shed some light on the main objectives and performance of the regional groupings in fostering intraregional trade. In doing so, the goal is to identify the elements that have hindered trade liberalization and expansion, which could be a dynamic contributing factor to the process of economic development in West Africa.

2.1 Theory of Economic Integration

Balassa (1961) defines economic integration as a process by which distinct entities are brought together to form a whole. These entities may be either markets or regions within the boundaries of the same nation, or they may be different nations. While the first type of integration is termed market or national integration, the second is referred to as international or regional economic integration, which is the focus of the present study.

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Though regional economic integration was attempted in several regions of the world prior to the World War Two, it was not until the early 50s that it became a major focus of economic studies, thanks to Viner's pioneering work. Prior to the publication of The Customs' Union Issue by Viner (1950), economists were more concerned about the welfare impact of free trade, assumed to be welfare increasing. As such, any deviation from free trade was seen as welfare-decreasing. Within this framework, a customs union, aimed at a free movement of goods produced within the union members, abolishing tariffs on these goods, and discriminating against products imported from union nonmembers, was believed to be a movement away from Pareto optimality.

Viner, as opposed to most of his contemporaries, did not view customs unions as necessarily welfare-decreasing. He argued that the overall welfare effect of a customs union depends on the relative weight of the outcome of two countervailing forces, referred to as "trade creation" and "trade diversion". Trade creation is defined as the shift from higher to lower cost goods. This shift induces a production effect and a consumption effect. The production effect results from a better resource allocation through the cost reduction from the higher cost to the lower cost union members. Meanwhile, the consumption effect appears to stem from a substitution of the lower cost union good for the more expensive domestic product. Trade creation, just like free trade, is assumed to be welfare-increasing.

Trade diversion denotes a situation whereby the source of a product may shift from a lower cost nonmember of the union to a higher cost union member. This shift also results in production and consumption effects, which are welfare-reducing. Thus, a custom

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a customs union may induce positive and negative welfare effects simultaneously and its net effect depends on the relative size of trade creation and trade diversion. On balance, the customs union results in a beneficial net welfare effect if the effect of trade creation is greater than that of trade diversion. Conversely, the net welfare effect of the customs unions is negative if the effect of trade diversion outweighs that of trade creation.

One major criticism of the neoclassical approach is its narrow focus on static efficiency gains to justify regional integration. This approach fails to include other policy objectives in its analysis and does not seem to recognize that there may be trade-offs between policy objectives, especially in developing countries. Within this framework, a government may decide to encourage the production of a good to preserve jobs even though this activity is inefficient in a neoclassical sense. Often, policy makers justify such decisions because they believe that workers displaced may have difficulty finding other employment opportunities.

Trade creation may not always be welfare-increasing and may even be welfare-decreasing. In the example given above, if the number of workers displaced is greater than the additional jobs made available by trade creation and the workers displaced do not find employment, this may lead to negative consumption effects that are greater than the positive production effects. As such, the net effect of trade creation may be welfare-decreasing. The objection to this argument is that it seems to ignore the notion of opportunity cost of labor, which is zero for workers unable to find alternative employment opportunities. Based on this objection, the industries' true economic costs of production are lower than they would appear at first glance.

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On the other hand, trade diversion, which may yield negative effects on social welfare in the short run, may induce long run benefits that outweigh the short term gains if the protected industry becomes more competitive and creates additional employment opportunities and income, owing to learning by doing.

Some analysts, such as Cooper and Massel (1965), have criticized the traditional theory of regional economic integration on the grounds that the lack of an industrial base in developing countries may be due to a market failure. In their view, the creation of an industrial base may be seen as a public good and the existence of external economies may be seen as a rationale for the creation of regional economic integration. As a result, protective measures have been often used to justify government involvement. Within this framework, Jaber (1971) argued that regional economic integration can be perceived as a means to economic development rather than a tariff issue.

Although much of the debate on regional economic integration has centered around customs unions, there exist several other forms of economic integration that range from a free-trade area to an economic union. A free-trade area consists of a region in which there is only a free movement of goods produced within the region and tariffs on these goods are abolished between the member countries. In addition to these characteristics, if member countries adopt common external tariffs against products imported from outside the region and factors of production move freely within the member countries, the integration takes the form of a common market. Moreover, if the monetary and fiscal policies of the individual countries of a common market are harmonized, the economic grouping is referred to as an economic union.

2.2 Regional Economic Integration in West Africa

This section focuses on the objectives and mode of operation of two regional economic integration schemes in West Africa, the Economic Community of West Africa and the Economic Community of West African States. Then, an attempt is made to evaluate the impact of these regional organizations on regional integration.

2.2.1 Economic Community of West Africa

The Economic Community of West Africa, known under its French acronym, CEAO, was created in 1973 and is composed of six Francophone countries: Burkina Faso, Côte d'Ivoire, Mali, Mauritania, Niger and Senegal. CEAO was to include two other Francophone countries, Benin and Togo, which signed the original Treaty. However, these two countries withdrew from the group at the time of creation under the heavy pressure from Nigeria, which was one of the targets of this regional grouping. Indeed, the creation of CEAO was in part aimed at countering and offsetting the growing economic and political power of Nigeria, feared not only by the small Francophone countries of West Africa, but also the French government (Robson, 1983).

At present, the overall population of CEAO is a mere 50 million people, about half that of Nigeria (World Bank, 1992). The average income per capita is less than US$ 300, and the most important economic sector appears to be agriculture, which accounts for a little less than half of the Gross Domestic Product (World Bank, 1992).

The main objectives of CEAO are to create a unified regional market, intended to spur trade of agricultural and industrial products, and to promote a harmonized and balanced eco

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balanced economic development among the member countries. The strategy to achieve these objectives centered around abolishing quantitative restrictions in local non-processed products and adopting by 1985 common external tariffs against industrial products emanating from nonmember states. These common tariffs are, however, yet to be realized by the Community.

The centerpiece of CEAO strategy in fostering trade flows among its member states is the preferential import duty regime, referred to as the Regional Cooperation Tax (TCR). The TCR, operational since 1976, was engineered to spur trade especially between the least developed countries and the more advanced states of the Community. Fixed by the Council of Ministers, the TCR is, for a given good that can be produced within CEAO countries and imported from nonmembers, lower than taxes imposed on the product of nonmembers to make that of CEAO more affordable. It is applied to manufactured goods produced within CEAO to give incentives to member countries to import these products from the member states rather than nonmembers, where production costs are lower. The TCR is granted to an enterprise under certain guidelines, based on the nature of the good produced, the origin of the raw material that this product embodies, and the level of economic development of the country where the enterprise is located. Within this framework, a preference in establishing the TCR is given to firms that rely on local raw materials. In addition, the TCR is in general set low for firms operating in the least developed member countries to reduce their competitive disadvantage.

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Undoubtedly, the institution of the TCR, intended for trade diversion, caused some member state governments to lose tax revenues on manufactured goods that could have been imported from nonmember countries relatively cheaply and taxed at a higher rate. To alleviate the costs to these countries and foster intraregional trade, a provision was made in the Treaty to create a system of fiscal compensation, which is operated through the Community Development Fund, known under its French acronym FCD (Fonds Communs de Développement). FCD is funded through the contribution of member countries, based on their share in intra-CEAO exports. The payable compensation to each country is the difference between the tax revenue collected on imported products from CEAO member countries under the TCR regime and the collectable tax revenue from the same imports from nonmember countries. According to the provision made in the Treaty, the compensation paid to each country is up to two-thirds of its revenue losses. Meanwhile the rest of the fund is used to finance development projects in the least developed countries. This is the means to carry out the harmonized and balanced development objective mentioned above. Within this framework, the projects funded by the Community in Niger and Burkina Faso between 1975 and 1980 accounted for nearly 40 percent of the total expenditures (Badiane, 1988).

2.2.2 The Economic Community of West African States

Created in 1975 under Nigeria's leadership, the Economic Community of West African States (ECOWAS) is composed of the six CEAO countries and ten other countries. The total population of ECOWAS is nearly 200 million people, of which

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Nigeria accounts for more than half. There appears to be a great disparity in the level of economic development in this grouping, in which the GNP per capita ranges between 180 and 890 US dollars (World Bank, 1992).

The objectives of ECOWAS are virtually the same as those of CEAO. These objectives consist, among other things, of eliminating customs duties, abolishing quantitative and administrative restrictions on trade, establishing a common customs tariff and a common commercial policy, harmonizing of agricultural and industrial policies and monetary policies and promoting economic development. These goals are to be achieved gradually. For instance, it was recommended by ECOWAS member countries that the establishment of the customs union be achieved within a fifteen year transitional period after the Treaty came into force.

The centerpiece of ECOWAS strategy in achieving its objectives is the Fund for Cooperation, Compensation and Development (FCCD), intended to distribute the Community costs and benefits equitably in the process of trade liberalization. Robson (1983, pp. 100) summarized the purpose of the FCCD, as follows:

> "To finance projects in member states; to provide compensation to member states that have suffered losses as a result of the location of Community enterprises; to provide compensation and other forms of assistance to member states that have suffered losses arising out of the application of the provisions of the Treaty on the liberalization of trade within the Community; to guarantee foreign investments made in member states in respect of enterprises established under the provisions on the harmonization of industrial policies; to provide means to facilitate the mobilization of internal and external financial resources for the member states and the Community; and to promote development projects in the less developed member states of the Community".

The FCCD resources originate primarily from the annual contributions of the member countries. The contribution of each country is based upon its economic strength, assessed as a coefficient of the Gross National Product and population. Other sources of the FCCD resources are not only the income of enterprises that operate within ECOWAS, but also foreign aid and the interest on previous loans made by the FCCD.

2.3 Performance of the Regional Economic Groupings in Fostering Intraregional Trade in West Africa

There has been a wide consensus among analysts and policy makers that intraregional trade among CEAO member states has increased since the inception of this regional economic grouping. A major factor that has contributed to the expansion of intra-CEAO trade is the fiscal compensation scheme engineered by the member countries. Owing to this scheme, coupled with the common currency used by CEAO member countries, trade increased between CEAO's least developed countries and its more advanced countries, namely Côte d'Ivoire and Senegal. However, intra-CEAO trade could be higher if subtle non-tariff barriers, which take the form of import and export licenses and act like a brake on the expansion of intraregional trade, were eliminated in the Community. Progress in intra-CEAO trade would probably be greater if the industrial and investment policies were harmonized and information on production capacity and potential were available to assess ex ante the comparative advantage of CEAO's member countries.

Notwithstanding the progress made in spurring trade among CEAO's member states, intra-CEAO trade still accounts for a small share of CEAO's overall trade. Indeed, the share of trade within the Community, which was nearly 10 percent in the mid

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80s (Badiane, 1988), is today about eight percent (World Bank, 1991). This is an indication that CEAO's trade is overwhelmingly with external markets.

The share of intraregional trade in overall trade appears to be even lower for ECOWAS member countries. It has varied between a mere three and five percent since ECOWAS's creation (World Bank, 1991). There appears to be no indication that this share will increase in the near future, despite the rhetoric of policy makers, who meet several times a year to make decisions on fostering intra-ECOWAS trade. The issue is thus why intraregional trade has remained very low, especially within ECOWAS, while one of the main goals of the regional economic integration schemes is to spur trade among member countries.

Several factors militate in favor of the modest progress realized or even the stagnation of intraregional trade in West Africa. One such factor is that the deficiency in the physical infrastructure (roads and bridges) and the lack of a reliable communication network among the member countries undermine any serious attempt to expand trade among countries. In addition, roadblocks are rife in the region. They exercise a brake on the free movement of goods in the region and deter traders from taking advantage of market opportunities across national borders.

Intraregional trade has been low in West Africa because most governments attempted to impose a single marketing channel for outputs and inputs, usually by creating a government agency that has a monopoly-monopsony power to satisfy the national market. Despite the dismantling of most parastatals to increase private traders' participation in business, high export and import restrictions still stand in the way of progress in

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progress in intraregional trade. Such restrictions appear more common between CEAO member states and the rest of ECOWAS countries.

Intraregional trade is also impaired by the lack of information on market opportunities across borders, which contributes to making cross-border trade risky and uncertain. Cross-border trade appears even riskier between Anglophone and Francophone countries, owing to language barriers and the poor knowledge of business institutions. It appears also that the multiplicity of nonconvertible currencies is a serious hindrance to intraregional trade on the grounds that it makes transaction payments difficult between countries. Within ECOWAS, there exist nine different currencies, among which the CFA Franc, shared by a group of seven countries, appears to be the only widely convertible currency across borders.

Another hindrance to intraregional trade during the past 10 years has been the collapse of incomes in the coastal states, especially in Côte d'Ivoire and Nigeria, due to the substantial decline in their commodity terms of trade. As a result, the demand for imported goods, which is in general positively correlated to income, and investments fell in these countries.

Expansion of intraregional trade has been further hindered by the very focus of regional economic integration, emphasizing manufactured goods, while the level of industrialization in the countries is in general low. Industries located in individual countries are, in general, of low capacity and cannot often supply the small domestic market, let alone export to neighboring countries. The low capacity of these import-substitutes industries, coupled with high production costs because of their small scale, makes it difficult for them to compete in their domestic market, let alone compete in foreign markets. Despite these handicaps, regional policies have been geared toward manufactured goods to foster intraregional trade. Only minor attention has been given to the agricultural sector as a means of encouraging regional trade. Thus, the issue is why the agricultural sector has received so little attention in the regional economic integration schemes.

2.4 Why the Bias Against Agricultural Commodities in the Regional Integration Schemes of West Africa?

The root of the bias against the agriculture sector has its origin in development strategies popularized in the 50s and 60s by Prebisch (1950) and Lewis (1954), who, among others, viewed agriculture as backward. The arguments generally were that capital and labor would not be productive in agriculture because of the diminishing returns in this sector. It was argued that these factors of production should rather be used in the industrial sector, where they would be more productive to promote economic development, defined as growth in average per capita output, leading to the accumulation of capital stock.

African policy makers appear to have been influenced by the import-substitution strategy proposed by the United Nations Commission for Latin America, under the leadership of Prebisch, who argued that primary commodity prices trend downward in the long run. As such, it is in the interest of developing countries to shift away from agriculture and move toward industry in order to produce manufactured goods that are imported. Such a strategy, reinforced by Hirschman's (1958) arguments about backward and forward linkages that give precedence to the industrial sector, shaped the thinking of development strategists in several regions, including West Africa. The idea commonly shared by these strategists was that the promotion of domestic industries was incompatible with an outward-oriented trade strategy, owing to the fact that the domestic industries were in the infant-industry stage. As such, they deserved to be protected against the external environment to bring about greater industrialization and economic growth.

2.5 Regional Economic Integration Reconsidered

If we consider that regional integration strategies have failed to yield the results of spurring intraregional trade and overall economic development, one may hypothesize that a shift in emphasis from supporting import-substitution industries to favoring a more export-oriented agricultural sector in West Africa may provide an impetus for intraregional trade and eventually economic growth.

A vast body of literature has been devoted since the mid 60s to the comparison between import-substitution strategies and export-oriented strategies. Salvatore and Hatcher (1991), Moschos (1989), Chow (1987), Bhagwati (1986), Kreuger (1980), Balassa (1978) and Michaely (1977) showed that the effect of export-oriented policies on the economic growth performance is overwhelmingly positive and that countries that stuck too long to import-substitution missed opportunities provided by the export-oriented strategies. Export-oriented strategies have a positive effect on economic growth for three reasons: 1) they lead to better resource allocation in response to competition abroad, 2) they give the incentives for technological improvements in order for domestic producers to be competitive in the domestic and external markets, and 3) they create an economy better able to take advantage of economies of scale.

Import-substitution strategies usually have an inward-looking view, intended to satisfy the domestic market by protecting noncompetitive industries. Efforts to promote regional economic integration with such strategies are bound to fail given that each country is concerned with protecting its noncompetitive domestic industries and supplying its own market.

It appears that regional economic integration in West Africa will be best achieved through strategies geared toward promoting agricultural exports instead of strategies focusing on import-substitution in the industrial sector. This requires, however, that appropriate technologies be available at the farm level to yield surpluses that can be traded and that resources be used efficiently at the farm level and within the marketing system.

CHAPTER III

CONCEPTUAL FRAMEWORK

This chapter provides the theoretical conceptual framework used in this study to analyze a country's comparative advantage. More importantly, it focuses on the domestic resource cost method, which has been one of the most widely used techniques to measure comparative advantage.

3.1 Theory of and Approaches to Comparative Advantage

The notion of comparative advantage originated from Ricardo's (1817) pioneering work, which attempted to justify the policy of laissez-faire. Basing his analysis on the labor theory of value and using the case of two countries and two commodities, Ricardo argued that a beneficial trade between two countries should be based upon the relative labor cost rather than the absolute labor cost of production. His contention was that each country should specialize in the commodity for which it had a lower opportunity cost of production. In other words, each country should export the commodity in which it had a comparative advantage.

Despite Ricardo's major finding about the basis of mutually beneficial trade, he failed to explain what determines the relative production efficiency of each country. Heckscher (1949) and Ohlin (1933) made a major contribution to the theory of international trade by addressing this important issue. Assuming more than one factor of production, these authors attributed comparative advantage to differences in countries' factor endowments.

According to the Heckscher-Ohlin theorem, given countries' factor endowments, a country will tend to specialize in and export goods intensive in its relatively abundant factor, which is relatively cheap. On the basis of this factor endowment, trade is mutually beneficial to trading countries and can be a substitute for the movement of factors of production between countries; i.e., trade tends to equalize the return to factors across borders.

Ricardo and Heckscher-Ohlin's theory of comparative advantage was tested by several researchers, among whom the most famous is Leontief (1964). Using an input-output table for the economy of the United States, he found to everyone's surprise that the ratio of capital to labor of the U.S. exports was smaller than that of the goods imported by the U.S. This paradox, which drew a lot of criticism because it was expected that the U.S. exports would be more capital intensive, set the stage for the development of methods to measure a country's comparative advantage.

One objection made to most analyses of comparative advantage is that they often assumed two countries, two goods and two inputs and more importantly, they assumed an identical technology for the production of a good in the countries considered. Once one of these assumptions is relaxed, as shown by several studies that introduced the assumptions of many goods, many countries, many factors of production or different production technologies, it becomes difficult for these models to explain the pattern of trade by simply comparing autarky prices (Samuelson, 1953; Jones, 1961 and Melvin, 1968). Another objection to these models is that they focused only on the aspect of production and failed often to take into account other factors that have a bearing on a country's trade position. Key among these are transfer costs of products from the production site to the international market. Indeed, a country may be an efficient producer of a good, but because of high marketing costs, it may not be an efficient supplier of that good (Samuelson, 1954). In addition to these transfer costs, policies such as public investments in research, which are aimed at improving productivity and affect a country's comparative advantage, were not accounted for in the early methods of testing comparative advantage.

Even when sectoral and macroeconomic policies were included in the models of comparative advantage, these models failed often to make the link between the micro behavior of economic agents and the policies, which influence this behavior. These traditional trade models also had difficulties in explaining the persistence of protection policies or the use of trade policies, such as taxes or subsidies in defense of national interest. This failure of traditional trade theory gave rise to the modern trade theory that can be labelled "strategic trade theory" (Krugman, 1986).

Modern trade theorists attribute the success of a country in trade to its capacity to anticipate trade opportunities and exploit them. As a result of situations characterized by economies of scale, monopolistic competition including product differentiation, increasing returns to scale and increasing technical progress, the modern trade theory is concerned with the optimal use of trade policies, mainly taxes and subsidies, to give a strategic position to a country vis-a-vis other countries. Specialization and trade patterns are based on the strategic behavior of countries. Owing to the issues raised above, determining comparative advantage will rely on the domestic resource cost (DRC) coefficient, which has its roots in microeconomic theory and will be explained in the next sections.

3.2 Microeconomic Foundation of Comparative Advantage

Conventional microeconomic theory suggests that the main objective of producers is to maximize profit, defined as the difference between the value of the output produced and that of inputs (labor, land and capital) used in the production process. The profit identity can be written as follows:

$$\Pi_{pi} = P_i * Q_i - \sum_{j=1}^{J} P_j * Q_j \quad \text{where,}$$

Π_{pi} = Private profit from producing output i

P_i = Price of output i

Q_i = Quantity of output i

P_j = Price of input j used to produce output i

Q_j = Quantity of input j used to produce output i

In a perfectly competitive market each producer maximizes profit, termed private profit, by using each input to the point at which the marginal value product of the input is equal to its marginal cost. When inputs and output are valued at their opportunity cost in an environment characterized by no market failure (monopoly power, externalities, or public goods), producers' behavior results in an efficient allocation of resources.

In most developing countries, it is common to note that resources are not allocated efficiently because either input markets or output markets, or both, function imperfectly, owing to not only market failures, but also government interventions, through its fiscal and pricing policies. Examples of government interventions are protective tariffs, import bans, pan-territorial and pan-seasonal prices, etc. With such interventions, market prices may differ from social opportunity cost and in this case, government-induced prices may lead to suboptimal resource allocation. In this respect, private profitability may differ from social profitability, which is the true measure of the efficiency of resource allocation because inputs and output are valued at their opportunity costs. In a case of market imperfection, market prices may need to be adjusted to derive the true opportunity cost, which may be qualified as economic prices or shadow prices.

3.3 Economic Profitability and Domestic Resource Cost As Measures of Comparative Advantage

One of the major challenges facing decision makers in developing countries is how to allocate limited resources best in order to promote sustainable economic growth. Comparative advantage is aimed at addressing this challenge, which requires defining workable and objective principles for measuring comparative advantage.

3.3.1 Economic Profitability As a Measure of Comparative Advantage

Comparative advantage can be measured by economic profitability, based upon economic or shadow prices. By analogy to the private profit identity defined above, the economic profitability or social profit function can be written as follows:

$$\Pi_{ei} = P_{ie} * Q_i - \sum_{j=1}^{J} P_{je} * Q_j \qquad \text{where,}$$

Π_{ei} = Economic profitability

P_{ie} = Economic price of output i

Q_i = Quantity of output i

P_{je} = Economic price of input j used to produce output i

Q_j = Quantity of input j used to produce output i

Certain inputs may be nontraded and others may be traded. Assuming no taxes or subsidies, Gittinger (1982) defines an input as nontraded if its domestic production cost is above its FOB price but below its CIF price. Conversely, an input may be considered tradable if its domestic production cost is either lower than the FOB price or greater than the CIF price. As such, by dividing the inputs into traded and nontraded ones, the economic profitability identity may be rewritten as follows:

$$\Pi_{ei} = P_{ei} * Q_i - \sum_{t=1}^{T} P_{et} * Q_t - \sum_{n=1}^{N} P_{en} * Q_n \qquad \text{where,}$$

Π_{ei} = Economic profitability from producing output i

P_{ei} = Economic price of output i

Q_i = Quantity of output i

P_{et} = Economic price of tradable input t used to produce output i

Q_t = Quantity of tradable input t used to produce output i

P_{en} = Economic price of nontradable input n used to produce output i

Q_n = Quantity of nontradable input n used to produce output i

Assuming that a country's objective is to maximize its economic or social profit to make the best use of its resources, it will produce a good if its economic profitability is positive ($\Pi_{ei} > 0$). In this case, the country is said to have a relatively low cost or a comparative advantage, as it uses its resources efficiently at the shadow prices. Conversely, if the economic profitability is negative ($\Pi_{ei} < 0$), the country does not produce the good efficiently; hence, the country does not have a comparative advantage.

In a case where a country produces two goods, which yield a positive economic profit, the temptation is to allocate the limited resources to the good that generates the greatest positive economic profit. This criterion may, however, lead to a biased decision if attention is not paid to other factors. For instance, if one activity is small scale and another activity is large scale, the large-scale activity may be favored because it produces greater economic benefits, due to the higher quantity of output produced. Ex ante, the small-scale activity is penalized if both activities are not converted into a comparable unit of the output, such as kilogram (kg). Another problem in using the economic profitability criterion is that, even if competing activities (maize and cotton) are translated in the same unit (kg), it is sometime difficult to compare the same unit of output across activities. Hence, it is useful to find a measure of comparative advantage that is independent of the unit and scale of operation.

3.3.2 Domestic Resource Cost As a Measure of Comparative Advantage

Domestic resource cost (DRC) is nothing more than an extension of economic profitability to measure comparative advantage. It has, however, the advantage of being scale-free and independent of the unit of measurement. Starting with the criterion of the economic profitability function to determine comparative advantage, the DRC, defined as a ratio, is derived and made unit-free as follows:

$$\Pi_{ci} > 0 \text{ if } (P_{ci} * Q_i - \sum_{t=1}^{T} P_{ct} * Q_t - \sum_{n=1}^{N} P_{cn} * Q_n) > 0 \text{ or}$$

$$\text{if } (P_{ci} * Q_i - \sum_{t=1}^{T} P_{ct} * Q_t) > (\sum_{n=1}^{N} P_{cn} * Q_n)$$

This inequality is equivalent to:

$$(\sum_{n=1}^{N} P_{cn} * Q_n) < (P_{ci} * Q_i - \sum_{t=1}^{T} P_{ct} * Q_t)$$

If each side of the inequality is divided by $(P_{ci} * Q_i - \sum_{t=1}^{T} P_{ct} * Q_t)$, the following ratio will be generated:

$$(\sum_{n=1}^{N} P_{cn} * Q_n) / (P_{ci} * Q_i - \sum_{t=1}^{T} P_{ct} * Q_t) < 1$$

In the ratio $(\sum_{n=1}^{N} P_{cn} * Q_n) / (P_{ci} * Q_i - \sum_{t=1}^{T} P_{ct} * Q_t)$, the denominator represents the value of tradable goods (output and inputs) expressed in terms of foreign currency, which needs to be converted into local currency. The economic value of the tradables is converted into local currency by means of the shadow exchange rate. As such, the above ratio can be rewritten as follows:

$$(\sum_{n=1}^{N} P_{cn} * Q_n) / \{(P_{ci} * Q_i - \sum_{t=1}^{T} P_{ct} * Q_t) * SER\} \quad \text{where,}$$

SER = Shadow exchange rate.

The ratio $(\sum_{n=1}^{N} P_{cn} * Q_n) / \{(P_{ci} * Q_i - \sum_{t=1}^{T} P_{ct} * Q_t) * SER\}$ represents the domestic resource cost ratio (DRC). The numerator is the economic value of nontradables or domestic resources used in producing the output. The denominator, which is the difference between the value of the output and that of the tradable inputs, represents the value added in terms of tradables. Intuitively, the DRC ratio can be interpreted as the cost of domestic resources in producing one unit of value added, which is one unit of foreign currency. One may state that the smaller the cost of these domestic resources to yield a unit of foreign currency, the more efficiently the country uses its limited resources.

At first glance, the ratio given above seems to measure absolute advantage instead of comparative advantage because it deals with one country. But if one considers the fact all resources, which include inputs and outputs, are valued at their opportunity cost, the efficiency of the country, assumed to be small and a price taker in the international market, is measured relative to the rest of the world. Therefore, the ratio given above can be interpreted as a measure of comparative advantage.

From the DRC ratio, one can state that a country has a comparative advantage if the DRC is positive and less than unity (one). Conversely, a DRC greater than unity or negative suggests that the country is an inefficient producer of that commodity, as it yields a negative economic profitability. This cut-off point can lead to some problems of interpretation that deserve to be addressed. Given this point, one may encounter cases where the DRC coefficients of a country are all lower or higher than unity for the range of products studied and as such, these coefficients suggest that this country has a comparative advantage or disadvantage in all the products. One source of this type of problem may be that the exchange rate used is not in line with the true opportunity cost of resources and needs to be adjusted to determine the country's comparative advantage.

In an ideal situation where the quality of the data is excellent, the criterion for stating that a country has a comparative advantage is of course to compare the DRC to unity. This ideal situation may be difficult to satisfy in the case of developing countries, especially in West Africa where the data often lack or are of poor quality. As a result, it may be safer to put the cut-off point in a confidence interval to allow for measurement errors. This is for instance done in this study. The range (0.90, 1.10) is an arbitrary confidence interval chosen to make a call on whether a country has a comparative advantage. If the computed DRC coefficient lies in this interval, we may infer that the value of the DRC is too close to unity to make a conclusive statement on comparative advantage. Conversely, if the DRC coefficient is lower than 0.90, we may state that the country has a comparative advantage. Meanwhile, the country has a comparative disadvantage if its DRC coefficient is above 1.10.

3.4 Usefulness of the Domestic Resource Cost Method

3.4.1 Domestic Resource Cost As a Revealer of Distortions

In computing the domestic resource cost coefficient, one can calculate private profitability and social profitability. Doing so can be a useful means of revealing distortions introduced by government policies. Not only can one determine the overall impact of policy distortions, but one can also measure the effect of each policy distortion. While the overall policy distortion is measured by the difference between the private profitability and the economic profitability, the individual distortions are derived from the difference between the market price and the shadow price. Table 3-1, which shows different types of policy distortions, indicates that the overall distortion is represented by O and that the individual distortions are given by K, L, M and N.

Table 3-1. Domestic Resource Cost and Policy Distortions

	Tradables		Nontradables		Profitability
	Output	Input	Labor	Capital	
Market Price	A	B	C	D	E=A-B-C-D
Shadow Price	F	G	H	I	J=F-G-H-I
Policy Effect	K=A-F	L=B-G	M=C-H	N=D-I	O=E-J
NNPC	P=A/F	Q=B/G			
NEPC					R=(A-B)/(F-G)

Note: In this table, letter A may be seen as the value of one unit of output, expressed in market price. Meanwhile, the letters from B to D may be considered as the values of the total quantities of tradable and nontradable inputs, expressed in market prices, to produce one unit of the output. Similarly, letter F is the value of one unit of output, expressed in shadow price. The Letters G to I represent the values of the total quantities of tradable and nontradable inputs, expressed in shadow prices, to produce one unit of the output. Thus, E and J are the financial and economic profitability, respectively. The net nominal protection coefficient (NNPC) is the ratio between the local market price of a good and the shadow price of the good, expressed in local currency by means of the shadow exchange rate.

The net effective protection coefficient (NEPC) is the ratio between the value added of tradable inputs, based on the local market price, and the value added of the same tradable inputs, based on the shadow prices and expressed in local currency by means of the shadow exchange rate.

Source: Adapted from Monke and Pearson

The effects of the policy distortions on tradables (inputs and output), instead of being given in absolute terms, can also be presented in relative terms, such as a ratio. The ratios generated are termed protection coefficients. Among these coefficients, one may cite the net nominal protection coefficient and the net effective protection coefficient. The net nominal protection coefficient (NNPC) of a tradable is the ratio between its market price and its shadow price expressed in local currency, using the shadow exchange rate. For instance, the NNPC of the output in table 3-1 is given by the ratio P = A/F. If the NNPC is greater than unity, it indicates that producers of the good are given an incentive through protective policies. Conversely, an NNPC less than unity suggests that consumers are the ones receiving the incentive.

While the NNPC gives an idea of the effect of an individual policy distortion, it does not show an overall picture. The broad view is given by the net effective protection coefficient (NEPC), which is the ratio between the value added of tradable inputs at market prices and the value added of the same tradable inputs in shadow prices. For example, the NEPC is given by R = (A-B)/(F-G), which measures the overall policy distortion. If the NEPC is greater than unity it indicates than producers of the output receive an incentive, and an NEPC less than unity suggests that they are faced with a disincentive.

3.4.2 Comparing Different Activities, Different Technologies and Different Regions within a Country

The DRC method, within the framework of an individual country, can be a useful tool in guiding decision makers on where to invest the country's scarce resources. For instance, decision makers may be faced with the dilemma of allocating resources between two competing activities, such as coarse grains (millet or maize) and rice. Should investments be made in increasing either the supply of domestic coarse grains or domestic rice? Within this framework, should the limited resources be invested in either animal traction or mechanized production systems? Another problem that decision makers may face is whether they should promote a particular region to foster growth in that region at the expense of another one. Such issues can be addressed by the DRC analysis.

3.5 Objections to Domestic Resource Cost

Although the DRC analysis is a useful tool in helping guide a country's investment decisions, it has been criticized on several grounds. The first objection to the DRC method is that it uses a partial equilibrium framework, which focuses on only a single market and does not provide a broad picture of the linkages between markets. This criticism is particularly important for developing countries on the grounds that resources are relatively limited and a policy change in one sector or enterprise can affect the production pattern in another competing sector or enterprise.

The DRC method has also been criticized on the grounds that it is based on a static framework. Yet, the aim of much of development policy is to change a country's comparative advantage rather than keep it static. A country can alter its comparative advantage by investing in human capital and physical infrastructure, research, and by building the institutions necessary for achieving this goal. In the short run, when investments are made, the country may have a comparative disadvantage. Under these circumstances, the investments may not be made because the payoff occurs in the long run. Another problem associated with these investments is that the payoff is uncertain because of changing economic environment. Thus, an issue is how to account for such an uncertainty in this type of analysis.

Another criticism of the DRC analysis is that it is based on world prices, which have many characteristics. First, world prices can be too variable and volatile for making sound investment decisions in developing countries. This price instability poses the problem of the choice of the relevant price to help guide resource allocation. Should one choose the present price, an average of past prices, or an unknown future price? In this range of prices, should one focus on nominal prices or real prices, and what is the base-year for determining real prices? Another objection to the use of world prices is that they are not derived from a competitive world market, but rather from an oligopolistic market. Thus, certain critiques argue that world prices do not reflect an efficient allocation of resources. Third, world prices may embody subsidies provided by some exporting countries to their exports. Certain critiques suggest that these subsidies should be taken into account in deriving the true world prices if the purpose of the DRC analysis is to remove all distortions introduced by government interventions. One may argue that if the distortions in international prices are likely to remain in the future, they can be accepted as the relevant opportunity cost for a small country because this country is a price taker and cannot change these prices. If the distortions are, however, not likely to continue in the future, one may want to adjust the world price.

In order to address some of the objections formulated against the DRC method, analysts have performed sensitivity analyses on some key parameters. The objective of these sensitivity analyses is to evaluate the response of the DRC coefficient to a change in a parameter. For example, if the production of a commodity relies on a technique that depends heavily on uncertain rainfall patterns which affect on-farm yields, one may perform a sensitivity analysis on yields by assigning different values to the yield parameter to assess the impact of different yield levels on the DRC coefficient. Sensitivity analysis may be also used to address the issue of on-farm technology changes for one crop.

One may also perform a sensitivity analysis on other parameters such as world prices, exchange rate, wage rate, transport cost, etc. Not only can one perform a sensitivity analysis on each individual parameter, but also one can do it for a set of parameters, especially since the computation of the DRC is done on micro-computers, which allow varying several parameters at once. Despite this possibility to perform sensitivity analyses, the basic issue of estimating the opportunity cost of most parameters remains, and is the subject of the upcoming sections.

3.6 Determining Economic Prices

The principle governing the determination of economic prices is the notion of opportunity cost, which may be seen as the marginal contribution of a good to a social welfare function. Such a function, considered as a set of a community values, may include more than one objective. Determining the marginal contribution of the good to the social welfare function requires assigning a weight to each objective to show the relative importance of each objective in the ultimate social objective.

Given that there exist different and sometimes conflicting goals, the benefits and costs of each objective need to be expressed in a consistent fashion in order to make them comparable. This calls for defining a numéraire which is the common denominator for measuring costs and benefits (Ward et al., 1991).

In the literature of cost-benefit analysis, two kinds of numéraire have been widely used by economists. The first one was developed by the Organization for Economic Cooperation and Development (OECD, 1969) and formalized by Little and Mirrlees (1974). This approach chose foreign exchange as the numéraire. In this approach, traded goods are valued in terms of their direct impact on foreign exchange, while nontraded goods are valued in terms of their indirect contribution to foreign exchange. The underlying assumption of this view of the numéraire is that tradable goods, thus border prices, represent an option for a country to enhance its welfare. According to Powers (1981), foreign trade should be treated as an alternative "industry". Thus, imports and exports become the basis for domestic production decisions.

The second numéraire used to value benefits and costs was defined by the United Nations Industrial Development Organization (UNIDO, 1972) as the willingness to pay, known also as the aggregate consumption numéraire. This method is based upon the marginal willingness of the market to pay for a good; thus, how society values a good in reference to its consumption level. In essence, the value of a good is based upon its marginal contribution to national consumption or income.

3.6.1 Valuing Tradable Goods

→ by computing import parity price, which is the economic price of the imported good at the point of delivery

The point of departure for determining the economic price of a traded good or tradable at a specific point is its world price. Determining the economic price requires knowing if the good is intended to be either imported or exported or used as an import-substitute.

Assuming that a good can be imported without restrictions, its economic price is obtained by adding to its FOB price all freight and insurance charges between the world market and the port of entry. This results in the CIF price, expressed in foreign currency at the point of import. Then, this foreign currency must be converted into local currency, using an exchange rate that best reflects the opportunity cost of the currency. In fact, although there exists an official exchange rate established by a central bank, the currency may be undervalued or overvalued because of distortions introduced by the structure of the economy.

The importance of determining the opportunity cost of the currency cannot be overemphasized for developing countries, especially those of Francophone West Africa.

An overvalued currency contributes to making resource allocation more inefficient by making imports artificially cheap and exports artificially expensive. One consequence of an overvalued currency is that it encourages imports and discourages exports and creates additional imbalances in the economy through resource reallocations. Conversely, an undervalued currency discourages imports and encourages exports. As such, one needs to adjust the exchange rate to put it in line with the true value of the local currency.

When the proper adjustment of the currency has been made to convert the foreign currency into the local currency and obtain the CIF price at the point of import, the economic price of the tradable at a specific point inside the country is obtained by ignoring all taxes and subsidies and adding the marketing costs between the port and the point of delivery. This process results in the import parity price, which is the economic price of the imported good at the point of delivery. Conversely, the export parity price, which is the economic price of exports at a specific point, is obtained by deducting from the CIF price all relevant economic costs.

3.6.2 Valuing Nontradable Goods

Conventionally, nontradable goods include factors of production such as labor, land and some kinds of capital. In addition, they consist of commodities that can be potentially traded but are actually nontraded because of government regulations and trade barriers. This last category of nontradables will be discussed in length in section 3.6.2.4.

3.6.2.1 Economic Price for Labor

Determining the economic price of labor in developing countries constitutes one of the most difficult tasks in evaluating the efficiency of resource allocation, for the labor market is segmented between skilled and unskilled labor, urban and rural labor, and the formal and informal sectors. Due to this segmentation, various theories have been put forward to deal with the imperfections in the labor market.

One may cite among these theories the "disutility of effort" theory, which claims that if the unskilled unemployed labor fails to bid down modern sector wages, it is because it places a high value on leisure. Mazumdar (1965), Todaro (1969), and Harris and Todaro (1970) argued within the same line of reasoning that the wage differential between the urban and the rural sectors can be essentially explained by the fact that rural workers prefer the certainty of earning a lower wage to the uncertainty of earning a higher wage in the urban sector. The consequence of the risk aversion of rural workers is that the labor market is faced with an imperfect mobility which, in the long run, causes unemployment and underemployment in the rural sector. This view of unemployment and underemployment can be complemented by the notion of "unlimited supply of labor" advanced by Lewis (1954). As such, the opportunity cost of withdrawing labor from the agricultural sector is close to zero.

This view of the zero marginal product of agricultural labor was challenged by authors such as Schultz (1964) and Sen (1966), who focused on the importance of seasonal variations in the demand for agricultural labor. Their argument is that the zero marginal product of rural labor may be valid during part of the year, but that the marginal product of agricultural labor is higher than zero during the agricultural season.

The controversy surrounding the segmentation of the labor market has prompted several economists to formulate methods to value labor within the context of cost-benefit analysis. Among them are Little and Mirrlees (1974), Squire and van der Tak (1975), McDiarmid (1977) and Powers (1981). The point of departure for these authors in determining the economic value of labor is the notion of opportunity cost, which may be defined in several ways. Focusing on unskilled agricultural labor, the opportunity cost can be seen as either the output forgone by removing a laborer to a new employment or the marginal value product of the worker on the new job. To the opportunity cost of labor, however defined, some economists add not only the net consumption effect of a new job, but also the distributional effect of hiring an additional worker.

It appears difficult, however, to measure the consumption and distributional effects owing to a lack of data. As a result, we focus only on the notion of opportunity cost, which is still difficult to determine for all alternative uses of labor. As a result, the market wage rate during the agricultural peak season is accepted as a proxy for the opportunity cost of labor during the agricultural season. The underlying assumption for acceptance of this measure stems from the idea that unemployment during the peak season is almost negligible. Therefore, at that period, the market wage rate represents a worker's marginal productivity.

3.6.2.2 Economic Price of Capital

Broadly speaking, capital has many definitions in the economic literature. It can mean a physical stock that lasts beyond a single accounting period. As such, it represents part of the economy's past output that was not consumed. It is hence the goods set aside to produce future output. Capital can also mean a financial resource which is not consumed, but saved to finance activities that will be undertaken during an accounting period. Central in both definitions is the idea that capital represents a present sacrifice for future gain or consumption. This non-consumed portion, saved for future consumption, has a value which can be measured by the discount rate or current rental rate or interest rate associated to the capital stock.

In a well-functioning capital market, the discount rate performs the function of balancing the "subjective rate of time preference and the objective productivity of capital" (Irvin, 1978, p. 131). Implicit in this balancing role of the discount rate is that it balances the supply of and demand for investment, measured by the rate of interest, which takes into account the market's or society's willingness to pay. In this sense, the interest rate measures the rate of fall in the present value of society's consumption over time. Thus, it is an indication of the marginal productivity of capital, serving as a guide to the relative scarcity of capital in the economy. In a capital market that functions poorly, the market rate of interest sends the wrong signals to economic agents and leads to an inefficient allocation of resources. As a result, the market interest rate may need to be adjusted to show the relative scarcity of capital, which represents in general one of the major stumbling-blocks of development programs in developing countries.

Capital markets in developing countries may fail to function properly for many reasons. First, there may exist a dichotomy in the capital market, divided very often into formal and informal sectors. On one side, large commercial farmers who belong in general to the formal sector may have access to credit at the interest rate prevailing in the formal financial markets to purchase agricultural inputs and machinery. On the other side, small farmers may not have access to credit in the formal sector, owing to their inability to provide collateral. As a result, they are required to borrow capital in the informal sector at relatively high interest rates. Such interest rates are intended not only to cover high transactions costs, such as the costs of gathering information on the borrower, but also to account for a risk premium aimed at the uncertainty surrounding the borrower's ability to repay the loan. As a result of the dichotomy, different interest rates prevail in the economy.

Another source of market distortion may be that the government funds a specific project in a region to achieve specific social goals, such as enhancing growth in that particular region. In such a case, farmers who participate in the project may be provided with a subsidized interest rate, while other farmers are faced with interest rates that are higher. The differential in the interest rates does not reflect a risk premium, but rather distortions introduced by government interventions. As a result, a shadow discount rate is needed.

In cost-benefit analysis, different approaches to estimate the shadow discount rate have been suggested. The calculation of the shadow discount rate is, in principle, dependent upon the numéraire chosen to express costs and benefits. When the aggregate consumption represents the numéraire, the shadow discount rate is determined by the consumption rate of interest, which measures the rate of fall of the average consumption over time. If the foreign exchange is the numéraire, the shadow discount rate is the accounting rate of interest, measuring the rate of fall in the present value of public investments (Little and Mirrlees, 1974; Squire and van der Tak, 1975). The rationale for the second line of reasoning is that, as argued by some authors, marginal units of public income in the hands of government have greater value than if the funds were to accrue to private consumption. As such, only public investment can maximize the social welfare function in the presence of market failure. This statism implicit in this approach was rejected by the liberalization policies under the Structural Adjustment Programs launched in the early 80s. As a result, this study uses the first method to estimate the shadow price of capital.

3.6.2.3 Economic Price for Land

Determining the economic price for land can be as difficult as valuing labor and capital, especially in regions where the land market is poorly developed. Because of the underdeveloped land market, the shadow price of land is not calculated on the basis of the market price for land. It is rather generated by the residual return to land in the best alternative use. Stated otherwise, it is the difference between the social profit and the economic cost of other factors of production in their best alternative use, as suggested by Morris (1989). This requires that all alternative production activities be identified and cost out.

3.6.2.4 Valuing Nontraded Tradable Goods

In some instances, governments impose regulations such as export or import bans or quotas to achieve certain social goals. These goals may be aimed at giving incentives to producers or protecting consumers. These goods, without the regulations, would be traded across national boundaries but are actually not traded because of the regulations. Such goods can be termed "nontraded tradable goods" or "nontraded tradables".

The principle governing the economic valuation of non-traded tradables is the willingness to pay, by accepting the market price of the good as a good indicator of the economic price. However, one needs to assume that government regulations will be in effect in the future so that economic agents will face the same price for the regulated good. If the government policies are believed likely to change, the point of departure of the economic valuation is the FOB or CIF price, depending upon if the good would have been imported or exported. For such goods, one needs to decompose them into their tradable and non tradable components, by paying close attention to the value of the tradables and nontradables.

Although the distinction between nontradable factors and tradables is essential, it is often a difficult task, for production processes are complex. An example of the complexity of a production activity is that of a fertilizer. It may be produced in a local factory, using local land, labor and capital, imported machinery, and fuel. Fuel may be imported in a raw form and refined later in a local factory that, in turn, employs local labor, capital and other imported machinery. The issue for the analyst is whether or not he should focus on the fertilizer itself or take his analysis further by decomposing the value of the fuel into tradables and nontradables for more accuracy. Answering this relevant question leads us to Gittinger's "doctrine of materiality" (1982) and requires that the analyst compare the marginal cost and benefit of undertaking this activity. Such a comparison is not always easy for an analyst to undertake.

CHAPTER IV

DATA COLLECTION, FARMING SYSTEMS, PRODUCTION AND MARKETING POLICIES, AND ASSUMPTIONS OF DOMESTIC RESOURCE COST

This chapter discusses the institutional link and data sources used to carry out this study. Then, it describes the farming systems used to produce cotton and cereals (maize, millet/sorghum and rice) in the different regions of Côte d'Ivoire and Mali. The choice of these commodities is based on the fact that they are important in each country's economy and that production and marketing data are available for them. It also documents the production and marketing policies of these commodities. Finally, it lays out the assumptions used to calculate the domestic resource cost coefficients in different markets.

4.1 Institutional Link and Data Collection

In 1986, a meeting was held in Mindelo to discuss the creation of a regional protected Sahelian cereals market, within which there would be free trade, to address the food security issue in the Sahel. This idea, agreed to by most participants, remained only at the discussion stage because it was proposed without thorough understanding of the determinants of intraregional cereals trade. To provide information geared toward

fostering regional cereals trade, the Sahelian heads of state and the international donor agencies mandated CILSS[1] and the Club du Sahel[2] to fund some studies.

It is within this context that a research team was funded in 1987 by CILSS and the Club du Sahel to launch a study of regional trade in West Africa. This team was under the leadership of Johny Egg, an agricultural economist at the French Agronomic Research Institute in Montpellier (INRA), John Igué of the National University of Benin (UNB), and Jérôme Coste of the French consulting firm IRAM (Institut d'Application des Méthodes de Développement)[3]. The results of the work undertaken by the INRA/IRAM/UNB research team were presented at a seminar held in November 1989 in Lomé, Togo.

This seminar recommended that, among other things, the products studied be broadened to include livestock and that the regional study be expanded to the southern coastal countries, as a great deal of trade takes place between the Sahelian States and these coastal countries. It was also recommended by the seminar to include other disciplines and methods to complement the regional study under way. As a result, Associates for International Resources and Development (AIRD)[4], under Dirck Stryker's

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[1]/ Created in 1973, CILSS (Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel) is an organization of nine Sahelian States for coping with drought in its member countries.

[2]/ The Club du Sahel, a coordinated program for donor countries, is located within the Organization for Economic Cooperation and Development (OECD) to assist CILSS member states and international donor agencies in natural resource management and food security in the Sahel.

[3]/ 49, rue de la Glacière, 75013 Paris, France.

[4]/ 55 Wheeler Street, Cambridge, MA, 02138, USA.

leadership, was funded by the Club du Sahel and the United Agency for International Development (USAID) to work in collaboration with the INRA/IRAM/UNB research team in order to produce more comprehensive knowledge of the intraregional trade. Within this context, I was hired in 1990 by AIRD to be based at IRAM to collaborate with the Afro-French research team. My duty was, among other things, to be the field economist and collect the data needed to carry out the regional study. The data for the present study were drawn from that study, and their sources are given in Appendix A.

4.2 Farming Systems and Production Policies

This section describes the farming systems and their locations within Côte d'Ivoire and Mali, and discusses farm policies in the two countries.

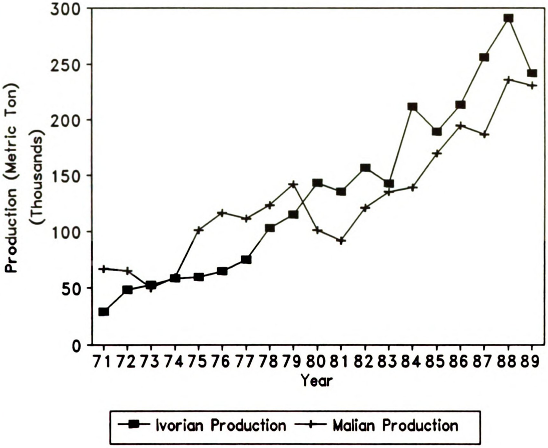
4.2.1 Cotton

4.2.1.1 Côte d'Ivoire

Cotton production is concentrated in the vast savannah zone, encompassing the center and the north of the country. This production has been under the leadership of the Compagnie Ivoirienne de Développement des Textiles (CIDT) since the creation of this regional development agency in 1974. This organization is jointly owned by the Compagnie Française de Développement des Textiles (CFDT), a French firm providing the technical assistance, and the Government of Côte d'Ivoire, which owns nearly 75 percent of the equity. As a result of its larger share, the government, through the supervision of the Ministry of Agriculture and Animal Resources (MARA), defines the overall objectives of the cotton subsector.

Cotton production has exhibited an unprecedented increase since 1974. As shown in figure 4-1, it increased from less than 60,000 tons in 1974 to over 290,000 tons in 1988, owing to large investments in infrastructure and research to find varieties better suited to the Ivorian climatic and ecological conditions (Lele et al., 1989). Even though the increase in cotton production was due to an increase in yields in the late 70s, growth in cotton production in the 80s appears to have been associated with an expansion of the area under cultivation, as yields have stagnated (CIDT, 1991). This stagnation of yields is believed to be due in part to the heavy reliance of production on manual cultivation. Indeed, while over 80 percent of producers used manual cultivation in 1989/90, only 18 percent of producers used animal traction during the same period, owing to the fact that most of Côte d'Ivoire is disease-prone for animals. Animal traction cultivation is mostly concentrated in northern Côte d'Ivoire and yielded nearly 1300 kg/ha in 1989/90, while the yields of the manual cultivation were about 1100 kg/ha. Yields were 1500 kg/ha for semi-mechanized farming system, which is used only by a few farmers because it is capital intensive and farmers often lack the capital to purchase machinery. In fact, they do not resort to loans and rely on previous saving from other activities to finance equipment. Credit appears to be mostly available for small inputs, such as fertilizers (NPK 10-18-18 and urea) and insecticide. The dose per hectare for these inputs and their unit costs are presented in table 4-1 and 4-2.

Figure 4-1. Seed Cotton Production in Côte d'Ivoire and Mali (1971 - 1989)



Source: CIDT and OSCE

Table 4-1. Characteristics of Cotton Production Techniques in Côte d'Ivoire and Mali in 1990							
Region/production technique	Yields Kg/ha	Labor Day/ha	Power Source	Water Control	Seeds kg/ha	NPK kg/ha	Urea kg/ha
Côte d'Ivoire							
Center/improved manual	1100	120	Manual	Rainfed	30	200	50
North/improved animal traction	1300	98	Animal	Rainfed	30	200	50
North/semi-mechanized	1500	70	Tractor	Rainfed	30	200	50
Mali							
South/improved manual	1200	151	Manual	Rainfed	45	150	50
South/improved animal traction	1500	122	Animal	Rainfed	45	150	50

Source: MARA and IER

Table 4-2. Acquisition Prices of Inputs in Côte d'Ivoire and Mali				
Input	Price (CFAF/Unit)		Life Expectancy (Year)	
	Côte d'Ivoire	Mali	Côte d'Ivoire	Mali
NPK (10-18-18) (kg)	130	155	1	1
Urea (kg)	115	145	1	1
Insecticide (liter)	3,300	1,000	1	1
Multi-purpose Plow	52,000	55,000	5	5
Seeder	49,000	52,700	5	5
Sprayer	8,500	10,200	5	5
Cart	72,000	77,000	7	7
Animal	120,000	80,000	5	5

Source: MARA, CIDT and IER

As shown in table 4-1, the farming systems that rely on a stronger source of power have relatively higher yields, owing to several factors. First, farmers, who use these techniques generally have better land. Second, the soil can be dug deeper thanks to the strong power and as a result, the plant has access to the most nutritive elements in the soil during the first stage of the plant growth. Third, these farmers do not generally wait for the rainy season to start the land preparation and hence they are able to plant earlier.

Although the level of subsidy has declined substantially since the implementation of the Structural Adjustment Programs in the early 80s, farmers enjoy some subsidy. For instance, farmers receive seeds and extension services free of charge.

4.2.1.2 Mali

Parallel to Côte d'Ivoire, cotton production in Mali is under the leadership of the Compagnie Malienne de Développement des Textiles (CMDT), which has helped rank Mali among the largest cotton producers in Sub-Saharan Africa. Mali's performance is evidenced by the increase in cotton production from nearly 70,000 tons in 1971/72 to more than 275,000 tons in 1989/90, as shown earlier in figure 4-1. Thus, production grew at over 5 percent per annum.

The bulk of cotton production takes place in southern Mali, where several production systems coexist. These range from the manual cultivation to the more motorized production techniques. Despite the existence of this array of techniques, information is available for only the improved manual production technique and the animal-drawn production system, which is the most widely used production system. As such, this study will focus on these systems of production, for which no direct subsidies are granted by the government. The only subsidy available is that on extension services, which amounted to approximately 15,000 CFAF/ha of seed cotton in 1989/90 (CMDT, 1990).

The improved manual technique and the animal-drawn system differ in their requirements for labor. They rely heavily on family labor. It is estimated that the improved manual technique uses about 150 person-days per hectare for the different agricultural tasks, with harvesting taking up to one-third of the labor time. Meanwhile, the animal traction technique employs about 122 person-days per hectare, of which almost half is devoted to harvesting. Thus, it appears that the bulk of the labor time is assigned to harvesting cotton (Stryker et al., 1987).

One of the major differences between the improved manual technique and the animal-drawn technique resides in the investment in agricultural equipment. While the improved manual system uses small tools only, the animal traction system relies on a pair of animals bought at about 160,000 CFAF and sold after 5 years of use at nearly three-fourths of their acquisition value (IER, 1989). In addition, this latter system uses equipment, such as a multi-purpose plow, seeder, sprayer, cart and harrow.

4.2.2 Coarse Grains

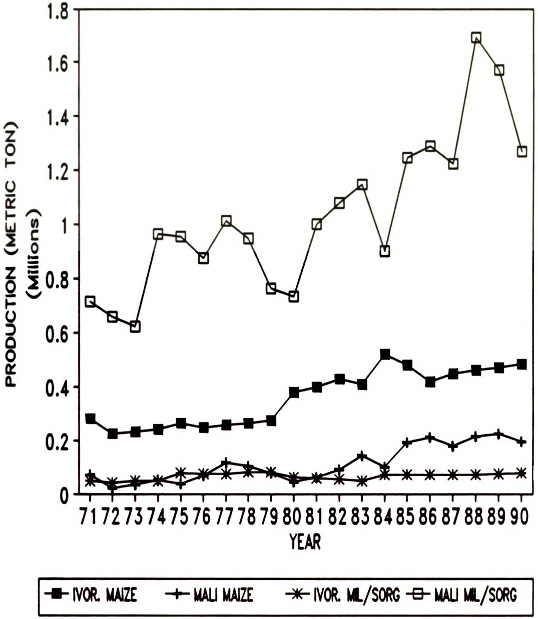
4.2.2.1 Côte d'Ivoire

While maize production can be undertaken in all regions of the country, that of millet/sorghum is concentrated in the northern region. In the case of both maize and millet/sorghum, the predominant production system is manual cultivation. However, some farmers use animal power in the center and north of the country. Moreover, a very small proportion of farmers relies on the semi-mechanized system to produce maize in the savannah region.

Since 1977, owing to the dismantling of most government agencies due to their financial burden on the government budget, the agricultural sector has been organized in such a way that four major regional development agencies are in charge of providing assistance and extension services to farmers, regardless of the crops produced. It is within this framework that the Middle Forest is covered by PALMIVOIRE and SATMACI, while SODEPALM monitors the southern coastal zone. In the meantime, CIDT is responsible for the vast region encompassing the center and the north of the country. Since 1988, CIDT has been strengthened in its duty by the Compagnie Ivoirienne de Développement des Cultures Vivrières (CIDV) to assist a greater number of farmers. The involvement of this organization may have explained the increase in maize production from about 250,000 tons in the mid 70s to almost 500,000 tons in 1990 (CIDV, 1990), as shown in figure 4-2.

The use of modern inputs such as improved seeds and fertilizers has helped increase maize yields from 700 kg/ha to nearly 1500 kg/ha by relying on manual

Figure 4-2. Coarse Grain Production in Côte d'Ivoire and Mali (1971 - 1990)



Source: CIDV and OSCE

cultivation. Improving the source of power to animal traction increased on-farm yields to about 2000 kg/ha in 1990. By further intensifying inputs and relying on a semi-mechanized technique, maize yields average about 4000 kg/ha, as indicated in table 4-3. About 30 kg of improved seed, distributed free to farmers, are applied to a hectare.

In contrast to maize, millet/sorghum production has stayed steady since the early 70s, owing to the little progress made in increasing yields. While yields for the traditional manual technique have been about 600 kg/ha, those of the animal traction have been around 800 kg/ha in the north of the country. According to some accounts (McIntire, 1986), the response of millet/sorghum production to fertilizers use has been so low that farmers do not have any incentives to use them in the short run.

4.2.2.2 Mali

Because of its moisture requirements, maize production is concentrated in southern Mali, which accounts for nearly two-thirds of national production (Office Statistique des Communautés Européennes, 1989). Although maize production is intercropped and undertaken under several production systems, information is available for only the improved animal traction and the improved manual techniques, owing to the fact that the CMDT extension agents monitor farmers who use these techniques of production.

In the CMDT zone, maize produced in an intercropping system accounts for about two-thirds of maize supply (Boughton, 1993). Yet, data lack for this type of maize production. As information is available on the pure-stand maize produced intensively,

Table 4-3. Characteristics of Coarse Grains Production Techniques for Côte d'Ivoire and Mali in 1990							
Region/production technique	Yields	Labor	Power	Water	Seeds	NPK	Urea
	Kg/ha	Day/ha	Source	Control	kg/ha	kg/ha	kg/ha
Côte d'Ivoire/maize							
Center/traditional manual	700	70	Manual	Rainfed	30	0	0
Center/improved manual	1500	131	Manual	Rainfed	40	200	50
Center/improved animal traction	2000	98	Animal	Rainfed	40	200	50
Forest/semi-mechanized	4000	33	Tractor	Rainfed	20	300	100
Mali/maize							
South/improved manual	1600	143	Manual	Rainfed	25	100	150
South/improved animal traction	2000	99	Animal	Rainfed	25	100	150
Côte d'Ivoire/millet/sorghum							
North/traditional manual	600	49	Manual	Rainfed	30	0	0
North/animal traction	800	41	Animal	Rainfed	30	0	0
Mali/millet/sorghum							
South/traditional manual	600	61	Manual	Rainfed	10	0	0
South/animal traction	800	50	Animal	Rainfed	10	0	0

Source: MARA, IDESSA and IER

this study focuses on this maize, which accounts for about one-third of maize production in the CMDT zone. Pure-stand maize is produced in rotation with cotton and yields roughly 1600 kg/ha under manual cultivation and 2000 kg/ha with animal traction (Stryker et al., 1987). Such yields reflect the use of modern inputs, such as NPK and urea. The use of chemical fertilizers for maize production corresponds to Boughton and de Frahan's (1992) intensive technique. It is estimated by IER (1989) that nearly 100 kg of NPK and 150 kg of urea are applied per hectare.

In contrast to maize, millet/sorghum production is in general undertaken with no fertilizers and takes place in most of Mali. Nevertheless, the focus will be on southern Mali, for which information on production is better. There exist two main production systems in this region: the traditional technique, which relies solely on manual cultivation, and the animal traction production system. For 1989/90, yields were estimated at nearly 600 kg/ha and 800 kg/ha for these systems of production.

4.2.3 Paddy

4.2.3.1 Côte d'Ivoire

In Côte d'Ivoire, rice production takes place in two distinct ecological zones, namely the southern forest zone and the savannah zone. The dominant production technique in both ecological zones is the traditional manual system in the uplands, covering about 95 percent of the area devoted to rice production and contributing to approximately 85 percent of national production (Louis Berger International, 1990). As shown in table 4-4, farm yields for upland traditional manual cultivation are about 1300

Table 4-4. Characteristics of Paddy Production Techniques for Côte d'Ivoire and Mali in 1990

Region/production technique	Yields Kg/ha	Labor Day/ha	Power Source	Water Control	Seeds kg/ha	NPK kg/ha	Urea kg/ha
Côte d'Ivoire							
Forest/upland/traditional manual	1300	120	Manual	Rainfed	0	0	0
Forest/upland/improved manual	2200	121	Manual	Rainfed	60	150	75
Forest/lowlands irrigation/improved manual	3500	240	Manual	Irrigation	60	150	75
North/upland/traditional manual	890	85	Manual	Rainfed	0	0	0
North/upland/improved manual	1500	97	Manual	Rainfed	60	150	75
North/upland/improved animal traction	1800	90	Animal	Rainfed	60	150	75
North/dam irrigation/improved manual	4000	247	Manual	Irrigation	60	150	75
Mali							
Office/irrigation/non-intensive	2603	59	Animal	Irrigation	150	68	70
Office/irrigation/semi-intensive	3544	92	Animal	Irrigation	150	92	133
Office/irrigation/intensive	5386	135	Animal	Irrigation	150	113	175
Mopti/traditional flooding	700	53	Manual	Irrigation	120	0	0
Mopti/controlled flooding	1200	69	Animal	Irrigation	120	0	0

Source: Humphreys and IER

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kg/ha in the forest region and 900 kg/ha in the savannah zone. The relatively high yields in the forest zone reflect not only the higher and less variable rainfall, but also the fact that rice production comes at the beginning of crop rotations. As a result of rice coming first in the crop rotations, land clearing and preparation for rice production take more time in the forest region than in the savannah. This may explain why the labor requirement is relatively high for forest zone rice production, estimated at about 120 person-days per hectare, compared to 85 person-days per hectare in the savannah region.

When the manual cultivation is improved by making use of modern inputs, such as improved seeds, fertilizers and insecticide, average yields increase from 1300 to 2200 kg/ha in the forest zone and from 900 to 1500 kg/ha in the savannah region. Improving the source of power from manual to animal-drawn power in the upland production of the savannah, where animals are more resistant to disease, brings about higher yields, estimated at nearly 1800 kg/ha when modern inputs are used.

Irrigation systems were introduced in the early 70s in both regions, owing to the government concern about achieving self-sufficiency in rice (Humphreys, 1981). The underlying policy goal in the early 70s was to reduce rice imports, which were thought to be a growing burden on foreign exchange availability and the balance of payments in the long run. Achieving the objective of self-sufficiency in rice meant improving productivity through investments in more secure water control to enhance the domestic supply. It is within this framework that public funds were used to finance lowland irrigation schemes in the forest region. Such schemes were intended to divert water from small streams to nearby bottom lands. With these schemes, yields increased to nearly 3500 kg/ha in this region.

In contrast to the forest region, the northern region benefitted from major government investments through borrowing foreign capital that helped construct dams in the early part of the 70s. Thanks to these dams, the irrigation systems enjoy complete water control, assuring double-cropping during the year. It is estimated that the yields for this system of production are as high as 4000 kg/ha. This production system has, however, high labor requirements, evaluated at more than 240 person-days/ha/year, as a result of the irrigation control, transplanting and longer harvesting time.

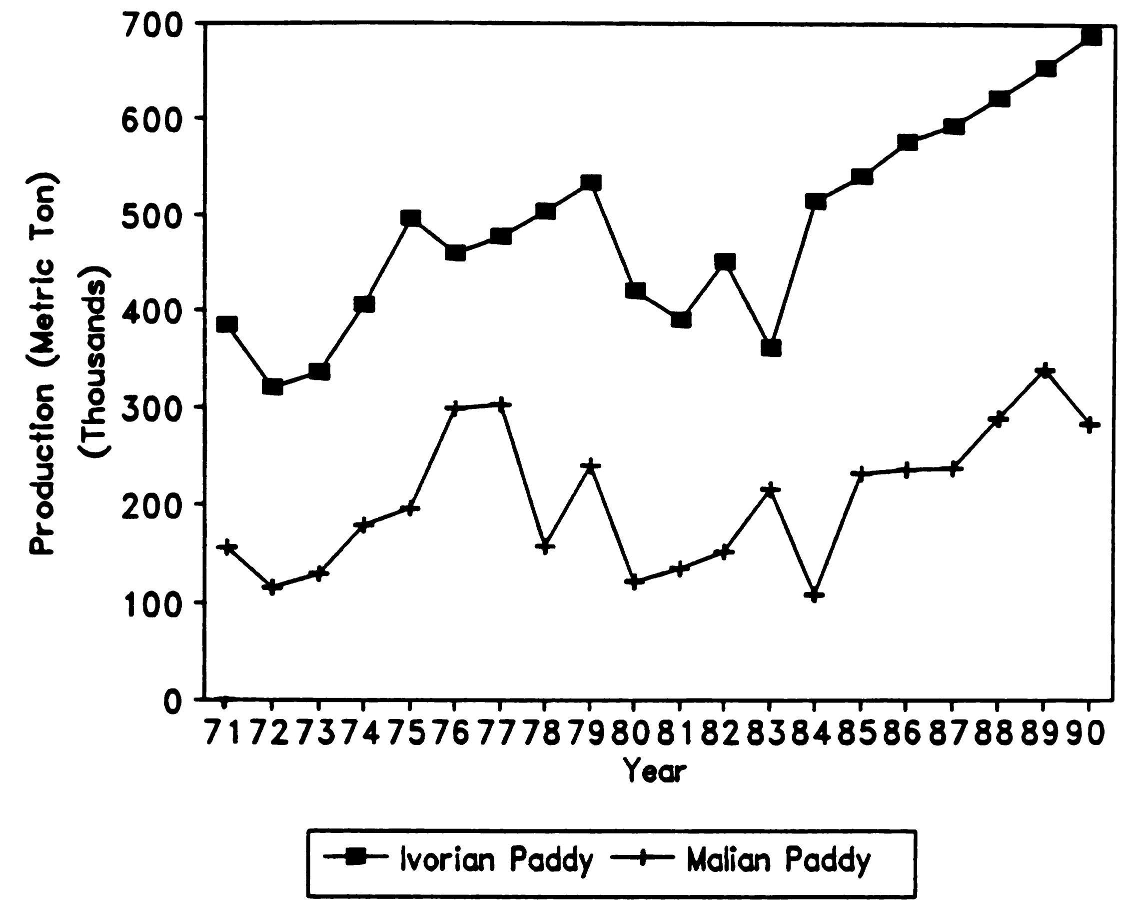
The second device used by the government to expand paddy production was to encourage utilization of modern inputs to enhance yields. To ensure the use of these modern inputs, the government created in 1970 a major parastatal, SODERIZ, which instituted a contract device with farmers to provide them, in a timely fashion, with subsidized modern inputs paid for at harvest time either in cash or in paddy equivalent. SODERIZ was dismantled in 1977 because of its financial difficulties. Since then, its role of delivering inputs to farmers has shifted to other parastatals (SODEPALM, PALMIVOIRE, and CIDT). It is estimated that 150 kg of NPK, 75 kg of urea and 4 liters of herbicide are applied on a hectare of rice field (Louis Berger International, 1990). In general, farmers purchase these inputs on credit and repay them after harvest. Only farmers of the irrigation system of the North receive free inputs. These farmers, as well as other rice farmers, are granted free extension services, which run between 30,000 and 40,000 CFAF per hectare. Thanks to these extension services, the use of modern inputs and the pricing policies, which will be discussed later, paddy production rose from nearly 300,000 tons in the early 70s to almost 700,000 tons in 1990 (CIDV, 1990), as shown in figure 4-3.

4.2.3.2 Mali

Paddy production takes place also in two distinct ecological zones, which are the south of Mali and the zone surrounding Mopti and Ségou. While southern Mali accounts for less than 10 percent of paddy production in Mali, the regions of Mopti and Ségou supply more than three-fourths of paddy production, thanks to major investments along the Niger river.

In southern Mali, there exists no traditional water control system for paddy production. Two systems of production essentially coexist in this region. The oldest production technique of this region is the rainfed traditional swamp technique that uses no improved seeds and no fertilizers. Its yields are variable and range between 1000 and 2000 kg/ha. Owing to this instability in yields, the Government of Mali attempted to introduce a water control system through a simple diversion of water, under the leadership of CMDT. In its attempt to stabilize and increase yields, CMDT introduced not only animal traction for paddy production, but also the use of improved seeds and modern inputs. As a result, yields increased to nearly 1800 kg/ha (McIntire, 1981). Unfortunately, lack of information on the labor requirement and production costs for this system limits this study to the rice production systems in the regions of Mopti and Ségou.

Figure 4-3. Paddy Production in Côte d'Ivoire and Mali (1971 - 1990)



Source: CIDV and OSCE

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In the zone surrounding Mopti and Ségou, there exists a wide range of techniques, ranging from no water control to complete water control. The traditionally uncontrolled flooded system of production is based upon manual cultivation and uses no modern inputs. Its yields, very variable, are estimated at about 700 kg/ha in normal years. Because of this variability in yields, a limited water control system has been introduced in the Mopti and Ségou regions through projects called Opération Riz. Floodwater enters the fields through diked polders for this limited water control system, which yields nearly 1200 kg/ha. This system uses modern inputs and animal traction as a source of power.

The most productive region in the Mopti/Ségou zone is that of the Office du Niger, which was first intended to produce irrigated cotton, but quickly stopped cotton production because of agronomic constraints (De Wilde, 1969). The Office du Niger includes the sub-regions of Niono, N'Débougou, Macina, Kourouma and Molodo, where major investments have been undertaken by the Government of Mali since 1984. The major objective of these investments was to restore areas that were productive in the past, but have witnessed a drastic decline in productivity as a result of the breakdown of the irrigation system. It is within this framework that the French government, through the Caisse Centrale de Coopération Economique (CCCE), funded the project RETAIL in 1986 (République du Mali, 1989).

The most productive system in the Office du Niger is that of RETAIL, which yielded over 5 tons per hectare (Cebron, 1992) in 1990/91. Yields are highest for this project because it enjoys a full water control and a regular maintenance of the irrigation network that allow double-cropping during the year. Moreover, it requires transplanting and the use of a heavy dose of chemical fertilizers, which make it an intensive production system. Water charges and threshing services paid by farmers are estimated at 42,000 CFAF/ha and nearly 8 percent of production, respectively. Farmers are, however, granted free extension services, estimated at nearly 13,000 CFAF/ha.

The second most productive technique in the Office du Niger region is the system of production of the ARPON project, which does not enjoy a systematic leveling of the fields. As a result, certain areas of the fields are poorly flooded. Moreover, farmers of this project use lower doses of inputs than those of RETAIL. The production system of ARPON can thus be termed semi-intensive. Its yields are lower and averaged about 3.5 tons/ha in 1990/91 (Cebron, 1992). As a result of the lower yields, farmers are charged about 28,000 CFAF/ha for water use. They pay, however, the same rate for threshing services.

The third production system found in the region of the Office du Niger is that of the non-restored areas that use gravity irrigation. The irrigation network of this production system is not maintained on a regular basis and as a result, yields are lower than those of the other systems described above. These yields, estimated at nearly 2500 kg/ha, reflect also the use of a relatively lower dose of inputs. Farmers are charged 28,000 CFAF/ha for the use of water and 8 percent for threshing (Cebron, 1992).

4.3 Marketing Policies

4.3.1 Cotton

4.3.1.1 Côte d'Ivoire

Before seed cotton is transformed into cotton fiber, it is collected in rural areas either by the CIDT agents or by farmers' cooperatives, whose share of the assembly market has gradually increased since the mid 80s. It is estimated that 640 cooperatives collected over 240,000 tons of seed cotton out of a production of nearly 241,000 tons in 1989/90 (CIDT, 1991). This overwhelming share of the cooperatives appears to be mainly due to their lower collection costs than those of the CIDT. Collection costs for these cooperatives averaged 4200 CFAF/ton 1989/90, compared to 6500 CFAF/ton for CIDT's marketing agents.

In Côte d'Ivoire, there are 10 industrial mills that gin seed cotton into cotton fiber in several regions of the savannah zone. It is estimated by CIDT that the ginning ratio in these mills averaged nearly 45 percent in 1989/90 and that the total average ginning cost in cotton fiber equivalent amounted to approximately 54,000 CFAF/ton. Such a cost is composed of the direct cost of ginning and the finance charges that amounted to about 18,400 CFAF/ton in 1989/90. As a result, the direct costs of ginning were about 35,600 CFAF/ton. Ginning cotton provides seed, a by-product that was sold by CIDT to TRITURAF[5] at nearly 23,000 CFAF/ton of seed. As the ginning ratio is about 45 percent, the value of the seed for one ton of cotton fiber is about 28,700 CFAF. Thus,

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[5]/ TRITURAF is a firm located in Bouaké that processes cotton seed into oil.

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the net ginning cost to CIDT is about 25,300 CFAF/ton of cotton fiber after the value of the seed sold is deducted from the total ginning cost.

While about 15 percent of the cotton fiber obtained is sold to the local textile mills in Bouaké, the bulk of cotton fiber is sold to the international market to generate foreign currency. Before this cotton fiber is shipped to the international market, it is bulked, stored, and handled at nearly 10,000 CFAF/ton and transported from the mills to the port of Abidjan. Transport cost is about 11,000 CFAF/ton from Bouaké to Abidjan and nearly 20,000 CFAF/ton from Korhogo to Abidjan. Port charges in Abidjan averaged nearly 19,500 CFAF/ton in 1990.

4.3.1.2 Mali

Seed cotton collection is a joint activity between CMDT and farmers' cooperatives, whose role is to help assemble cotton in selected areas, where cotton is picked up and transported by CMDT to the mills. It is estimated that transport costs from the rural areas to the mills averaged 10,000 CFAF/ton in 1989/90 and that the costs of storage, handling, insurance and cotton protection were nearly 13,000 CFAF/ton (CMDT, 1990).

The average ginning ratio in the 13 industrial mills, located mainly in southern Mali, was nearly 43 percent in 1989/90 and the total ginning cost averaged about 54,200 CFAF/ton. The seed obtained after ginning is sold to HUICOMA[6] at 9,000 CFAF/ton;

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[6]/ HUICOMA has its headquarters in Bamako and its industrial unit in Koulikoro. It processes cotton seed bought from CMDT and groundnut into refined oil, sold in the local market.

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thus, the net ginning cost in cotton fiber equivalent after deducting the value of the by-product was a little over 42,000 CFAF/ton. CMDT exports nearly all the cotton fiber produced, owing to the very small capacity of the textile mills in Mali and the desire to earn foreign currency. Marketing costs from the mills to the port of Abidjan, where over two-thirds of Malian cotton fiber is shipped, averaged nearly 44,100 CFAF/ton in 1989/90 (CMDT, 1990).

4.3.2 Coarse Grain

4.3.2.1 Côte d'Ivoire

As for most food commodities, the bulk of the coarse grain produced is consumed by farmers, who are in general semi-subsistence farmers. SOFRECO (1989) estimated that the share of coarse grain marketed is only 25 to 30 percent of total production. These quantities are marketed entirely by the private sector and do not involve any government interventions at the domestic level. Generally, large wholesalers fund assemblers, who are in charge of buying coarse grain from farmers. The average 1990 farmgate price for maize produced in the forest region and the center of Côte d'Ivoire, and for millet/sorghum produced in northern Côte d'Ivoire were calculated from the data provided by the Office de Commercialisation des Produits Vivriers (OCPV), a government agency in charge of collecting monthly wholesale and retail prices of food crops in the major urban centers of Côte d'Ivoire. The monthly farmgate price for the two coarse grains are derived by assuming that the marketing margins between the wholesale and retail prices, given in table 4-5 and 4-6, are identical to the marketing

Table 4-5. Wholesale Prices for Maize, Millet and Local Rice in Selected Markets of Côte d'Ivoire in 1990

	Maize			Millet			Rice		
Month	Abidjan	Bouaké	Korhogo	Abidjan	Bouaké	Korhogo	Abidjan	Bouaké	Korhogo
January	53	46	43	108	88	86	184	175	160
February	51	46	42	103	86	80	173	164	160
March	49	47	44	122	88	78	175	171	160
April	51	52	48	129	99	98	180	171	148
May	57	52	47	122	105	93	192	177	160
June	66	74	64	115	109	105	197	196	166
July	73	81	79	125	114	99	196	194	170
August	81	70	77	129	121	123	209	184	161
September	69	52	71	133	120	125	210	183	162
October	69	57	64	129	118	121	193	178	160
November	73	59	50	141	121	136	202	179	163
December	71	60	60	148	133	124	166	170	164
Average	64	58	57	126	108	106	190	179	161

Source: O.C.P.V.

Table 4-6. Retail Prices for Maize, Millet and Local Rice in Selected Markets of Côte d'Ivoire in 1990

	Maize			Millet			Rice		
Month	Abidjan	Bouaké	Korhogo	Abidjan	Bouaké	Korhogo	Abidjan	Bouaké	Korhogo
January	123	100	67	159	152	114	227	200	186
February	113	100	68	145	150	108	222	180	199
March	116	98	65	172	147	106	228	200	193
April	111	100	70	176	151	124	213	252	187
May	126	100	62	177	150	119	228	206	185
June	126	103		163	150		229	217	
July	140	117	105	174	156	132	237	223	195
August	132	125	97	170	171	150	247	230	201
September	121	100	71	176	164	154	241	233	205
October	125	100	84	170	169	152	238	200	201
November	121	95	74	169	176	158	230	212	198
December	121	100	73	184	181	142	229	215	183
Average	123	103	76	170	159	133	231	206	194

Source: O.C.P.V.

margins between the wholesale and farmgate prices. As such, the average 1990 farmgate price for millet/sorghum in Korhogo is about 80 CFAF/kg and that of maize is about 40 CFAF/kg in the center and forest of Côte d'Ivoire[7], respectively.

Interviews with traders revealed that collection costs that include assembling, handling, and storing coarse grain averaged nearly 4,500 CFAF/ton in 1990 and transport costs from the rural areas to the nearest large market such as Bouaké or Korhogo were estimated at nearly 5000 CFAF/ton. According to the same interviews, coarse grain was shipped to the major urban centers at about 35 CFAF/ton-km and distribution costs between markets averaged approximately 6,800 CFAF/ton in 1990 (Barry et al., 1992).

4.3.2.2 Mali

Marketing of coarse grain was long dominated by government interventions in Mali. It was not until the early 80s that the government, under increasing pressure from the donor community, took steps to liberalize the cereals market. During the initial period of the liberalization, OPAM, the parastatal created in the mid 60s to market cereals, was granted the role of defending cereals prices within a band, which was defined by the government. One of the objectives of the Government of Mali was to

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[7]/ The price spreads between wholesale and retail prices in both Abidjan and Bouaké suggest that either high barriers to entry exist in these markets or the price data for these markets are unreliable. Given that the price spreads in Korhogo are close to the price spreads obtained from the price data collected by Michigan State University between 1986 and 1987 in southern Mali, Korhogo's average 1990 farmgate price obtained from the method explained above is used as a proxy for the average 1990 farmgate prices for central Côte d'Ivoire and the forest region.

provide farmers with stable prices and protect consumers' real income, as cereals were seen as wage goods. Within this framework, OPAM was, among other things, to buy when cereals prices were under the lower limit and sell when they transcended the upper limit of the band. Such a defense mechanism assumed that OPAM had the means to influence prices. By all accounts, OPAM did not have the financial resources required to undertake this defending role (Humphreys, 1986). In the first place, one of the reasons why the liberalization took place was OPAM's financial difficulties. As a result of OPAM's financial constraints, OPAM's role has been narrowed to managing food aid, providing market information, and holding the national food security stock.

Since 1986, coarse grain prices have been determined by market forces, owing to the participation of private traders, who undertake the marketing activities. They buy coarse grain from farmers, and assemble, store and ship them to the consumption centers, among which the most important is Bamako. An interview with traders revealed that transfer costs between the farms in the southern CMDT region and Sikasso were about 8,500 CFAF/ton and that between Sikasso and Bamako were roughly 13,000 CFAF/ton in 1990. Such costs are close to what Gabre-Madhin and Maiga (1990) found.

One of the objectives of the policy reforms in the cereals subsector was to bring about a more efficient cereals marketing system, through competition and better information available to market participants. Within this framework, a Market Information System (MIS) has been set up to collect price data both at the farmer and consumer levels so that market participants have available some information to make rational decisions and efficient use of their resources. Price data have been available since 1988. The MIS data indicate that the 1990 consumer prices for maize and millet/sorghum in Sikasso averaged about 60 and 80 CFAF/kg, respectively and those of Bamako were about 80 and 90 CFAF/kg, respectively. Assuming a 10 CFAF/kg price differential between the consumer prices and the wholesale prices to cover marketing costs, the average 1990 wholesale prices can be evaluated at 50 and 70 CFAF/kg for maize and millet/sorghum in Sikasso, and 70 and 80 CFAF/kg for the same cereals in Bamako.

4.3.3 Marketing of Local Rice

4.3.3.1 Côte d'Ivoire

The bulk of paddy produced is consumed and used for seed by farmers, and only 40 percent of national production appears to be marketed by the private traders and the official channel (Louis Berger International, 1990). According to Louis Berger International, over three-fourths of the quantity marketed was handled by private traders during the period prior to 1988. Since that year, the private sector has handled nearly all the marketable local rice, owing to previous government policies that are explained below.

A pricing and marketing policy was instituted by the government in the early 70s to complement the production policies, described earlier, to expand domestic production. Both sets of policies were aimed at reducing not only the increasing burden of rice imports on the balance of payments, but also the country's dependence on the international market, which witnessed a sharp increase in prices in the mid 70s. It is within

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within this framework that the role of SODERIZ was expanded from assisting rice farmers to collecting, storing, transporting, hulling paddy, and supplying wholesalers with rice. At each stage of this official marketing channel, prices and margins were set by the government to achieve its goals, consisting of expanding domestic supply through adequate revenues to farmers and providing consumers with rice at a reasonable price. With these objectives in view, the farmgate producer price was raised from 60 to 80 CFAF/kg in 1974. In the meantime, the consumer price, which increased sharply after the sudden increase in international prices, was lowered by the government by 25 percent in 1975. Such increase in producer price and the lowering in consumer prices triggered the substantial deficit of SODERIZ, which was dismantled in 1977 and replaced by several industrial units owned by the government.

The government devised a new rice policy whereby a distinction was made between production and marketing activities. With this new policy, extension services were not provided by the newly created units, but rather by development agencies (CIDT, SODEPALM, SATMACI), each in charge of a specific production zone. In the meantime, the rice production zones were divided into regions so as to make each industrial unit responsible for purchasing paddy from farmers in a particular region, without the possibility of expanding its activities beyond its designated region. Once again, paddy was purchased at an official price and sold to wholesalers at a price set by the government. It was assumed in the new pricing policy that the industrial units would make profits if the wholesale price was greater than costs. But, in the event that costs exceeded the wholesale price, the government would absorb the loss through a subsidy funded by

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funded by coffee and cocoa revenues, managed by CSSPPA, a government agency in charge of stabilizing agricultural prices.

Obviously, this new marketing and pricing policy was not conducive to holding down operating costs. It rather encouraged the industrial units to ask for more government financial support, which became, throughout the years, increasingly demanding on the limited public resources. To alleviate costs, the government reduced the paddy farmgate price from 80 to 60 CFAF/kg. Even with this reduction, subsidies to the industrial processing units ranged from 85 CFAF/kg of rice for the least inefficient plant to 455 CFAF/kg of rice for the most inefficient industrial unit in 1987 (Louis Berger International, 1990). By 1988, the government owed these industrial units over 17 billion CFAF, which were cumulated over several years. This amount was unlikely to be paid by the government, especially when it decided unilaterally to withhold its major export crops from the world market, owing to the low international prices. As a result, the industrial units have virtually stopped operating and the private sector has marketed nearly all the local rice since 1988.

Even during the heyday of the industrial mills, they marketed only a small share of domestic production. In fact, the price offered by the private sector to farmers was sometimes nearly 40 percent higher than that of the industrial mills (Louis Berger International, 1990). Nonetheless, the selling price of this private sector was much lower than that of the official channel, owing to its lower cost. In addition, the quality of its rice produced was better than that of the industrial mills because of its faster and shorter turnover. Its hullers, nonetheless, have yielded since the mid 70s a lower milling ratio, which is

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which is on average 55 percent (Barry et al., 1992). Such a relatively low milling ratio is due to the fact that the hullers were originally intended to process coffee and, as such, are not well suited for hulling rice.

During 1990, paddy collection costs for the private sector averaged about 9,000 CFAF/ton, and hulling cost in rice equivalent was estimated at approximately 10,000 CFAF/ton (Barry et al., 1992). Rice milled was shipped to the major consumption centers at nearly 35 CFAF/ton-km. The average distribution cost in rice equivalent was about 6000 CFAF/ton in 1990. The average 1990 wholesale price for local rice, collected by OCPV in the urban centers, was 190 CFAF/kg in Abidjan, 180 CFAF/kg in Bouaké, 170 CFAF/kg in Daloa and 160 CFAF/kg in Korhogo.

The domestic price of rice is influenced by rice imported by the Caisse Générale de Péréquation des Prix (CGPP), a parastatal granted the monopoly power to import rice in order to maintain a regular supply of rice to the cities. The level of rice imports during a single year is, according to government officials, decided by the Ministry of Commerce, in conjunction with the Ministry of Agriculture and Animal Resources, which forecasts the level of national production. Imported rice accounts for nearly half of domestic consumption and is sold to wholesalers, who are registered at the Ministry of Commerce (Louis Berger International, 1990). The parastatal, through a transport subsidy, maintains pan-territorial and pan-seasonal prices, fixed by the government at 147 CFAF/kg at the wholesale level and 160 CFAF/kg at the retail level. In addition, the parastatal influences the domestic price of rice by managing a national food security stock of

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of nearly 90,000 metric tons, equivalent to three months of consumption (Louis Berger International, 1990).

4.3.3.2 Mali

Marketing of local rice was subjected to substantial government interventions, which were aimed at providing producers with stable revenues and supplying rice to urban consumers at a "reasonable" price. Achieving these objectives required the government to possess some tools to influence the rice market. The Office du Niger and OPAM were the instruments of the government to influence the local market. The Office du Niger was in charge, among other things, of buying paddy from farmers at administered prices, collecting and milling paddy at the industrial mills owned by the government. In the meantime, OPAM was granted the monopoly power to purchase rice produced by the Office du Niger and market it at prices fixed by the government.

Even though these two parastatals were granted monopoly-monopsony power, there existed a dynamic private sector, which offered higher prices to farmers than those of the parastatals and marketed rice at relatively low per unit costs. It was not until 1986 that the private sector, thanks to the reforms programs pressed by the donors, was allowed to participate officially in the marketing of the local rice. These reform policies did not, however, question the existence of the Office du Niger, which was seen as a force that could counterbalance the private sector vis-a-vis farmers. The Office du Niger is compelled to buy paddy at a floor price, set by the government at 70 CFAF/kg. This price appears to be the buying price of the Office du Niger for all qualities of paddy.

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The private sector, in contrast to the Office du Niger, faces prices that are determined by market forces, which have been increasingly influenced by farmers' cooperatives. Indeed, farmers have formed associations in recent years to buy, store, and release paddy to maintain adequate prices in the paddy market. It appears that they have been increasingly moving toward hulling paddy to capture the value-added when they supply rice to wholesalers (Diarra, 1994).

The share of the Office du Niger in paddy marketing has been variable since 1987, when the liberalization of the rice market became effective. Its share has depended on several factors, among which one of the most important is its ability to acquire credit from the local banks in order to purchase and mill paddy. Also influential on this share were the quantity of unsold rice in stock and the state of the mills, which stop sometimes as a result of broken parts. The Office's share of paddy marketed has also depended upon the quality of paddy produced by farmers. In fact, farmers prefer to sell the good quality of paddy to the private sector, which offers higher prices for higher qualities, as opposed to the Office du Niger, which purchases paddy at a uniform price. As a result of these factors, the share of the parastatal in paddy marketing in the zone of the Office du Niger has generally been under 50 percent and has been falling (Allard, 1990), because of the increase in the number of small hullers owned either by farmers, private agents or wholesalers (Lanser, 1990).

The costs of collecting paddy and milling it into rice by the parastatal appear higher than those of the private sector. According to some estimates, these marketing costs for the parastatal are nearly 20 percent higher than those of the private marketing channel

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channel (Dembélé, 1990; Allard, 1990). Such high costs may be part of the reason why the parastatal is faced with difficulties in trying to sell its rice. Another reason for the difficulties of the parastatal in selling its rice is the low price of imported rice. As a result, it is sometimes compelled to sell its rice at loss to a few wholesalers who enjoy a price reduction if they decide to buy large amounts. Other times, rice is sold to wholesalers through a bidding process agreed to by the government.

Private wholesalers represent the engine of the private sector. They usually fund smaller wholesalers and stallholders, who market paddy and some rice. The average 1990 collection costs of paddy were estimated at nearly 9,000 CFAF/kg for the private sector. Paddy was hulled at about 9,500 CFAF/ton in 1990. According to Diarra (1994), the milling costs of the private sector are about 25 percent lower than those of the Office du Niger.

The rice produced in the zone of the Office du Niger was shipped from Niono to Bamako at roughly 6000 CFAF/ton during the same year. Other rice distribution costs such as handling, storage, the finance charge and the wholesaler's margins from Niono to Bamako were estimated at nearly 10,000 CFAF/ton (Barry et al., 1992; Dembélé, 1990).

The domestic price of rice has been substantially influenced by the unstable rice import policies. In fact, the private sector was allowed in 1981 to undertake rice imports, thanks to the cereals market liberalization and the concern of the government to ensure the food security of a country, which witnessed successive years of cereal deficits. Such a concern led the government to remove nearly all rice import duties and taxes. As a result, cereals prices were lower than those of the pre-liberalization period.

In 1986, the government adopted new measures to protect the domestic rice production, which had increased in response to a high rainfall level. Import duties increased from 5 percent to 32 percent of the border price, but they did not induce an increase in the domestic price of rice because of the relatively low world price of rice (Coelo, 1989). Despite these high import duties, the Office du Niger was unable to sell its stock of rice, which forced the government to ban rice imports in October 1987. Such a restricted policy led to high cereals prices until June 1988. A similar policy undertaken by the government in 1990 induced again high rice retail prices. In contrast, retail prices became normal whenever the government permitted rice imports. As such, the domestic retail price of rice is largely influenced by rice imports. The retail price of 40 percent broken rice averaged nearly 195 CFAF/kg in Bamako, and 200 CFAF/kg in Sikasso (MIS, 1991).

4.4 Assumptions of the Domestic Resource Cost Method

This section discusses the assumptions used to calculate the domestic resource cost coefficients. First, the world price of the commodities, used to estimate border prices, and the shadow exchange rates are discussed. Then, the assumptions about the shadow price of domestic resources are explained.

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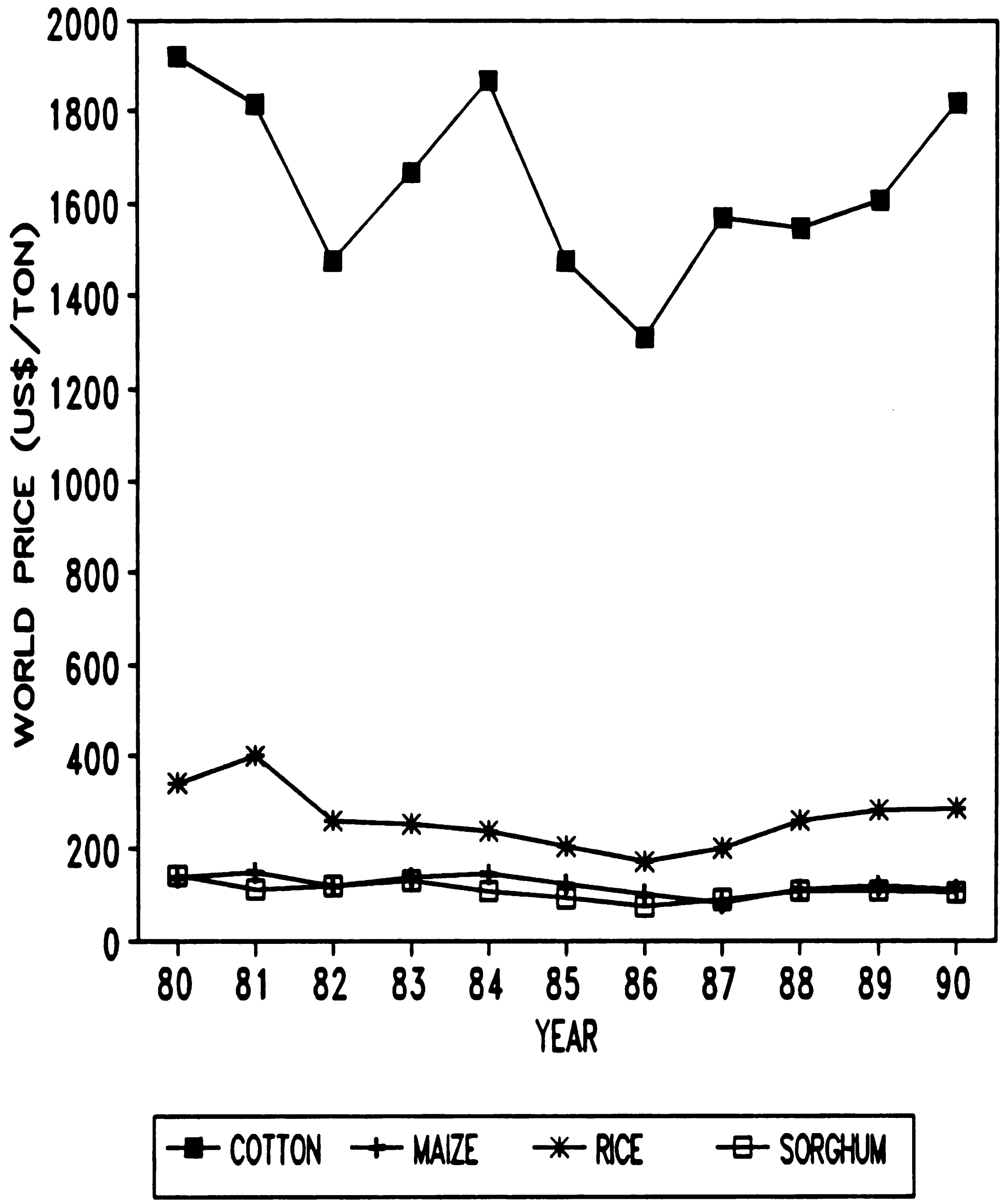
4.4.1 World Prices of Commodities

4.4.1.1 Cotton

Determining the border price of cotton could have started with the FOB price given by the parastatals. This price was, however, not used for two main reasons. First, the parastatals base their calculation of their FOB price on their marketing costs and the prices at which they buy cotton from farmers because they can minimize their taxes by doing so. Second, their true income originates from cotton sold in the international market, where they are price takers. As a result, this study bases the calculation of the border price on the world price of cotton, as often done in the DRC analysis.

As shown in figure 4-4, the world price of cotton has fluctuated since 1980. It fell from US$ 2050/ton in 1980 to US$ 1320/ton in 1985 and reached US$ 1820/ton in 1990 (World Bank, 1991). Such prices represent the value of the highest quality of cotton fiber in the world market. It appears that cotton exported by West African countries is of a slightly lower quality than that supplied by the major exporters. As a result, the price of Malian and Ivorian cotton was obtained by discounting the international average 1990 price, which was used as the baseline price for computing the DRC coefficients to match the production and marketing costs of 1990. The international average 1990 price was discounted by 1 percent for Malian cotton, as done by Stryker et al. (1987). Meanwhile, the discount rate for Ivorian the cotton, based on CIDT's estimate of the selling price of its cotton in the world market, was about 3 percent because the second grade in the Ivorian exports increased during the recent years.

Figure 4-4. Evolution of Nominal World Prices of Commodities (1980 - 1990)



Source: FAO and World Bank

For an export crop such as cotton, the world price is the CIF price, which needs to be translated into a border price. The border price or FOB price is obtained by first subtracting from the CIF price the costs of freight and insurance from the border to the world market. These costs were valued at nearly \$109/ton for Côte d'Ivoire and US\$ 122/ton for Mali (Barry et al., 1992). This difference, expressed in foreign currency, is converted into local currency by using the shadow exchange rate instead of the official exchange rate, which was evaluated at nearly 275 CFAF/US\$ for both countries (IMF, 1991). Indeed, several studies suggested that the CFA franc has been overvalued since the early 80s, when most states of the West African Monetary Union (WAMU), a group of seven Francophone countries that share the same central bank, BCEAO, started to run a deficit in their balance of payments. Using data from 1981 to 1985, Stryker et al. (1987) estimated by means of the elasticity approach that the exchange rate needed to bring about an equilibrium in the current account of Mali would be 33 percent higher than the official exchange rate[8]. Thus, the CFA franc for Mali was overvalued by

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[8]/ The elasticity approach consists of answering the following question: given the official exchange rate (OER), what should be the exchange rate in the foreign exchange market to induce the current account deficit (DEF) to be in equilibrium. The equilibrium exchange rate, termed shadow exchange rate (SER), is obtained by the following formula for small deviations:

$$SER = OER + OER * (DEF/(e_S * X + e_D * M))$$

where e^S and e^D are the elasticity of supply of and demand for foreign exchange respectively, and X and M are the current export and import levels, expressed in foreign currency units.

Assuming e_S and e_D to be 1.0 and 2.0 respectively, Stryker et al. estimated that the Malian CFA Franc was overvalued by 33 percent for the period 1981-85. The above method of calculation underestimated, however, the degree of overvaluation on the grounds that it did not correct for the high tariff rates and import controls, which are distortions introduced by trade policies during the period of study.

Formulated by Schiff (1986), the correction for the distortions is as follows:

nearly 33 percent during the period 1981-85. Using the corrected method described in footnote 7 and data from 1980 to 1989, Salinger and Stryker (1991) found that the CFA franc was overvalued by as much as 50 percent in both Mali and Côte d'Ivoire. Other estimates of the degree of overvaluation, which are not made public because of the controversies surrounding the devaluation of the CFA franc vis-a-vis other currencies, seem, however, to suggest that this currency is overvalued by less than 40 percent for both countries. As a result of these differences, it has been assumed for the base calculation of the shadow exchange rate that the CFA franc is overvalued by 40 percent for Côte d'Ivoire and 33 percent for Mali. Consequently, the shadow exchange rate is about 385 CFAF/US$ for Côte d'Ivoire and 365 CFAF/US$ for Mali.

Once the FOB price is converted into local currency using the shadow exchange rate, port charges are deducted from the FOB price to obtain the export parity price of cotton in Abidjan. For each point between Abidjan and the farm, the economic transfer costs are subtracted from the border price to generate the export parity price at that specific point. The calculation of the border price of the Ivorian and Malian cotton at different points is shown in table 4-7a and 4-7b.

$SER = OER + OER * \{DEF+(t_M*e_D*M/(1+t_M) - t_X*e_X*X/(1-t_M))\}/(e_S*X + e_D*M)$
where, t_M and t_X are the import and export tariffs, respectively.

Table 4-7a. Export Parity Price of Ivorian Cotton and Cereals (CFAF/Ton)

	Cotton	Sorghum	Rice
1- World price (US$) a/	1820	104	287
2- Quality adjustment	-3 %	0 %	-30 %
3- FOB price of adjusted quality (US$) (1)*(2)	1765.4	104	200.90
4- Freight and insurance (US$)	109.09	48	48
5- FOB Price in the port of Abidjan or Dakar (US$) a/	1656.3 1	152	248.90
6- Shadow exchange rate of Ivorian CFAF (CFAF/US$)	385	385	385
7- FOB Price at the port of Abidjan or Dakar (CFAF) (5)*(6) a/	637680	58520	95825
8- Port charges in Abidjan	27305	16160	16725
9- FOB price in Abidjan (7)-(8) a/	610375	74680	112550
10-Marketing costs: Abidjan to Bouaké	49880	12175	15160
11-Marketing costs: Abidjan to Korhogo	57235	20345	19830
12-Marketing costs: Abidjan to farm b/	91225	26560	25715
13-Marketing costs: Abidjan to Sikasso c/		38920	38920
14-FOB price: Bouaké (9)-(10)	560495	88805	97390
15-FOB price: Korhogo (9)-(11)	553140	96975	92720
16-FOB price: farm (9)-(12) d/	519150	95020	86835
17-FOB price: Sikasso (9)-(13)		35760	73630
18-CIF Dakar		76775	114725
19-Marketing costs: Dakar to Bamako e/		29045	29045
20-FOB Bamako (18)-(19)		47730	85680

Note: a/ For cereals, the world price is the FOB price and the price in Abidjan is the CIF price
b/ The farm is assumed to be in the Korhogo region for cotton and cereals.
c/ The value of the tradables between Côte d'Ivoire and the Malian border assumes that the Ivorian CFAF is overvalued by 40 percent, while all the marketing costs between the border and Sikasso, treated as tradables, assume that the Malian CFAF is overvalued by 33 percent.
d/ For cotton the border price is expressed in cotton lint. The equivalent of this price in seed cotton is about 230,000 CFAF/ton.
e/ All the marketing costs between Dakar and Bamako are treated as tradables. The CFAF in Senegal is assumed to be overvalued by 40 percent in Senegal.

Source: Synthesis of Appendix B

Table 4-7b. Export Parity Price of Malian Cotton and Cereals (CFAF/Ton)

	Cotton	Sorghum	Rice
1- World price (US$) a/	1820	104	287
2- Quality adjustment	-1 %	0 %	-30 %
3- CIF price of adjusted quality (US$) (1)*(2)	1801.8	104	200.90
4- Freight and insurance (US$)	122	48	48
5- FOB price in the port of Abidjan or Dakar (US$) (3)-(4) a/	1679.8	152	248.90
6- Shadow exchange rate of Ivorian CFAF (CFAF/US$)	365.75	365.75	365.75
7- FOB price at the port of Abidjan or Dakar (CFAF) (5)*(6) a/	614385	55595	91035
8- Port charges in Abidjan	6775	16160	16725
9- FOB price in Abidjan (7)-(8) a/	607610	71755	111095
10-Marketing costs: Abidjan to Bouaké b/	16760	12175	15160
11-Marketing costs: Abidjan to Korhogo c/	27720	20345	19160
12-Marketing costs: Abidjan to Sikasso d/	44985	38920	38920
13-Marketing costs: Abidjan to farm e/	136885	46975	43055
14-FOB price: Bouaké (9)-(10)	590850	59580	95935
15-FOB price: Korhogo (9)-(11)	579890	51410	91935
16-FOB price: Sikasso (9)-(12)	562625	32835	72175
17-FOB price: farm (9)-(13)	470725	24780	68040
18-CIF price in Dakar		76775	109935
19-Marketing costs: Dakar to Bamako f/		29045	29045
20-FOB Price in Bamako (18)-(19)		47730	80890

Note: a/ For cereals, the world price is the FOB price to which are added freight and insurance, and port charges to generate the CIF price in West Africa.

b/ All the marketing costs are treated as tradables and assume that the Ivorian CFAF is overvalued by 40 percent.

c/ For cotton, the Malian border is the relevant market instead of Korhogo

d/ The marketing costs between Abidjan and Mali's border are treated as in b/. Meanwhile, the economic value of the tradable components of the marketing costs between the border, and Sikasso and the farm assumes that the Malian CFAF is overvalued by 33 percent.

e/ The farm is assumed to be in the Sikasso region for cotton and sorghum, but in the Office du Niger for rice. The border prices for cotton and rice are in lint and rice equivalent. These prices are about 215,000 CFAF/ton of seed cotton and 43,800 CFAF/ton of paddy.

f/ All the marketing costs between Dakar and Mali's border are treated as tradables and assume a 40 percent overvaluation of CFAF in Senegal. Meanwhile, the economic value of the tradable components of the marketing costs in Mali assumes that the Malian CFAF is overvalued by 33 percent.

Source: Synthesis of Appendix B

4.4.1.2 Cereals

The most widely imported cereal in most of West Africa is rice, which appears to be preferred by urban consumers. As a result of the increased urbanization in this region, the West African share in world imports increased from nearly 7 percent in the early 80s to about 15 percent in 1989 (Daviron, 1991). The increased West African share in world imports may also be attributed to increased self-sufficiency in other major importers, such as Indonesia.

Most West African imports originate from Thailand, the world's largest exporter. This country produces different qualities of rice, ranging from the highest quality of rice, known as 5 percent broken, to the lowest quality, that is, the 100 percent broken. The highest quality of rice, which serves as a benchmark for establishing the price of other qualities, enjoys a premium in the world market.

The bulk of rice imported by Côte d'Ivoire and Mali is the 35 percent broken rice. Although it is known that the 35 percent broken rice sells under the price of the 5 percent broken, its price is not quoted in the international rice market. Quoted are the prices for the 5, 10, 15 and 25 percent broken rice. It is estimated from the prices quoted by USDA that the FOB price of the 25 percent broken rice was 20 to 25 percent lower than that of the highest quality between 1987 and 1990 (USDA, 1991). By analogy to the relationship between these two qualities of rice, the FOB price of the 35 percent broken rice is assumed to be 30 percent lower than the 5 percent broken rice. This study assumes the current 1990 FOB price for the 5 percent broken rice, estimated at US$ 287/ton (World Bank, 1991). Thus, the current 1990 FOB price for the 35 percent broken rice can be evaluated at nearly US$ 200/ton. The current 1990 CIF price at the West African ports is obtained by adding the costs of freight and insurance, estimated at about US$ 50/ton, to this discounted price assumed above.

Unlike rice, very little coarse grain is officially imported into Côte d'Ivoire and Mali on a commercial basis, although maize and red sorghum are traded in the international market. The FOB price quoted for maize in 1990 was US$ 109/ton, while that of red sorghum, used as a proxy for millet/sorghum consumed in West Africa, was US$ 104/ton for the same year (World Bank, 1991). The CIF price for coarse grain at the West African ports assumes freight and insurance costs of rice, as used by Boughton and de Frahan (1992)[9].

The CIF price at the port is converted into local currency, using the shadow exchange rates assumed above. Then, the import parity price at each consumption point, shown in table 4-8a and 4-8b, is simply obtained by adding to the CIF price at the port all port charges and the economic transfer costs to the point of consumption.

The bulk of cereals imported officially by Côte d'Ivoire transits in Abidjan, considered as the major consumption center. Cereals are shipped from Abidjan to other consumption regions, among which some of the most important are Bouaké, Daloa, and Korhogo. In Daloa, it appears that very little coarse grain is consumed. As a result, it is retained only as a rice consumption center for the purpose of the study.

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[9]/ Boughton and de Frahan assumed, however, an FOB price, based on the average world price for the period 1986-90, and the 50 percent overvaluation of the CFA Franc found by Salinger and Stryker (1991) for Côte d'Ivoire and Mali. Moreover, they assumed the average official exchange rate for the period 1986-89, estimated at 302 CFAF/US$.

Table 4-8a. Import Parity Price of Ivorian Cereals (CFAF/Ton)

	Maize	Sorghum	Rice
1- FOB price (US$)	109	104	287
2- Quality adjustment	0 %	0 %	-30 %
3- FOB price of adjusted quality (US$) (1)*(2)	109	104	200.90
4- Freight and insurance (US$)	48	48	48
5- CIF price in the port of Abidjan or Dakar (US$) (3)+(4)	157	152	248.90
6- Shadow exchange rate of Ivorian CFAF (CFAF/US$)	385	385	385
7- CIF price at the port of Abidjan or Dakar (CFAF) (5)*(6) a/	60445	58520	95825
8- Port charges in Abidjan	16185	16160	16725
9- CIF price in Abidjan (7)+(8)	76630	74680	112550
10-Marketing costs: Abidjan to Bouaké	12175	12175	15160
11-Marketing costs: Abidjan to Korhogo	20345	20345	19830
12-Marketing costs: Abidjan to farm b/	18390	26560	25715
13-Marketing costs: Abidjan to Sikasso c/	38920	38920	38920
14-CIF price: Bouaké (9)+(10)	88805	86855	127710
15-CIF price: Korhogo (9)+(11)	96975	95020	132380
16-CIF price: farm (9)+(12)	95020	101240	138265
17-CIF price: Sikasso (9)+(13)	115550	113600	151470
18-CIF price: Bamako (9)+(18A)+(18B) d/	111245	109225	148395
A-Port charges in Dakar	18350	18255	20120
B-Marketing costs: Dakar to Bamako	32450	32450	32450

Note: a/ All the figures are in CFAF from this line to the end of the table

b/ The farm for maize is the Bouaké region, while that of sorghum and rice is assumed to be in the Korhogo region.

c/ The value of the tradables between Côte d'Ivoire and the Malian border assumes that the Ivorian CFAF is overvalued by 40 percent, while all the marketing costs between the border and Sikasso, treated as tradables, assume that the Malian CFAF is overvalued by 33 percent.

d/ All the marketing costs between Dakar and Bamako are treated as tradables. The CFAF in Senegal is assumed to be overvalued by 40 percent in Senegal.

Source: Synthesis of Appendix B

Table 4-8b. Import Parity Price of Malian Cereals (CFAF/Ton)

	Maize	Sorghum	Rice
1- FOB price (US$)	109	104	287
2- Quality adjustment	0 %	0 %	-30 %
3- FOB price of adjusted quality (US$) (1)*(2)	109	104	200.90
4- Freight and insurance (US$)	48	48	48
5- CIF price in the port of Abidjan or Dakar (US$) (3)+(4)	157	152	248.90
6- Shadow exchange rate of Ivorian CFAF (CFAF/US$)	365.75	365.75	365.75
7- CIF price at the port of Abidjan or Dakar (CFAF) (5)*(6) a/	57425	55595	91035
8- Port charges in Abidjan	16185	16160	20060
9- CIF price in Abidjan (7)+(8)	73610	71755	110955
10-Marketing costs: Abidjan to Bouaké b/	20600	20600	23630
11-Marketing costs: Abidjan to Korhogo b/	34515	34515	31585
12-Marketing costs: Abidjan to Sikasso c/	41750	41750	30515
13-Marketing costs: Abidjan to farm d/	46975	46975	43055
14-CIF price: Bouaké (9)+(10)	94210	92355	134725
15-CIF price: Korhogo (9)+(11)	108125	106270	142680
16-CIF price: Sikasso (9)+(12)	115360	113505	141610
17-CIF price: farm (9)+(13)	120585	118730	182035
18-CIF price: Bamako (9)+(18A)+(18B) e/	104820	102895	138980
A-Port charges in Dakar	18350	18255	18900
B-Marketing costs: Dakar to Bamako	29045	29045	29045

Note: a/ All the numbers are in CFAF from this line to the end of the table

b/ All the marketing costs are treated as tradables and assume that the Ivorian CFAF is overvalued by 40 percent.

c/ The marketing costs between Abidjan and Mali's border are treated as in b/. Meanwhile, the economic value of the tradable components of the marketing costs between the border and Sikasso assumes that the Malian CFAF is overvalued by 33 percent.

d/ The farm is assumed to be in the Sikasso region for maize and sorghum, and in the Office du Niger for rice.

e/ All the marketing costs between Dakar and Mali's border are treated as tradables and assume a 40 percent overvaluation of CFAF in Senegal. Meanwhile, the economic value of the tradable components of the marketing costs in Mali assumes that the Malian CFAF is overvalued by 33 percent.

Source: Synthesis of Appendix B

Cereals imported into Mali enter West Africa at three points: Abidjan, Dakar, and Lomé. By the accounts of the National Office of Economic Affairs (DNAE), the port of Dakar accounts for nearly 60 percent of Mali's imports. As such, the estimation of the import parity prices for the markets of Kayes, Bamako, and the region of Mopti and Ségou is based on the cost structure from Dakar. The import parity price of cereals in southern Mali assumes that cereals are imported into Mali via Abidjan.

After the comparative advantage of each country for cereals is measured within its boundaries, it is assessed in some key consumption centers of the other country. For instance, Côte d'Ivoire's comparative advantage is measured in both Sikasso and Bamako, while that of Mali is evaluated in Korhogo, Bouaké and Abidjan. For cotton, only Mali's comparative advantage is estimated in Bouaké for reasons that will be explained subsequently. In all cases, once the commodity crosses the boundaries of the exporting country, all the transfer costs to the importing country are assumed to be tradable, although some of the resources used may belong to the exporting country. This assumption is intended to be consistent with trade theory, which assumes that factors of production are mobile only within one country.

In addition to considering cereals as import-substitutes in both Côte d'Ivoire and Mali, the competitiveness of the Ivorian and Malian cereals, assumed to be export crops, is measured at the different consumption points. Such a scenario is considered, owing to the large surpluses generated in both countries during the recent years. In this case, the point of departure for deriving the border price is the CIF price in Abidjan and Dakar. Then, the border price at each consumption point, illustrated in table 4-7a and

4-7b, is obtained by deducting the marketing costs between the point of consumption and Abidjan or Dakar from the CIF price.

4.4.2 Shadow Price of Domestic Resources

Conventionally, land has been assigned a zero economic cost in most DRC analyses undertaken for West African agriculture. This is, however, not the case in this study on the grounds that there has been a growing concern on land deterioration. There is now widespread evidence of increased soil erosion and degradation as a result of population growth, which has put tremendous pressure on land use.

In Côte d'Ivoire and Mali, there has not been any evidence of a competitive market for renting land. As a result, the shadow price of land is estimated as a residual, which requires estimating the economic value of capital and labor and deducting these economic values from the value added in alternative crops per unit of land.

For Côte d'Ivoire, the opportunity cost of land in producing one commodity is assumed to be a weighted average of the returns to land from growing other commodities on the same piece of land, owing to the fact that most farmers tend to diversify their commodities to minimize their risk. Likewise, the opportunity cost of land in southern Mali in growing cotton and maize is estimated by making the same assumption. In contrast to cotton and maize grown in southern Mali, the economic value of land used to produce millet/sorghum is assumed to be close to zero. The rationale for such an assumption stems from three reasons. First, millet/sorghum is the most widely consumed product in this region. As such, producers, who are in general semi-subsistence farmers and concerned about the food security of their family, tend to allocate their land first to the production of this coarse grain. Second, farmers are constrained by the limited ginning capacity of the cotton mills, which induces them to allocate a greater share of the land to coarse grain. Third, the maize market appears to be quickly saturated, as its demand is generally small in Mali.

Estimating the opportunity cost of land as a weighted average of the returns to land calls for knowledge of the share of land devoted to the different agricultural commodities. The share of land for growing cotton, maize, and millet/sorghum in southern Mali is based on the data collected by IER/DRSPR (1992) in the lower portion of the CMDT region. These data seem to suggest that on average about 30 percent of the land is grown to cotton and that maize share of the land is nearly 15 percent. Thus, millet/sorghum account for more than half of the land.

In northern and central Côte d'Ivoire, it estimated that nearly 20 percent of the cultivated area is grown to cotton (République de Côte d'Ivoire, 1988). This study assumes that the rest of the land is devoted to cereals, although very little rice and no millet/sorghum are produced in central Côte d'Ivoire, where root crops are widely grown. Within the area allocated to cereals in northern Côte d'Ivoire, paddy, maize, and millet/sorghum accounts for 37 percent, 45 percent, and 18 percent, respectively. In central Côte d'Ivoire, it is assumed that maize accounts for nearly 90 percent of the land allocated to cereals and that only 10 percent of the cereals land is grown to rice.

The forest region of Côte d'Ivoire is known for producing tree crops, such as coffee and cocoa intended to be exported to the world market, where the prices of these commodities have collapsed. Even though data are unavailable on these crops and root crops, we may assume that the returns from growing them are roughly equal to what would be gained from growing the mixture of cotton, maize and paddy. The opportunity cost of land used to produce irrigated rice in the zone of the Office du Niger and northern Côte d'Ivoire is estimated differently from rainfed crops, as farmers are compelled to only grow paddy in the irrigated areas, supervised by a parastatal. If farmers of irrigated rice were not bound to growing paddy only in the irrigation schemes, they would probably produce vegetables, as is the case of the non-restored areas of the Office du Niger, where some maize is also grown. Owing to the lack of data on vegetables, the economic return to land in producing maize is used as a proxy to the opportunity cost of the irrigated land in the Office du Niger and northern Côte d'Ivoire. In this case, the economic value of land, computed as a residual between the border price and the total economic costs of labor and capital, is estimated by analogy to the costs figures of rice and maize in Senegal (Martin, 1988). In the Senegal study, yields for irrigated maize in the Senegal river region are about one and a half times higher than those of rainfed maize in the Casamance region, which appears to be nearly similar to southern Mali and northern Côte d'Ivoire.

Few government interventions have been observed in the rural capital market, except in areas where there are major projects. In the rural areas, few farmers resort in general to credit to invest in agricultural equipment, as they rely often on earnings from other activities (Dioné, 1989). Farmers resort, however, to credit to buy inputs such as improved seeds and fertilizers, which represent a small share of production costs. The interest rates on these inputs are about 12 percent in Côte d'Ivoire and 8 percent in Mali (CIDT, 1991; IER, 1989). These interest rates are accepted in this study as the shadow interest rate, though some may argue that if the rural capital market worked efficiently, a greater number of farmers would borrow capital to invest in agricultural equipment.

The shadow value of agricultural labor, which accounts for the bulk of costs at the farm level, is a critical element in determining comparative advantage in West Africa. As for land, the shadow price of labor can be determined by either its market price if there exists a competitive labor market, or its residual value. This study assumes that the rural labor market is relatively competitive during the period between land preparation and harvest. During this agricultural season, the daily agricultural wage rate varies from task to task and from region to region. According to the interviews conducted in the production regions, the average 1990 wage rate during the peak season was about 700 CFAF/day in both the savannah region of Côte d'Ivoire and southern Mali, 1000 CFAF/day in the southern forest region of Côte d'Ivoire and 650 CFAF/day in the Office du Niger (Barry, 1992). Interviews were not conducted in Mopti region. The daily wage rate in this region was based on the 450 CFAF/day used by de Frahan (1990) and by applying a five percent annual inflation rate on this wage rate over the period 1988-90. Doing so, the average daily wage rate in the Mopti region is evaluated at about 500 CFAF.

CHAPTER V

COMPARATIVE ADVANTAGE AND TRADE FLOWS UNDER CURRENT POLICIES AND ALTERNATIVE SCENARIOS

This chapter uses the domestic resource cost (DRC) coefficients to measure the comparative advantage of Côte d'Ivoire and Mali in producing and marketing cotton, coarse grains and rice at different points. Then, it discusses the pattern of trade suggested by each country's comparative advantage, and compares the theoretical trade flows with actual trade flows not only between the two countries, but also between both countries and the rest of the world to explain the similarity or divergence between these trade flows. Finally, sensitivity analyses are performed to determine the direction of trade flows, under alternative scenarios and macroeconomic policies.

5.1 Results of the Domestic Resource Cost (DRC) Coefficients

Before proceeding with the discussion of the DRC coefficients, it will be useful to state that the two expressions "comparative advantage" and "socially profitable" are used synonymously with the term "competitive" in the upcoming sections, though they are defined differently by different people. Some view the concept of comparative advantage as trade patterns based on relative costs in an undistorted world (Barkema et al., 1991). Others define the notion of competitiveness as the ability of a firm or country to maintain its market share by delivering a good in a cost-effective way (Agriculture Canada, 1991; Sharples, J. and N. Milham, 1990). Notwithstanding this difference, these two definitions are related on the grounds that they compare costs of trading partners. Comparative cost is the basis of using these terms interchangeably.

5.1.1 Côte d'Ivoire

The results of the DRC coefficients, shown in table 5-1a, appear to show that Côte d'Ivoire generally produces and markets cotton efficiently if all resources are valued at their opportunity cost, as the DRC coefficients for the improved manual and animal traction farming systems, which supply the bulk of cotton, range from 0.59 to 0.66. It appears, however, that the semi-mechanized technique is an inefficient farming system because of the high acquisition and maintenance costs of the machinery. This may explain why fewer than one percent of farmers rely on this production technique.

In contrast to cotton, the semi-mechanized technique seems to be the most efficient farming system in cereals production, probably owing to the high on-farm yields that help to lower the unit costs of maize. The results appear to indicate that most cereals are inefficiently produced at the farm level when they are treated as import-substitute commodities, and as a result, cereals appear noncompetitive in all Ivorian markets. Such results differ significantly from those obtained by Barry et al. (1992) and Humphreys (1981), who assigned a zero opportunity cost to land.

If the opportunity cost of land were zero in this study, as is generally done in the DRC analysis, the results would be consistent with those of the studies mentioned above.

Table 5-1a. DRC Results for Côte d'Ivoire Under a Positive Opportunity Cost of Land

Region/production system	Farm	Daloa	Korhogo	Bouaké	Abidjan
Cotton					
Center/improved manual	0.59			0.61	0.65
North/improved animal traction	0.61		0.63		0.66
North/semi-mechanized	1.27		1.26		1.23
Maize		1/			
Forest/semi-mechanized	0.60	0.80	0.85		1.24
Center/improved animal traction	0.96		1.20	1.18	1.80
Center/traditional manual	1.29		1.51	1.51	> 2
Center/improved manual	1.32		1.59	1.60	> 2
Millet/sorghum					
North/traditional manual	0.96		1.23	1.54	> 2
North/animal traction	0.99		1.28	1.61	> 2
Rice					
Forest/lowlands/improved manual	1.11			1.76	> 2
Forest/upland/traditional manual	1.23	1.55		1.76	> 2
Forest/upland/improved manual	1.27	1.60		> 2	> 2
North/irrigation/improved manual	1.31	1.80	1.93	> 2	> 2
North/upland/traditional manual	1.39		1.79	> 2	> 2
North/upland/animal traction	> 2		> 2	> 2	> 2

1/ For maize produced in the forest, Dimbokro is the market instead of Daloa

Source: Appendix B

Indeed, these results assuming zero opportunity for land, presented in table 5-1b, show that maize and millet/sorghum are in general socially profitable at the farm level, as most of the DRC coefficient range from 0.35 to 0.81. The difference in millet/sorghum competitiveness at the farm level in table 5-1a and 5-1b is due to the high economic value of land, which stems from the high economic profitability from growing cotton in northern Côte d'Ivoire. In this region as well as in the forest region, the local rice appears to be barely competitive in the production zones, as suggested by table 5-1b.

In table 5-1b, the results of the DRC coefficients suggest that for all the commodities, except rice, the more capital intensive farming systems have the lowest DRC coefficients when the opportunity cost land is close to zero. This is, however, not true for cotton and millet/sorghum when land is assigned a positive economic value, owing to the fact that the return to land from producing maize under the most productive techniques is relatively high.

Under the assumption of a zero opportunity cost of land, Côte d'Ivoire could efficiently supply coarse grains to most its markets, except the coastal consumption markets, owing probably to high transfer costs. Unlike coarse grain, local rice shipped to the cities of Abidjan, Bouaké and Korhogo seems to be in general socially unprofitable. Despite the differences in the assumptions used to assess Côte d'Ivoire comparative advantage in producing and marketing local rice, the results for Abidjan in this study are consistent with those found by Humphreys (1981) and Barry et al. (1992), who did not measure the competitiveness of local rice in Bouaké.

Table 5-1b. DRC Results for Côte d'Ivoire Under a Zero Opportunity Cost of Land					
Region/production system	Farm	Daloa	Korhogo	Bouaké	Abidjan
Cotton					
North/semi-mechanized	0.38		0.43		0.50
North/improved animal traction	0.42		0.45		0.50
Center/improved manual	0.54			0.57	0.61
Maize		1/			
Forest/semi-mechanized	0.35	0.50	0.58		0.85
Center/improved animal traction	0.66		0.87	0.83	1.33
Center/traditional manual	0.81		1.00	0.97	1.40
Center/improved manual	1.05		1.30	1.29	1.96
Millet/sorghum					
North/animal traction	0.46		0.66	0.87	> 2
North/traditional manual	0.65		0.88	1.12	> 2
Rice					
Forest/upland/traditional manual	0.99	1.32		1.47	1.75
North//upland/traditional manual	0.99		1.32	1.52	> 2
Forest/lowlands/improved manual	1.05	1.48		1.68	> 2
Forest/upland/improved manual	1.15	1.70		1.96	> 2
North/irrigation/improved manual	1.31		1.93	> 2	> 2
North/upland/animal traction	1.64		> 2	> 2	> 2

1/ For maize produced in the forest, Dimbokro is the market instead of Daloa

Source: Appendix B

5.1.2 Mali

The results of the DRC coefficients, shown in table 5-2a, suggest that cotton and millet/sorghum make the best use of domestic resources. In contrast, maize and rice appear to be noncompetitive in most Malian markets because they are generally produced inefficiently at the farm level when land is valued at its opportunity cost. Such results for rice differ from those of Barry et al. (1992) and Stryker et al. (1987), who did their calculations under the assumption that the economic value of land is zero. Under this assumption, the DRC coefficients of this study, presented in table 5-2b, seem to indicate that the farming systems studies are all efficient. The results for rice need to be, however, interpreted cautiously because the recent investment costs in the irrigation schemes to rehabilitate several areas in the Office du Niger are treated as sunk costs. Thanks in part to these investments (for which data are not available), the RETAIL project in the Office du Niger has the highest on-farm yields and as such, its rice appears competitive in Bamako and Sikasso when land is assigned a zero economic value.

The results of the DRC coefficients in table 5-2a and 5-2b appear to suggest that the farming systems that generate the highest on-farming yields make the best use of domestic resources. For example, the animal traction production system, which has higher on-farm yields for cotton and coarse grains, generates lower DRC coefficients than those of manual cultivation.

Table 5-2a. DRC coefficients for Mali Under a Positive Opportunity Cost of Land

Region/production system	Farm	Mopti	Niono	Bamako	Sikasso	Border
Cotton						
South/improved animal traction	0.70				0.74	0.74
South/improved manual	0.81				0.84	0.84
Maize						
South/improved animal traction	0.71			1.11	0.86	
South/improved manual	0.92			1.38	1.09	
Millet/sorghum						
South/animal traction	0.48			0.82	0.61	
South/traditional manual	0.63			0.96	0.76	
Rice						
Office/irrigation/intensive	0.74		0.87	1.11	1.10	
Office/irrigation/ semi-intensive	0.97		1.10	1.39	1.36	
Office/irrigation/non-intensive	1.21		1.35	1.69	1.65	
Mopti/controlled flooding	> 2	> 2		> 2	> 2	
Mopti/traditional flooding	> 2	> 2		> 2	> 2	

Note: Office refers to the Office du Niger

Source: Appendix B

Table 5-2b. DRC coefficients for Mali Under a Zero Opportunity Cost of Land

Region/production system	Farm	Mopti	Niono	Bamako	Sikasso	Border
Cotton						
South/improved animal traction	0.47				0.55	0.55
South/improved manual	0.67				0.72	0.72
Maize						
South/improved animal traction	0.48			0.81	0.61	
South/improved manual	0.76			1.17	0.92	
Millet/sorghum						
South/animal traction	0.48			0.82	0.61	
South/traditional manual	0.63			0.96	0.76	
Rice						
Office/irrigation/intensive	0.46		0.61	0.81	0.82	
Office/irrigation/semi-intensive	0.54		0.68	0.91	0.91	
Office/irrigation/non-intensive	0.59		0.75	0.99	0.99	
Mopti/traditional flooding	0.80	0.90		1.20	1.19	
Mopti/controlled flooding	0.86	0.97		1.36	1.34	

Note: Office refers to the Office du Niger

Source: Appendix B

5.2 Direction of Trade Flows under Comparative Advantage and Actual Trade Flows

5.2.1 Direction of Trade Flows as Suggested by the DRC Coefficients

The DRC coefficients were computed for different points in Côte d'Ivoire and Mali. For any given market, if the DRC coefficient lies within the interval (0.90, 1.10), we will assume that the result is too close to one to make a conclusive statement on the competitiveness of the product. For any given market and commodity, if the DRC coefficients of the two countries are greater than 1.10 in a specific market, we may state that the local commodity is noncompetitive in that market. In this case, neither country should ship the product to the market, which should be supplied by the world market. For a commodity and a specific market, if the DRC coefficient of one country is above 1.10 and that of the other country is lower than 0.90, the latter country will supply its good to that market.

A difficulty may be encountered in using the DRC coefficients to determine the direction of trade flows based on comparative advantage when the DRC coefficients of the two countries are lower than 0.90 for a given commodity and a given market. In principle, the country that has the lowest DRC coefficient should be the only supplier of this market. However, given that comparative advantage is a matter of degree in this case, the definition of comparative advantage is relaxed in this study. In this case, we assume that the country with the lowest DRC coefficient will be the first supplier of the market because it has the strongest comparative advantage, but that the product of the other country may be supplied to this market if demand in this market is not fully met by the first supplier. This implies that at the margin, contrary to the average values used in the calculation of the DRC coefficients, the first country's DRC coefficient for the product is greater than unity.

Owing to the fact that data on demand conditions in each market are unavailable and that cereals demand is met by imports and the demand for cotton can be expanded in each country, we will assume further that the product of each country can be supplied to the market, where the DRC coefficients are lower than 0.90.

In light of the results of the DRC coefficients displayed in table 5-3a under the assumption that land is valued at its opportunity cost, it appears that Côte d'Ivoire and Mali produce and market cotton efficiently in general. Even though the Ivorian cotton appears to be more competitive than that of Mali in general, Mali could supply some of its product to Bouaké, where Côte d'Ivoire has installed a textile factory that uses the second grade of cotton to satisfy the local demand. Mali could do so if the price offered by Côte d'Ivoire would cover costs.

The DRC coefficients shown in table 5-3a and 5-3b seem to suggest that coarse grain produced in Côte d'Ivoire is in general barely competitive in the production zones, let alone being shipped to the major consumption markets of the two countries. It appears, however, that maize produced in Côte d'Ivoire under the semi-mechanized farming system would be more competitive than maize produced in southern Mali not only in the markets located in Côte d'Ivoire but also in Sikasso and Bamako. Hence, Côte d'Ivoire seems to have the strongest comparative advantage in maize to supply southern Mali and a comparative advantage in Mali to supply most Ivorian markets. In turn, Mali appears to have a comparative advantage in millet/sorghum, which reaches its

Table 5-3a. **Cotton and Maize DRC Coefficients in Different Markets Under a Positive Opportunity Cost of Land**

	Farm	Bamako	Sikasso	Border	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton							
Center/improved manual	0.59					0.61	0.65
North/improved animal traction	0.61				0.63		0.66
North/semi-mechanized	1.27				1.26		1.23
Mali/cotton							
South/improved animal traction	0.70		0.74	0.74		0.72	
South/improved manual	0.81		0.84	0.84		0.82	
Côte d'Ivoire/maize							
Forest/semi-mechanized	0.60	0.90	0.70		0.85		1.24
Center/improved animal traction	0.96	1.25	0.87		1.20	0.72	1.80
Center/traditional manual	1.29	1.57	1.14		1.51	0.91	> 2
Center/improved manual	1.32	1.66	1.14		1.59	1.13	> 2
Mali/maize							
South/improved animal traction	0.71	1.11	0.86		1.18	1.85	> 2
South/improved manual	0.92	1.38	1.09		1.48	> 2	> 2

Source: Appendix B

Table 5-3b. Millet/sorghum and Rice DRC Coefficients in Different Markets Under a Positive Opportunity Cost of Land

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.96	1.32	1.10	1.23	1.54	> 2
North/animal traction	0.99	1.38	1.13	1.28	1.61	> 2
Mali/millet/sorghum						
South/animal traction	0.48	0.82	0.61	0.84	1.33	> 2
South/traditional manual	0.63	0.96	0.76	0.99	1.42	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	1.11	1.63	1.37		1.76	> 2
Forest/upland/traditional manual	1.23	1.66	1.44		1.76	> 2
Forest/upland/improved manual	1.27	1.94	1.57		> 2	> 2
North/irrigation/improved manual	1.31	1.99	1.59	1.93	> 2	> 2
North/upland/traditional manual	1.39	1.84	1.81	1.79	> 2	> 2
North/upland/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.74	1.11	1.10	1.61	> 2	> 2
Office/irrigation/semi-intensive	0.97	1.39	1.36	> 2	> 2	> 2
Office/irrigation/non-intensive	1.21	1.69	1.65	> 2	> 2	< 0
Mopti/controlled flooding	> 2	> 2	> 2	> 2	> 2	> 2
Mopti/traditional flooding	> 2	> 2	> 2	> 2	> 2	< 0

Source: Appendix B

competitive limit somewhere between Korhogo and Bouaké, owing probably to the high transfer costs. Mali's comparative advantage is, however, explained by the fact land was assigned a zero economic value, while the opportunity cost of land in Côte d'Ivoire was positive. The results seem to suggest also that both countries should import rice to satisfy nearly all their domestic markets.

The results of the DRC coefficients under the alternative assumption of a zero opportunity cost of land, illustrated in table 5-4a and 5-4b, appear to suggest that the level of trade between Côte d'Ivoire and Mali would be relatively important. In this case, Côte d'Ivoire would still hold its comparative advantage in maize and a greater quantity of maize would be exported from Côte d'Ivoire to southern Mali, as the competitiveness of maize produced by the animal traction and traditional manual farming systems would improve in this Malian region. Under this assumption, southern Mali would also be able to export some maize produced under the animal traction technique to northern Côte d'Ivoire. Likewise, millet/sorghum produced in Côte d'Ivoire under the animal traction technique could also be shipped to southern Mali and Bamako. In contrast to coarse grain, it appears that local rice would remain non-traded between the two countries.

Cereals production and trade between Côte d'Ivoire and Mali are contingent on rainfall levels. In poor rainfall years, Mali is generally cereals deficit and imports some from the neighboring countries and the world market. In this case, cereals can be treated as import-substitute commodities, as done above. In years of abundant rainfall, such as those since the mid-80s, Mali exports some cereals to neighboring countries. In this

Table 5-4a. Cotton and Maize DRC Coefficients in Different Markets Under a Zero Opportunity Cost of Land

	Farm	Bamako	Sikasso	Border	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton							
North/semi-mechanized	0.38				0.43		0.50
North/improved animal traction	0.42				0.45		0.50
Center/improved manual	0.54					0.57	0.61
Mali/cotton							
South/improved animal traction	0.47		0.54	0.55		0.53	
South/improved manual	0.67		0.71	0.72		0.70	
Côte d'Ivoire/maize							
Forest/semi-mechanized	0.35	0.62	0.48		0.58		0.85
Center/improved animal traction	0.66	0.91	0.63		0.87	0.83	1.33
Center/traditional manual	0.81	1.03	0.76		1.00	0.97	1.40
Center/improved manual	1.05	1.36	0.94		1.30	1.27	1.96
Mali/maize							
South/improved animal traction	0.48	0.81	0.61		0.83	1.31	> 2
South/improved manual	0.76	1.17	0.92		1.24	1.95	> 2

Source: Appendix B

Table 5-4b. Millet/sorghum and Rice DRC Coefficients in Different Markets Under a Zero Opportunity Cost of Land

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/animal traction	0.46	0.73	0.60	0.66	0.87	> 2
North/traditional manual	0.65	0.95	0.79	0.88	1.12	> 2
Mali/millet/sorghum						
South/animal traction	0.48	0.82	0.61	0.84	1.33	> 2
South/traditional manual	0.63	0.96	0.76	0.99	1.42	> 2
Côte d'Ivoire/rice						
Forest/upland/traditional manual	0.99	1.39	1.20		1.47	1.76
North/upland/traditional manual	0.99	1.37	1.35	1.32	1.52	> 2
Forest/lowlands/improved manual	1.05	1.56	1.31		1.68	> 2
Forest/upland/improved manual	1.15	1.79	1.46		1.96	> 2
North/irrigation/improved manual	1.31	1.99	1.59	1.93	> 2	> 2
North/upland/animal traction	1.64	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.46	0.81	0.82	1.20	1.71	> 2
Office/irrigation/semi-intensive	0.54	0.91	0.91	1.36	1.98	> 2
Office/irrigation/non-intensive	0.59	0.99	1.99	1.52	> 2	< 0
Mopti/controlled flooding	0.80	1.20	1.19	1.69	> 2	< 0
Mopti/traditional flooding	0.86	1.36	1.34	> 2	> 2	< 0

Source: Appendix B

case, the competitiveness of the Malian cereals as well as those of in Côte d'Ivoire, where rainfall level is relatively stable, can be measured by treating them as export crops.

The results of the DRC coefficients in table 5-5, based on export parity prices and much greater than two, seem to suggest that cereals produced in Côte d'Ivoire and Mali cannot be exported outside of the region and that cereals can only be produced to compete with imported cereals within the region. These results may be an indication that absorbing cereals surpluses depends largely on expanding the regional cereals market. Cereals demand may be increased by enhancing, for instance, its consumption in the poultry and livestock subsectors. The issue is whether the benefits of using cereals as animal feed will outweigh the costs.

5.2.2 Are Actual Trade Flows Consistent With Comparative Advantage?

This section is intended to assess whether the actual trade flows accord with trade flows suggested by the DRC coefficients. The data on actual trade flows draw from the INRA/IRAM/UNB work during the period 1987-92, as discussed earlier. To assess the direction of trade flows, this team posted researchers, among other places, at the Mali-Côte d'Ivoire border in 1987/88 to have an eye on cereals traded between the two countries. This is the reason why the INRA/IRAM/UNB's results were relied upon to give the direction of trade flows. Their findings were complemented by field observations and interviews with traders, transporters and customs agents in Côte d'Ivoire and Mali and at the Côte d'Ivoire-Mali border.

Table 5-5. DRC Coefficients of Cereals as Export Crops Under a Zero Economic Value of Land

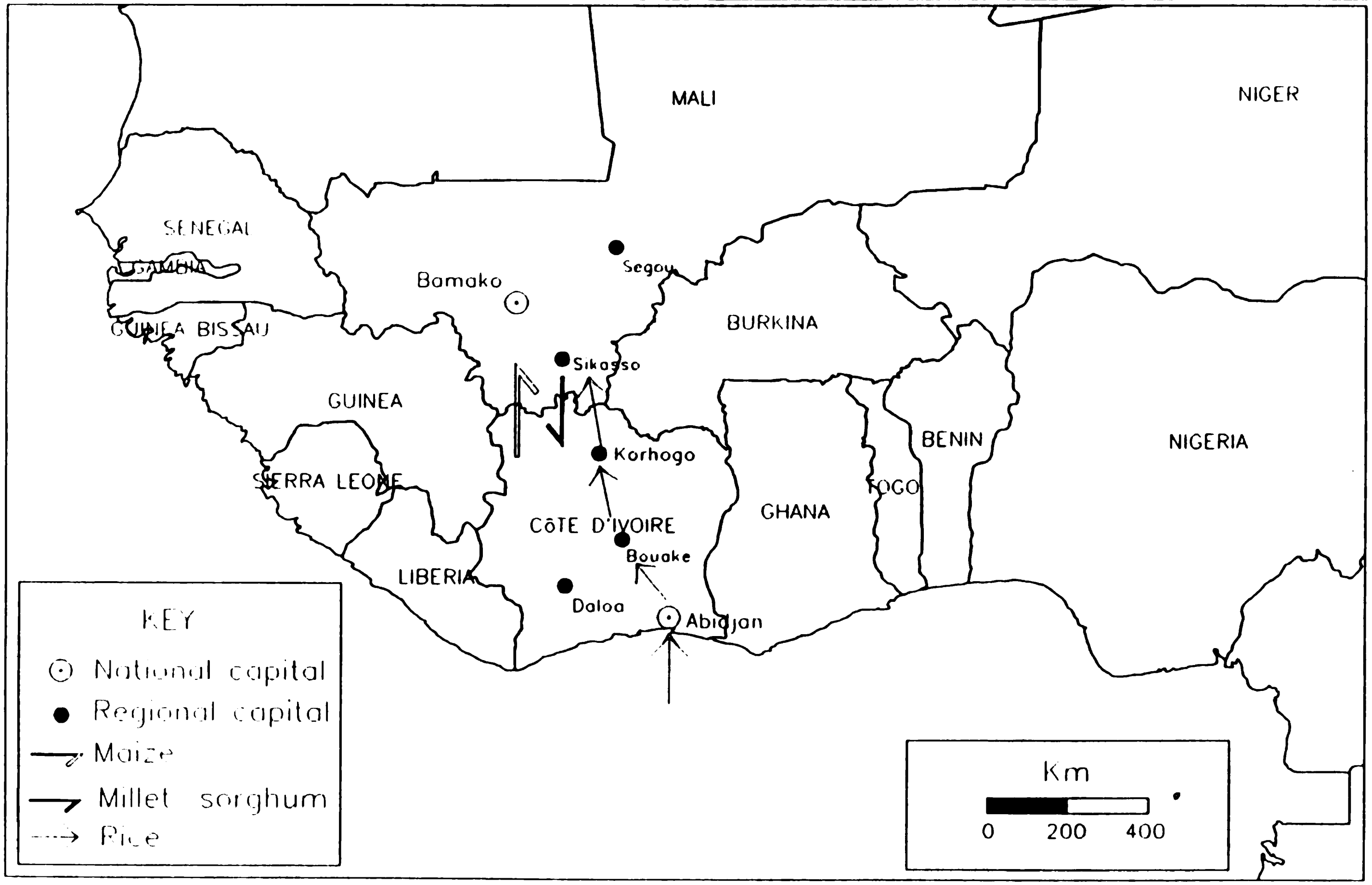
	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/maize						
Forest/semi-mechanized	> 2	> 2	> 2	> 2	> 2	> 2
Center/improved animal traction	> 2	> 2	> 2	> 2	> 2	> 2
Center/traditional manual	> 2	> 2	> 2	> 2	> 2	> 2
Center/improved manual	> 2	> 2	> 2	> 2	> 2	> 2
Mali/maize						
South/improved animal traction	> 2	> 2	> 2	> 2	> 2	> 2
South/improved manual	> 2	> 2	> 2	> 2	> 2	> 2
Côte d'Ivoire/millet/sorghum						
North/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
North/traditional manual	> 2	> 2	> 2	> 2	> 2	> 2
Mali/millet/sorghum						
South/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
South/traditional manual	> 2	> 2	> 2	> 2	> 2	> 2
Côte d'Ivoire/rice						
Forest/upland/traditional manual	> 2	> 2	> 2		> 2	> 2
North/upland/traditionalmanual	> 2	> 2	> 2	> 2	> 2	> 2
Forest/lowlands/improved manual	> 2	> 2	> 2		> 2	> 2
Forest/upland/improved manual	> 2	> 2	> 2		> 2	> 2
North/upland/animaltraction	> 2	> 2	> 2	> 2	> 2	> 2
North/irrigation/improvedmanual	> 2	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	> 2	> 2	> 2	> 2	> 2	> 2
Office/irrigation/semi-intensive	> 2	> 2	> 2	> 2	> 2	> 2
Office/irrigation/non-intensive	> 2	> 2	> 2	> 2	> 2	> 2
Mopti/controlled flooding	> 2	> 2	> 2	> 2	> 2	> 2
Mopti/traditional flooding	> 2	> 2	> 2	> 2	> 2	> 2

Source: Appendix B

Based upon the surveys, Coste (1989) found that maize was exported from Côte d'Ivoire to both Mali and Burkina Faso and that Mali exported millet and sorghum to its neighboring countries such as Côte d'Ivoire, Mauritania and Senegal. Coste did not, however, specify whether rice was shipped either from Côte d'Ivoire to Mali or vice versa. Nonetheless, he hypothesized that some rice may be shipped from production zones in Côte d'Ivoire to neighboring countries.

Coste's contention of the direction of the trade flows between Côte d'Ivoire and Mali, shown in figure 5-1, was confirmed by the interviews I conducted with traders, truck drivers and customs agents in October and November 1991. These interviews took place in the cities of Bouaké, Ferkessédougou, Korhogo and Sikasso and at the Côte d'Ivoire-Mali border. They revealed that the bulk of maize exported by Côte d'Ivoire to Mali takes place in general during the period June-August, which corresponds to the harvest period in Côte d'Ivoire and before maize matures in Mali. According to traders, truck drivers and customs agents, millet/sorghum is usually shipped from Mali to Côte d'Ivoire after the cotton harvest in Mali. Indeed, cotton production is believed to require a lot of farmers' time, and as the price received by farmers is a function of cotton quality, farmers reserve much of their time to get the highest cotton quality. As such, they have little time to devote to coarse grain marketing before the cotton harvest is over. Even though millet/sorghum is generally shipped from Mali to Côte d'Ivoire in most cases, Côte d'Ivoire exports sometimes, according to the interviews, some millet/sorghum to Mali. These Ivorian exports take place in general during the years when the rainfall level is low in Mali and Mali is cereal deficient. Such was the case in

FIGURE 5-1. CEREAL FLOWS BETWEEN COTE D'IVOIRE AND MALI



the drought period of the mid 80s. Since that period, Mali has been a net exporter of millet/sorghum to Côte d'Ivoire, according to the results of the interviews.

The interviews reveal some evidence of rice flowing from Côte d'Ivoire to Mali. This rice is, however, not produced in Côte d'Ivoire. It is rather imported officially from the international market by Malian traders, who hold an official Malian import license that allows them to make their imports transit at the port of Abidjan, according to treaties between the two countries. This may be the reason why Coste did not record them as trade flows from Côte d'Ivoire to Mali.

Cotton has so far been the object of very few regional studies. Most of these studies focused on comparing costs of production. Only Barry et al. (1992) have attempted to deal with issues of regional cotton trade. The findings in this study did not give any indication of cotton trade between Côte d'Ivoire and Mali, except that cotton produced in southern Mali crosses the Ivorian border to be exported to the world market, via the port of Abidjan. Thus, cotton appears to be a nontraded commodity between these countries.

Based upon previous findings, interviews and observations in the field, it appears that maize and millet/sorghum trade flows are in accordance with the theory of comparative advantage when land is valued at its opportunity cost. The empirical findings for rice also seem to be consistent with the results of the DRC coefficients, but those of cotton appear to be in contrast with the results predicted by the theory of comparative advantage, as suggested by the DRC coefficients. Thus, a question arises as to why cereals trade flows appear to be consistent with trade flows predicted by the

DRC coefficients, while actual cotton trade flows seem to contradict those predicted by theory.

5.2.3 Why Are Actual Trade Flows Consistent or Inconsistent With Comparative Advantage?

5.2.3.1 Coarse Grains

Maize trade flows appear to be in accordance with comparative advantage because its prices are determined by supply and demand in the markets in both Côte d'Ivoire and Mali. Indeed, the period during which maize trade flows are large corresponds to the harvest period in Côte d'Ivoire and the hungry season in Mali. During that period, maize prices are lowest in Côte d'Ivoire and cereals prices witness their highest level in Mali, owing to the shorter supply of cereals in Mali. As a result of the price differentials between Côte d'Ivoire and Mali, traders have the opportunity to make some profits by shipping maize from Côte d'Ivoire to Mali to fill the gap between the supply of and demand for maize in Mali.

As with maize, the price of millet/sorghum is determined by market forces in both countries. Since the drought of the mid 80s, Mali has exported millet/sorghum to Côte d'Ivoire because its national supply has been greater than its national demand and as such, it has been able to yield surpluses. Owing to these surpluses, the domestic price of this coarse grain has been relatively low. For instance, the average 1990 consumer price for millet was about 85 CFAF/kg in Sikasso. Meanwhile, the average 1990 consumer price of millet in Korhogo, the largest millet producer of Côte d'Ivoire and adjacent to Sikasso, was nearly 135 CFAF/kg. This relatively high consumer price in

Korhogo may be attributed to the small amount of surpluses generated by the Ivorian semi-subsistence farmers and the relatively high demand for millet/sorghum, for there exists a large number of Sahelian migrants, who account for almost one-fifth of the Ivorian population (République de Côte d'Ivoire, 1991). These migrants, in addition to the indigenous population of northern Côte d'Ivoire, consume a great deal of this coarse grain. The price differential of 50 CFAF/kg between Sikasso and Korhogo provides an incentive to traders to engage in cross-border trade to make some profits. This price differential is, however, not entirely captured by traders, owing to the high transfer costs between the two cities that result from the roadblocks erected by the police and customs officials to make transporters pay "unofficial" fees.

5.2.3.2 Rice

The discussion above showed that the local rice should not be traded between Côte d'Ivoire and Mali because it is noncompetitive in most of the markets. These trade flows predicted by the DRC coefficients appear consistent with actual trade flows. This lack of trade is even more reinforced by the current trade and food policies.

In Côte d'Ivoire, rice has been one of the few food commodities, besides bread and sugar, for which the government has fixed consumer prices in recent years. Because rice is considered a wage good in the urban centers and a source of income for farmers, the government has used some tools to control the rice subsector. Key among these were the trade and fiscal policies undertaken to complement the production policies, aimed at expanding domestic production of rice. Obviously, encouraging domestic production and supplying rice to the powerful urban centers at affordable prices required the government to formulate cautious trade and fiscal policies.

It is within this framework that CPSSPA was granted monopoly power to import rice from the international market. Through this parastatal, the government could monitor rice imports without jeopardizing the objective of expanding domestic supply. This parastatal served as a instrument throughout most of the 70s to implement import restrictions, which the government relied upon to keep domestic prices above import prices.

Since the late 70s, Côte d'Ivoire has relaxed its rice import restrictions and it made little use of trade quotas, owing partly to the growing gap between domestic supply and demand as a result of the increased urban population, which has a greater propensity to consume rice. According to Reardon (1989) and Delgado (1989), one major factor that contributed to growing demand for rice vis-a-vis other staples in the urban areas is the increasing women's and workers' opportunity cost of time in these areas.

To bridge the gap between the demand for and the domestic supply of rice, Côte d'Ivoire has resorted increasingly to rice imports, which soared from only 1,500 tons in 1975 to nearly 350,000 tons in 1989 (République de Côte d'Ivoire, 1991). The increase in rice imports may also have been facilitated by the Asian green revolution that has helped make Asia a reliable source of supply and lowered the cost of Asian rice, and the overvalued CFA franc that has helped to make rice imports more inexpensive. With such relatively low prices, the government can impose import duties and taxes on imported rice and still be able to achieve its goal of providing the urban centers with rice at affordable prices.

Since the early 80s, import duties and taxes on rice have become a great source of government income. While nearly 60 percent of the income generated by rice imports are used to maintain rice prices uniform across the country at 147 CFAF/kg at the wholesale level, the balance, estimated at nearly 3 billion CFAF in 1989 (over US$ 10 million), is fed to the general fund of the government. With such an important source of income for the government in the short run, it is obvious that the government will not have the incentive to set up policies aimed at improving the competitiveness of the local rice and expanding domestic production.

While Côte d'Ivoire has shifted from import restrictions to opening its market to imported rice from the international market, Mali has opted to protect national production. Protection of national production, especially rice produced in the Office du Niger, has taken the form of either banning imports of rice, or limiting imports to the quantity needed to fill the gap between domestic supply and demand, or resorting to high tariffs so as to drive the price of imported rice above that of local rice. Tariff rates were estimated in 1990 at nearly 33 percent of the border price. Such high tariffs were intended to compensate partly for an overvalued currency that favors rice imports. Owing to these trade policies, official rice imports have been relatively low in Mali, averaging about 41,000 tons during the period 1987-90 and causing domestic prices of rice to be relatively high. The relatively low level of rice imports explains in part the higher prices in Mali than in Côte d'Ivoire. Even when the domestic production exceeds the domestic demand, the government bans exports in order to hold down domestic prices, as rice is also considered an urban wage good. Rice exports to neighboring countries are not possible with Mali's current trade policies, which discourage rice exports on the grounds that if exports are allowed, rice is likely to be in short supply. As a result, rice exports are banned, though some of the local rice may be competitive in some markets located across the border.

In summary, the prospects of the local rice trade hinge on reversing the current policies. Key among these policies is monetary policy, which needs to be revised to put the official exchange rate in line with the real exchange rate. Adjusting the overvalued exchange rate may be the key to making local rice more competitive and expanding the trade of local rice. Undertaking this trade policy alone may, however, lead to the wrong direction of rice trade flows if it is not coupled with other adjustments, such as freeing the government from fixing prices in the rice subsector. Yet, the governments still have a major role to play in making local rice more competitive. A key role for the government would be to put in place the rules and regulations, and the mechanism to enforce them.

5.2.3.3 Cotton

It appeared above that Côte d'Ivoire is in general a more efficient producer of cotton than Mali, although cotton makes a good use of Mali's resources. Notwithstanding the efficiency in both countries, it appears that there are no trade flows between them. Several factors converge to explain the lack of cotton trade between these two countries. Key among these factors is the predominance of the two government interventions in the cotton subsector. Indeed, cotton prices are fixed by each government. At the current fixed prices, cotton should flow from Mali to Côte d'Ivoire, in opposite direction of the two countries' comparative advantage, as suggested by the DRC coefficients. Farmgate prices are on average 105 CFAF/kg in Côte d'Ivoire and 85 CFAF/kg in Mali. Even with this price differential of 20 CFAF/kg, cotton does not flow from Mali to Côte d'Ivoire. One may hypothesize that this price differential does not cover transfer costs or other factors hinder cotton trade. In fact, producer prices are much lower than the world price that is the opportunity cost for both countries. As such, it is more profitable for each country to export cotton to the world market than to trade with its neighboring country.

Cotton production and marketing in each country are organized around a parastatal which is granted monopoly power to buy seed cotton from farmers. As such, unofficial trade is illegal. Unofficial trade is made difficult because seed cotton is a bulky commodity, which is hard to move without being noticed. Farmers have little incentives to engage in unofficial trade because they depend on the credit provided by the parastatal to buy inputs, which is repaid at harvest. In addition, they get extension services from the parastatal that provides regional development services that are difficult to obtain without the presence of the parastatal. These services include improving the quality of roads in rural areas to help market other agricultural and non-agricultural products and make these rural areas more accessible.

Another factor that causes cotton not to be traded between Côte d'Ivoire and Mali appears to be the very limited local demand for cotton, owing to a very low capacity for the textile mills, which could potentially supply textiles to other West African countries. The textile mills face such high production costs that it is difficult for them to compete with textiles imported from the international market. Textile imports appear to be also encouraged by the overvalued exchange rate mentioned above. As a result, the only option available to Côte d'Ivoire and Mali is to sell cotton fiber to the world market, which provides foreign currency to finance development activities carried out by the parastatal, as outlined by the legal contract between each government and CFDT.

5.3 Sensitivity Analyses

This section discusses the direction of trade flows, based on comparative advantage, between Côte d'Ivoire and Mali, and between them and the rest of the world, under alternative scenarios and policies. Key among the policies that influence trade flows are exchange rate policies and investment policies, geared toward not only improving farming and processing technologies, but also reducing transfer costs between markets. In addition, the opportunity cost of resources, including outputs and factors of production such as labor, influence these countries' comparative advantage. Sub-sections 5.3.1, 5.3.2 and 5.3.3 assess the individual effects of a change in the different policies and factors on trade flows. The last sub-section attempts to make comparative advantage dynamic by measuring the joint impact of multiple policy variables on the DRC coefficients. All the results of the sensitivity analyses are shown in Appendix C.

5.3.1 Alternative Exchange Rate Policies and Comparative Advantage

The effects of macroeconomic policies, especially exchange rate policies, on the agricultural sector were long ignored. It is not until the mid 70s that Schuh (1974) demonstrated that the U.S. exchange rate policy tended to reduce the competitiveness and level of U.S. agricultural exports, prices and incomes. Schuh's seminal work opened a whole new field of inquiry not only for U.S. agriculture, but also for agriculture in the developing economies, where agriculture is generally the dominant sector. This relationship between exchange rate policies and agriculture has become a greater issue in the West African Francophone countries since the late 80s, owing to the Structural Adjustment Programs brought about by the policy dialogue between these countries and both the World Bank and the International Monetary Fund.

The Francophone countries, which belong to the West African Monetary Union (WAMU), have undergone since the early 80s a deep economic crisis, characterized by, among other things, balance of payment and budget deficits. Owing to these deficits, these countries, in collaboration with the international donor community, launched in the mid 80s a vast program to restructure their economies to bring about viable economic growth. These countries have enacted all kinds of devices except varying the nominal exchange rate to achieve their objectives. Within international institutions, such as the World Bank, it is believed that the currency of these countries, the CFA franc, pegged to the French franc since its inception in 1947, has been overvalued since the early 80s. It has been argued in these organizations that the overvaluation has hurt these weak economies by taxing the export sector, which has become increasingly noncompetitive.

This overvaluation, it has been argued, has tended to encourage imports at the expense of exports and added further imbalances in these weak economies. As a result, a devaluation of the CFA franc has been suggested to make nontradables, especially labor, relatively less expensive and restore the competitiveness of the export sector.

The majority of the leaders in the WAMU countries, along with the French government, which has guaranteed the conversion of the CFA franc, have, however, vehemently expressed their opposition to devaluing the CFA franc on the grounds that the costs of doing so will outweigh the benefits. They have argued that a devaluation of the CFA franc will lead to capital flight from the WAMU countries and such, investments in these countries will shrink further and will adversely affect the employment opportunities of these countries. Another argument put forward by these countries is that a devaluation of the CFA franc may induce high inflation in these countries, which have managed to keep inflation at a very low level. Inflation in these countries, it was argued, may be contained only if import duties are adjusted downward to compensate for the increased price induced by a devaluation. Lower levels of import duties mean for the WAMU countries lower levels of government revenues and, thus, difficulties for these countries to pay their civil servants.

As a result of this opposition, most studies undertaken to evaluate the degree of overvaluation of this currency have been unpublished and kept secret. The rare published and recent articles are those of Stryker et al. (1987), and Salinger and Stryker (1991), who found that the CFA franc was overvalued by nearly 50 percent for both Côte d'Ivoire and Mali between 1980 and 1989. This most recent estimate for Mali was, however, challenged by several unpublished papers, which found that the currency of this country was overvalued by only 20 percent in 1992. The estimate for Côte d'Ivoire in the same unpublished article was nonetheless close to that found by Salinger and Stryker. Another unpublished paper, without specifying its method of estimation, found the overvaluation of the Ivorian currency to be close to 40 percent in 1990. Clearly, estimates of the degree of overvaluation of the CFA franc vary from study to study, owing to the differences in the data and methods used. Obviously, these different estimates are likely to affect the assessment of these countries' comparative advantage.

In light of these different estimates of the degree of overvaluation of the CFA franc, the present study adheres to the idea that the CFA franc has been overvalued. Nevertheless, it is not aimed at focusing on finding the best point estimate of the degree of overvaluation. Rather, the study uses various estimates and shows how different levels of overvaluation and a corresponding common nominal devaluation of the CFA franc in the WAMU countries would affect the comparative advantage and direction of trade flows between not only Côte d'Ivoire and Mali, but also between these countries and the rest of the world. This study will assess, for instance, the impact of the present official exchange rate on the competitiveness of Ivorian and Malian agricultural products. In addition, it will measure the impact of a 50 and 100 percent common devaluation on the competitiveness of these products, assuming that the level of the devaluation is the same for the two countries. The results of these impacts are illustrated from table C5-1a to C5-3b of Appendix C.

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At the official exchange rate of 275 CFAF/$, cotton produced and marketed by Côte d'Ivoire and Mali appears to be at best barely competitive, as suggested by the DRC coefficients in table C5-1a in which land is valued at its opportunity cost. The improved manual cotton, which accounts for the bulk of Ivorian cotton, appears to be more competitive than cotton produced in Mali. In contrast to these results, the DRC coefficients, under the scenario that land has a zero economic value, seem to suggest that cotton would still be a competitive commodity in general for both countries.

Cereals, including coarse grain and rice, appear in general noncompetitive in most markets at the official exchange rate when land is valued at its opportunity cost. At this exchange rate and a zero economic value of land, Côte d'Ivoire would competitively supply its semi-mechanized maize to all markets, except to southern Côte d'Ivoire, owing probably to the high transfer costs. Other cereals of both countries appear at best competitive only in the production zones. These results seem to confirm the reason why Côte d'Ivoire relies heavily on imported rice to satisfy a large share of its domestic market and Mali resorts to protective measures to sell its rice in the domestic market.

Instead of the official exchange rate, if both Côte d'Ivoire and Mali undertook a 50 percent nominal devaluation, cotton would generally become even more competitive. At this new exchange rate and a positive opportunity cost of land, the semi-mechanized cotton of Côte d'Ivoire would still be noncompetitive in all the markets. Likewise, the Malian millet/sorghum would be noncompetitive in central Côte d'Ivoire, even if the CFA franc was devalued by as much as 100 percent and the opportunity cost of land was zero. Notwithstanding the benefits from devaluing the currency, the monetary policy may need to be complemented by other macroeconomic policies and sector tools aimed at reducing the overall unit cost of agricultural commodities.

5.3.2 Comparative Advantage and Trade Flows Under Alternative Opportunity Costs of Resources

5.3.2.1 Effect of Different Labor Opportunity Costs

In most developing countries, especially in West Africa, labor accounts for the bulk of on-farm production costs, for agriculture is generally labor-intensive. As such, the opportunity cost of labor is a critical element in determining the comparative advantage of these countries. Showing the importance of labor opportunity cost, Delgado (1990) concluded that the major driving force of the comparative advantage of Senegal, Mali and Burkina Faso during the 80s was the opportunity cost of labor, which appears to be highly correlated with the unstable coarse grain production. The agricultural wage rate appears to have decreased in Côte d'Ivoire during the 80s because it is associated with the domestic coffee and cocoa prices received by farmers. During the 80s, the farmgate prices of these commodities were lowered as a result of the fall in world prices.

Because the opportunity cost of labor appears unstable in both Côte d'Ivoire and Mali, a sensitivity analysis is performed to evaluate the impact of different levels of labor opportunity cost on the comparative advantage of Côte d'Ivoire and Mali and predict the direction of trade flows. Even though different levels of the opportunity cost were used, as shown from table C5-4a to table C5-5b in Appendix C, the discussion of the results will focus on the impact of a wage rate close to 500 CFAF/day on the DRC coefficients.

Meanwhile, the daily wage rate assumed in the forest region of Côte d'Ivoire is 750 CFAF.

The results of the sensitivity analysis seem to indicate that if the daily wage was in reality 500 CFAF/day in most production zones of Côte d'Ivoire and Mali instead of the 700 CFAF/day assumed above, cotton and cereals would be, as expected, more competitive in all markets. Despite this improvement in the competitiveness of the commodities, most cereals would be competitive at best in the production zones if land was valued at its opportunity cost. Even if the daily wage rate was 350 CFAF, most cereals would still be noncompetitive in general from central Côte d'Ivoire to southern Côte d'Ivoire. It appears that the manual cultivation techniques are in general more sensitive to the change in labor opportunity costs than other farming systems because of their relatively high labor requirements. For instance, maize produced under the traditional manual cultivation is more sensitive to the change in the wage rate than that produced under the animal traction farming system. This sensitivity is measured by the percentage change in the DRC coefficients.

In contrast to the case where land is valued at its opportunity cost, most maize produced in Côte d'Ivoire would be supplied efficiently to most Malian markets in this scenario if land was assigned a zero opportunity cost. Under this scenario, this Ivorian maize, which would become competitive in general in central Côte d'Ivoire, would still remain noncompetitive in the coastal markets. The bulk of the Ivorian maize would become competitive in these coastal markets only if the return to labor was at most 350 CFAF/day.

At the daily wage rate of 500 CFAF, the Malian coarse grain seems to reach its competitive limit between northern and central Côte d'Ivoire. Meanwhile, the Malian rice produced in the Office du Niger, which would generally be competitive within Mali when the economic value of land is zero, would still be noncompetitive in northern Côte d'Ivoire, owing probably to high transfer costs between the Office du Niger and Côte d'Ivoire.

5.3.2.2 Alternative Economic Values of Land and Comparative Advantage

The economic value of land calculated above may be considered as the upper limit of the true opportunity cost of land. As such, half of the value of the opportunity cost of land is arbitrarily chosen to assess its impact on the DRC coefficients. The results of this sensitivity analysis, exhibited in table C5-6a and C5-6b in Appendix C, suggest that the bulk of maize produced in Côte d'Ivoire would be marginally competitive in southern Mali if other factors are held constant. Meanwhile, this maize and other cereals would still be socially unprofitable in central and southern Côte d'Ivoire.

5.3.2.3 Output Prices and Comparative Advantage

The world market price of a commodity helps serve as a guide to determining a country's comparative advantage, for this price may be considered as the country's opportunity cost. For instance, a country producing a good that is sometime in short supply may decide to import more of the good and allocate its resources to other activities if the world price of the good is relatively low. In this case, the local good is said to be noncompetitive. Conversely, if the international price is higher than the local cost, the country may want to encourage local production and save its foreign exchange to finance its economic and social development.

Though prices in the world market may be a guide to a country's comparative advantage, they are often too unstable to guide policy makers. For instance, the world market of cotton and cereals witnessed unstable prices during the period 1980-90. Cotton and cereals prices were generally higher in the early part of the 80s, declined in the mid 80s and started rising in the late 80s. This variability in world prices may be an indication that the competitiveness of West African agricultural products fluctuated between 1980 and 1990.

As a result of the instability in international prices, a sensitivity analysis is performed to attempt to evaluate the impact of world output prices on the comparative advantage of Côte d'Ivoire and Mali. The sensitivity analyses use the highest and lowest prices observed during the period 1980-90, the average prices of this period, and the projected world prices for the year 2000 to predict what Côte d'Ivoire's and Mali's comparative advantage would be under these scenarios. The projected world prices of cotton, maize, sorghum and rice for that year are 2400 US$/ton, 164 US$/ton, 155 US$/ton, 389 US$/ton, respectively (World Bank, 1993). The results of the sensitivity analyses, shown in table C5-7a and table C5-7b in Appendix C, report only the case of the projected world prices.

These results seem to suggest that, if other variables are maintained constant, cotton, maize, millet/sorghum and rice produced in both Côte d'Ivoire and Mali were less competitive in the mid 80s, when commodity prices were at their lowest level, than in the early 80s. This may explain why Côte d'Ivoire resorted to large quantities of rice imports in the mid 80s to fill the gap between its increasing demand and domestic production.

Generally speaking, cotton and rice were on average less competitive during the period 1980-90 than in 1990. In contrast, maize was more competitive in 1980-90 than in 1990. However, it appears that the competitiveness of all the commodities will be better in the year 2000 than during the 80s if other factors remain constant and if commodity prices follow the World Bank's projections.

5.3.3 Comparative Advantage Under Alternative Investment Policies

Traditional theory of international trade has mainly focused on static production issues without recognizing that the objective of most development policies is to alter a country's comparative advantage in different time periods. Such a vacuum in the traditional theory was filled in part by the new approach to trade theory led by Krugman (1986), who, contrary to the conventional approach, views the government as a major active player in altering the comparative advantage of a country. Based upon this new approach, this section attempts to evaluate the impact of different investment scenarios on the competitiveness of the Ivorian and Malian agricultural products in different markets.

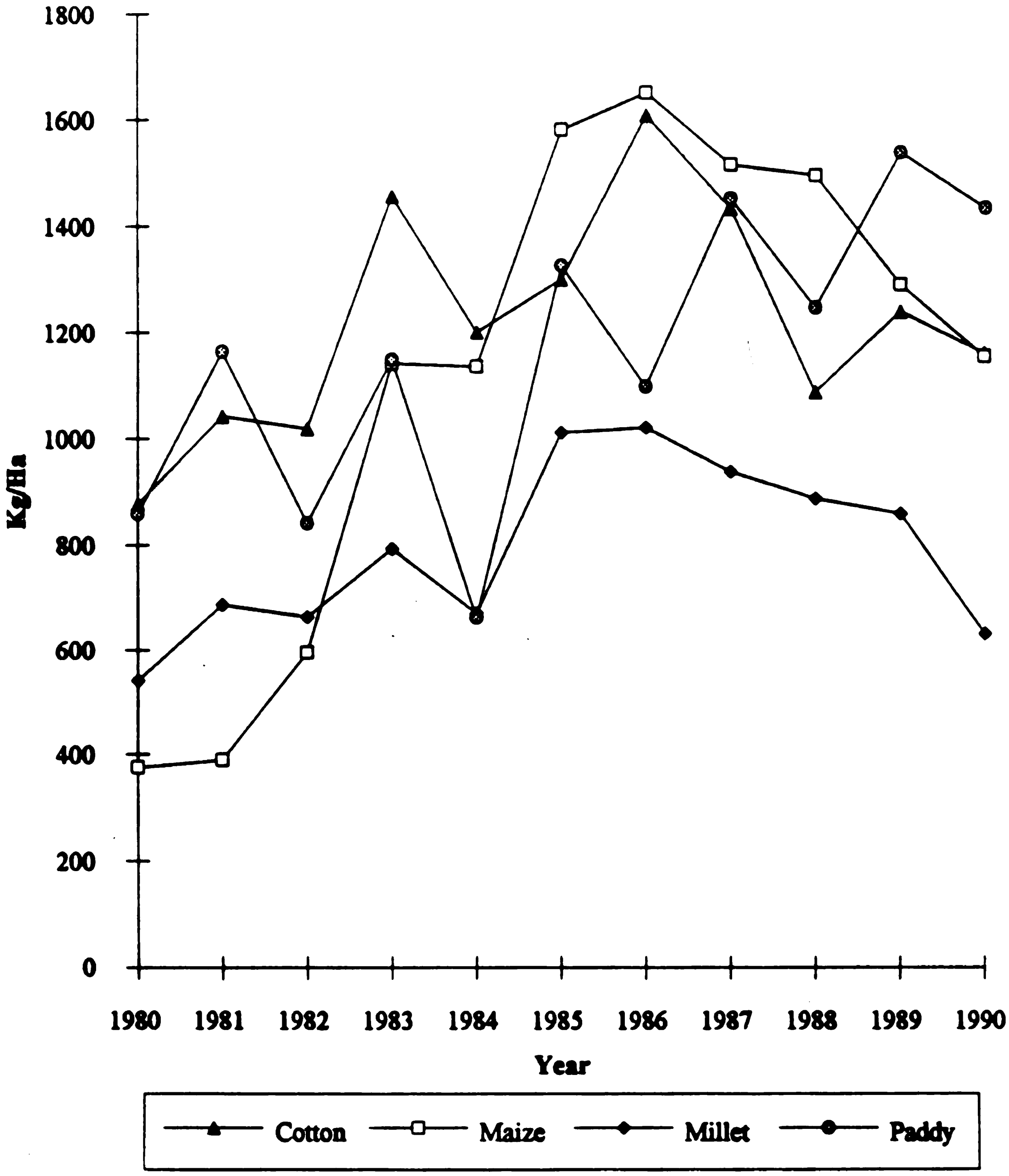
5.3.3.1 Farm Level Technology and Comparative Advantage

Technological change represents one of the major driving forces in altering a country's comparative advantage. Notwithstanding the private sector as a key player in technological changes, a key role of the government is to create the appropriate institutions that can diffuse existing technologies and improve them. In addition, the government can make new techniques accessible to farmers and induce these farmers to make the most efficient use of these techniques. As such, one of the challenges facing West African policy makers is to mobilize resources and invest them in research in order to improve and adapt farming systems to the local environment. This challenge has become even bigger in recent years, owing to the fact that the government has fewer resources now than in the past, while the demand on these limited resources is increasing at a fast pace.

The role of government in investing in human capital and creating the appropriate networks and institutions that will enable the improvement of current farming practices is particularly important for Côte d'Ivoire and Mali, where agriculture productivity is in general low, while one of the roles of agriculture is to generate surpluses and provide food to workers at an affordable price. Fulfilling this role may be difficult, especially if agricultural production relies mainly on volatile rainfall patterns, which make production more uncertain.

Yields have been unstable in Mali, in contrast to those of Côte d'Ivoire, during the period 1980-90, as shown in figure 5-2. This instability in yields is captured by the

Figure 5-2. Evolution of On-Farm Yields in Mali (1980-1990)



Source: OSCE

relatively high coefficients of variation[1] that range from 17 to 40 percent, calculated from the yield data provided by the Office Statistique des Communautés Européennes (1989). Among the products, cotton appears to have the least variable yields. In contrast, maize yields seem to be the most variable, owing to several reasons. Shortly before the mid 80s, maize yields increased substantially as a result of the significant increase in the rate of technology adoption in the CMDT region after the launch of an integrated approach to technology delivery, coupled with an attractive guaranteed market price. In addition, the mid 80s was a period of relatively high rainfall, to which maize production is very sensitive. However, the marketing services and the guaranteed market price were withdrawn in 1986, which led farmers to adopt the more traditional farming systems, based on a shift from pure stand to maize-millet intercropping in order to insulate themselves from the market uncertainties (Boughton and de Frahan, 1992). Intercropping is the predominant way of growing maize in southern Mali and its yields are much lower than those of the pure stands used in this study.

Although data on annual average yields for the different crops exist, information on the evolution of yields for different farming systems is not available. Information is also unavailable on the share of the different farming systems in the annual production of crops. As a result, it is difficult to make inferences about how the yields of the different farming techniques behaved in the past. Owing to this lack of information, this study attempts to assess the impact of different levels of yields on the competitiveness

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1/ The coefficient of variation, which measures the degree of stability of a parameter, is the ratio between its standard deviation and its mean. Thus, it measures the variation as a percentage of the mean.

of each crop. First, the effects of lower on-farm yields on this competitiveness are measured. These yields are assumed to be 25 and 50 percent lower than those used originally. Then, anticipating the positive impact of increased investments in agricultural research and extension on on-farm yields, the study tries to assess how the competitiveness of Ivorian and Malian commodities would respond to increased yields, which are assumed to be 25 and 50 percent higher than those used in the base run. The results of the sensitivity analyses, reported from table C5-8a to table C5-9b in Appendix C, are for the two cases where on-farm yields increased by 25 and 50 percent.

In principle, a change in the level of yields induces a change in the use of labor inputs, since the amount of labor allocated to harvesting changes. The change in labor inputs as a result of a change in yields is not accounted for in the results discussed below because the labor requirements for the different farming systems were not always decomposed in different tasks. As such, one should be cautious in interpreting the change of the DRC coefficients because they should not have fallen as much as indicated when on-farm yields increased. Conversely, they should not have increased as much as they did with lower yields.

Assuming that other factors are maintained constant, the results of the sensitivity analysis suggest that if land was valued at its opportunity cost and on-farm yields were 25 percent lower than those assumed originally, the bulk of cotton produced in Côte d'Ivoire would still be socially profitable, while the Malian cotton would no longer be an efficient earner of foreign exchange. At these lower yields, it appears that both Côte d'Ivoire and Mali would resort to cereals imports to supply nearly all their domestic markets because of the high production costs. Such results appear to also hold for cereals when land is assigned a zero economic value. Thus, stabilizing yields at current levels seems important for the competitiveness of cereals. It appears that the high yielding techniques are more sensitive to the decrease in yields than the traditional farming systems. Even more important than stabilization in these countries is to invest in agricultural research and extension to enhance yield levels for both cotton and cereals.

An expansion of current yields appears to improve the competitive position of the agricultural commodities, as suggested by the results of the sensitivity analysis. For instance, if on-farm yields increased by 50 percent, most of the maize produced in Côte d'Ivoire would be competitive in southern Mali and some of it could be supplied efficiently to the Bamako market even if land was valued at its opportunity cost.

Despite the improvement in the competitive position of the commodities, it appears that rice would not be traded across countries because it would remain noncompetitive under the assumption that land is valued at its economic cost. Even when land is not valued, Malian rice, which is produced more efficiently than Ivorian rice, would be at best marginally competitive in northern Côte d'Ivoire. These results for rice suggest that it will continue to be imported at current world prices unless several actions are combined with research and extension in the rice subsector. One such action is to improve the processing technologies.

5.3.3.2 Effect of Improving Processing Technologies on Comparative Advantage

Processing technologies are one of the critical elements that have a bearing on the competitiveness of a processed agricultural product, for they determine the unit cost at the consumer level through the conversion of the unprocessed commodity to the final product. The unit cost of a processed product tends to be lower if the processing conversion ratio is higher.

It was argued in a previous section, which described the marketing of the agricultural products, that while the cotton ginning ratio in Côte d'Ivoire was nearly 45 percent, that of Mali was less than 43 percent. This relatively higher ginning ratio in Côte d'Ivoire may be one of the factors that contributed to making cotton produced in Côte d'Ivoire more competitive than that produced in southern Mali.

Reported in table C5-10a of Appendix C, the DRC coefficients seem to suggest that if Mali's ginning ratio improved to that of Côte d'Ivoire as a result of increased investments in processing techniques, Malian cotton would still be less competitive than that of Côte d'Ivoire in the Bouaké region. Cotton produced in both countries would be relatively more competitive if the ginning ratio improved to nearly 50 percent.

The competitiveness of rice produced in Côte d'Ivoire was evaluated with a 55 percent milling ratio, while that of Mali relied on a 63 percent conversion factor. The relatively low milling ratio observed in Côte d'Ivoire was mainly attributed to the use of hullers, not well suited to process paddy into rice. The government may help to boost this milling ratio by giving incentives to private agents to import small hullers, as was done in Mali in 1987.

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If land was valued at its opportunity cost, improving the rice milling ratio in Côte d'Ivoire from 55 to 63 percent would still leave the Ivorian rice noncompetitive in nearly all consumption markets. Improving further the milling ratio to 67 percent appears to make some of the Ivorian rice marginally competitive only in the production zones even if land is assigned a zero opportunity cost. Doing so for the Malian rice produced in the Office du Niger would expand the competitiveness of this rice to southern Mali without reaching northern Côte d'Ivoire in the case where land is not valued at its opportunity cost. The relatively high transfer costs may be the cause of the noncompetitive position of the Malian rice in northern Côte d'Ivoire.

5.3.3.3 Effect of Reduced Transport Costs on Trade Flows

Notwithstanding the great effort made to improve their physical infrastructure, the West African countries are generally equipped with poorly developed physical infrastructure. The transport infrastructure is even more deficient in rural areas, where the roads are often poorly maintained. As a result, transport rates are high. Several studies, covering different countries, have shown that transport costs account for over half of the transfer costs from the production regions to the consumption markets (Camara, 1992; Gaye, 1992; Savadogo et al., 1992; Gabre-Madhin, 1992; Gabre-Madhin and Maiga, 1990; Inrets-Let, 1989 a and b; Newman et al., 1988). These high transport costs stem from several factors. A major contributing factor to the high transport cost appears to be the high level of import and custom duties levied on trucks to raise government revenues. Inrets-Let (1989) estimated that these duties are as high as 60 percent of the book value of trucks. Although the import and customs duties are aimed at reducing the outflow of foreign exchange, they unintentionally serve as barriers to entry in the transport sector and shift the supply of transport services inward. As a result, upward pressure is put on the cost of transport services. Another cause of the high transport costs seems to be the roadblocks by customs officials and police officers to impose illegal fees on transporters. Inrets-Let (1989) estimated that the illegal fees per vehicle were about 20,000 CFAF on average between Bouaké and Abidjan. Such fees were as much as 100,000 CFAF between Daloa and Bamako. Obviously, these fees are passed onto transport service users as part of the transport cost.

Transportation policies, aimed at reducing transfer costs between markets, could lower the price of agricultural commodities at the consumer level. The impact of low transfer costs on the competitiveness of local agricultural products is not, however, determinate because commodities imported from the world market may also be positively affected by the lower transport costs. Owing to the uncertainty, a sensitivity analysis is performed to assess the impact of lower transport costs on the competitiveness of local agricultural commodities. It is assumed in the sensitivity analysis that the current transport costs are halved in both Côte d'Ivoire and Mali. The results of this sensitivity analysis are shown in table C5-11a and table C5-11b in Appendix C.

The results of the DRC coefficients seem to suggest that the impact of the reduced transport costs on the competitiveness of local commodities would depend on the location of the supply and consumption markets and the distance between the two markets. For instance, local cereals produced and consumed inland, especially between the center of

Côte d'Ivoire and the Malian markets, would be less competitive in general when transport costs are halved because cereals imported from the international market gain in competitiveness, owing to the fact that the latter cereals are shipped inland and the distance between the port and the consumption centers is long. In this case, the DRC coefficients in northern Côte d'Ivoire and southern Mali become higher and reduce the prospect for increased cereals trade based on comparative advantage.

In contrast, if the local cereals are generally shipped southward, let us say between central Côte d'Ivoire and the coastal markets, the DRC coefficients of these cereals decrease. Despite this improvement in competitiveness, the Ivorian rice and the Malian cereals appear to have in general a competitive disadvantage in these markets. This may suggest that the reduction in transport rate alone is not enough to induce the local cereals to be competitive in these markets. A combination of factors may help to improve the competitiveness of these cereals.

5.3.4 A Dynamic Approach to Comparative Advantage and Trade Flows

One of the objections formulated against the method of domestic resource cost is that it is a static measure of comparative advantage, while the aim of development policies is to alter the comparative advantage of a country over time. Such a criticism has prompted policy analysts to perform sensitivity analyses, which have mainly focused on the effect of individual policy variables on comparative advantage.

Although one policy instrument may sometimes achieve a policy objective, the use of one policy variable is quite often less likely to succeed than using several policy instruments, especially with regard to competitiveness. This was shown in the sensitivity analyses performed above. For example, the use of alternative investment policies alone, aimed at reducing transport costs between the production zones and the coastal markets, failed to give the competitive edge to the local cereals in the coastal markets. Nor did the monetary policy instrument alone succeed to achieve this goal, unless the government undertook a strong devaluation, which may lead to social unrest that could challenge and reverse this action of the government.

Using several policy variables jointly may make local cereals competitive in the coastal markets. The government may for instance use a much lighter nominal devaluation and complement it with actions intended to lower transport costs between the production zones and the coast. For example, measures to reduce roadblocks, an impediment to the movement of agricultural commodities, may be taken. Import duties on trucks may be lowered to reduce barriers to entry into the transport sector, induce more competition in this sector and exercise a downward pressure on transport rate. In the short run, one may not see a quick fall in transport costs. They may however be lowered in the long run and the objective may be achieved.

In light of this example, several sensitivity analyses are performed to evaluate how the competitiveness of the agricultural commodities may respond to the use of several alternative policies or factors. In other words, the sensitivity analyses attempt to assess how the DRC coefficients react to a change in more than one policy. The results of these sensitivity analyses are reported from table C5-12a to C5-17b in Appendix C.

The results of the sensitivity analysis suggest that if the economic value of land were in reality half of its value assumed originally, if the opportunity cost of labor was 500 CFAF/day instead of 700 CFAF/day in the two countries, and both countries undertook a 50 percent devaluation, coarse grain produced in Côte d'Ivoire and Mali would be much more competitive. It appears, however, that most the coarse grain produced in both countries would remain noncompetitive from central Côte d'Ivoire to the coastal markets. Coarse grain and rice would still not be competitive in general in these markets if transport costs were halved in both countries. In general, they would be, however, competitive in central Côte d'Ivoire at the projected world prices, which are higher than current prices. It appears that Côte d'Ivoire would have a comparative advantage in rice in central Côte d'Ivoire if, in addition to the scenario described above, the milling ratio improved to 67 percent. Under this last scenario, its rice produced in the forest region would be marginally competitive in the coastal markets. This forest rice would gain the comparative advantage in the coastal market only if, in addition to the scenario described above, on-farm yields increased by 25 percent. Such an increase in on-farm yields would still leave the rice produced in northern Côte d'Ivoire and Mali noncompetitive in the coastal markets. The Malian rice would be competitive at best in central Côte d'Ivoire. In contrast to rice, the Malian coarse grain would generally be competitive in nearly all Ivorian markets, while Côte d'Ivoire would not be able to supply its millet/sorghum to its coastal markets.

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5.4 Summary

The results of the base run DRC coefficients suggested that there was scope for cotton trade between Côte d'Ivoire and Mali but that the empirical observations indicated that did not take place between these countries because export to the world market was more profitable than regional trade. In addition, the prospects for enhancing regional trade was hampered by the relatively low local demand for cotton and the monopoly power granted to cotton parastatals.

In contrast, maize and millet/sorghum trade flows between Côte d'Ivoire and Mali seem to be in accord with these countries' comparative advantage because the price of coarse grain is determined in a competitive market. The lack of local rice trade between the two countries seems to be also consistent with those predicted by the DRC coefficients under the assumption that the economic value of land is zero. Under current food policies in Côte d'Ivoire where the government considers rice as a wage good for the powerful urban centers, trade flows of the local rice would be in the wrong direction even if the local rice became competitive in Côte d'Ivoire.

Trade flows, as predicted by comparative advantage, between Côte d'Ivoire and Mali, and between them and the rest of the world, were analyzed under alternative scenarios. The results of the different scenarios, which included lower opportunity costs of labor, a lower economic value of land, alternative investments and policies aimed at increasing productivity and reducing transfer costs, and alternative exchange rate policies, suggested that making local cereals competitive in the coastal markets would be a difficult task because the individual policies would have little impact on the competitiveness of these cereals. The strongest impact of this competitiveness would be obtained by acting simultaneously on several policy variables.

The results of the DRC analysis suggested also that the prospects for increasing intraregional trade appear much greater for coarse grain than rice, owing to the fact that the former set of cereals seems to be more competitive in general than the latter. Despite this fact, coarse grain is generally handicapped in the coastal markets because of not only high transfer costs between the production zones and these markets, but also the low prices in the world market. Such prices are even lower for Côte d'Ivoire and Mali because of their overvalued currency, which favors imports at the expense of exports.

CHAPTER VI

FARM LEVEL INCENTIVES

This chapter attempts to assess whether farmers can produce agricultural surpluses that can be marketed to foster intraregional trade. Doing so would require knowledge of the relationship between prices and quantities produced to estimate farmers' supply response. Owing to the lack of data, this study will discuss whether farmers have the incentives to yield tradable agricultural surpluses. These incentives are measured by the returns to family labor, which accounts for the bulk of production costs at the farm level, and the protection coefficients. Both measures of farmers' incentives are analyzed under alternative scenarios.

Before discussing the returns to family labor, the financial profitability per unit of output, defined as the difference between the market price of the output and the market value of the inputs used to produce one unit of the output, is estimated for each product. This profitability is analyzed from two angles. First, it is computed by using only the purchased inputs, which include equipment, fertilizers, pesticides, etc. In this case, family labor is not valued. Second, it is estimated by imputing the market wage rate to family labor, in addition to all purchased inputs (fertilizers, pesticides, equipment), to assess the impact of valuing family labor on the profitability of the enterprise.

6.1 Incentives to Cotton Farmers

The cotton subsector has been considered by most analysts as one of the success stories of the agricultural sector in West Africa. A critical question then becomes to what extent farmers' financial profitability contributed to this success and will help to maintain cotton production as one of the major agricultural activities in West Africa.

The results of the financial profitability based on unpaid family labor, reported in table 6-1a, suggest that the financial profitability of the Ivorian and Malian cotton farmers is about 50 CFAF/kg and 40 CFAF/kg of seed cotton, respectively. These profits appear high because farmers resort to very few purchased inputs and rely mainly on family labor for cotton production, which is labor-intensive. As such, the returns to household labor will be a better indicator of farmers' incentives.

The returns to family labor range from about 500 CFAF/day to nearly 1000 CFAF/day in Côte d'Ivoire and from about 650 CFAF/day to nearly 900 CFAF/day in Mali, according to the results in table 6-1b. These returns are an indication that the Ivorian farmers, who rely on improved manual cultivation and supply the bulk of cotton, would face financial losses if the household labor was valued at the market wage rate, estimated at nearly 700 CFAF/day. Meanwhile, manual farmers in Mali and the Ivorian farmers, who depend on animal traction technique, would nearly break-even at the on-going daily wage rate. In contrast, the Malian farmers, who use animal traction, and the semi-mechanized farmers of Côte d'Ivoire would make positive financial profits at the daily wage rate assumed above.

Table 6-1a. Cotton and Maize Financial Profitability and Protection Coefficients at the Farm Level

Region/production system	Yields Kg/ha	Output Price CFAF/kg	Financial Profit CFAF/kg	NPC	NNPC	NEPC
Côte d'Ivoire/cotton						
North/improved animal traction	1300	105	55	0.67	0.48	0.41
Center/improved manual	1100	105	55	0.67	0.48	0.41
North/semi-mechanized	1500	105	50	0.67	0.48	0.41
Mali/cotton						
South/improved animal traction	1500	85	40	0.59	0.44	0.37
South/improved manual	1200	85	40	0.59	0.44	0.37
Côte d'Ivoire/maize						
Center/traditional manual	700	40	35	0.56	0.40	0.39
Center/improved animal traction	2000	40	15	0.56	0.40	0.32
Center/improved manual	1500	40	15	0.56	0.40	0.31
Forest/semi-mechanized	4000	40	5	0.56	0.42	0.26
Mali/maize						
South/improved animal traction	2000	45	15	0.48	0.36	0.27
South/improved manual	1600	45	15	0.48	0.36	0.27

Note: 1/ NPC stands for nominal protection coefficient
2/ NNPC refers to net nominal protection coefficient
3/ NEPC is net effective protection coefficient

Source: Appendix B

Table 6-1b. Returns to Household Labor from Producing Cotton and Maize

Region/production system	Yields Kg/ha	Labor Day/ha	Returns CFAF/day	NPC	NNPC	NEPC
Côte d'Ivoire/cotton						
North/improved animal traction	1300	98	745	0.67	0.48	0.41
Center/improved manual	1100	120	505	0.67	0.48	0.41
North/semi-mechanized	1500	70	1025	0.67	0.48	0.41
Mali/cotton						
South/improved animal traction	1500	151	905	0.59	0.44	0.37
South/improved manual	1200	122	650	0.59	0.44	0.37
Côte d'Ivoire/maize						
Center/traditional manual	700	70	325	0.56	0.40	0.39
Center/improved animal traction	2000	98	315	0.56	0.40	0.32
Center/improved manual	1500	131	150	0.56	0.40	0.31
Forest/semi-mechanized	4000	33	550	0.56	0.42	0.26
Mali/maize						
South/improved animal traction	2000	99	300	0.48	0.36	0.27
South/improved manual	1600	143	160	0.48	0.36	0.27

Note: 1/ NPC stands for nominal protection coefficient
2/ NNPC refers to net nominal protection coefficient
3/ NEPC is net effective protection coefficient

Source: Appendix B

The bulk of cotton produced in both countries appears to yield negative financial profitability when family labor is valued at the market wage rate because the price received by farmers is relatively low. Indeed, the results of the nominal protection coefficients (NPC) suggest that the farmgate price of cotton, fixed by the government at nearly 105 CFAF/kg in Côte d'Ivoire and 85 CFAF/kg in Mali, is at best two-thirds of the border price adjusted to the farm level. This may be an indication that cotton farmers are implicitly taxed by the government. Taking into account the overvaluation of the CFA franc, the net nominal protection coefficients (NNPC) suggests that farmers are taxed by over 50 percent in both countries. If the import duties and indirect taxes on farm inputs are further accounted for, farmers seem to be highly taxed in the two countries, according to the net effective protection coefficients (NEPC).

6.2 Incentives to Coarse Grain Farmers

Maize farmers in both Côte d'Ivoire and Mali appear to make positive financial profits when household labor is not accounted for in the production costs. Although the semi-mechanized technique of Côte d'Ivoire appears to be the most economically profitable farming system, it yields the lowest financial profitability, owing to the high costs of mechanized agricultural equipment, which is in general imported, and taxed heavily. Despite this fact, household labor for this technique appears to earn the highest returns because this farming system is not labor-intensive. Notwithstanding the relatively high returns to family labor, household labor seems to earn less than the market wage rate, which is at least twice as high as the returns to family labor for the other farming systems of both countries. The low return to family labor may be due to the relatively low maize price in both countries, as suggested by the protection coefficients. Maize farmers appear to earn less than 50 percent of the import parity adjusted to the farm. The issue is, thus, why maize market prices are so low in both Côte d'Ivoire and Mali.

One of the factors contributing to these low prices is the thinness of the maize market resulting from the relatively low supply of and demand for maize during most of the year (Barry, 1989). Probably, expanding the demand for maize through its increased use in the livestock and poultry industries would help maize prices to be higher and expand farmers' financial profitability.

The financial profitability seems to be, according to the results in table 6-2a, relatively high for millet/sorghum produced in Côte d'Ivoire and Mali, owing to higher prices and the little use of purchased inputs. It appears from the results in table 6-2b that this coarse grain reward household labor at a level higher than the daily wage rate in northern Côte d'Ivoire. In contrast, the returns to family labor in Mali seem to be lower than the wage rate earned by daily hired workers, owing to the fact that the farming systems are relatively labor-intensive and that millet/sorghum prices are much lower than the import parity price adjusted to the farm.

6.3 Incentives to Paddy Farmers

Paddy production appears to be also financially profitable in both Côte d'Ivoire and Mali. Even though the price fixed by the government is lower in Côte d'Ivoire than in Mali, the financial profitability seems to be generally higher in Côte d'Ivoire than in

Table 6-2a. Millet/sorghum and Paddy Financial Profitability and Protection Coefficients at the Farm Level

Region/production system	Yields Kg/ha	Output Price CFAF/kg	Financial Profit CFAF/kg	NPC	NNPC	NEPC
Côte d'Ivoire/millet/sorghum						
North/traditional manual	600	80	70	1.04	0.74	0.74
North/animal traction	800	80	65	1.04	0.74	0.74
Mali/millet/sorghum						
South/traditional manual	600	60	50	0.65	0.49	0.46
South/animal traction	800	60	35	0.65	0.49	0.42
Côte d'Ivoire						
Forest/upland/traditional manual	1300	60	55	1.11	0.80	0.80
North/upland/traditional manual	900	60	50	1.07	0.76	1.23
North/irrigation/improved manual	4000	60	50	1.07	0.76	1.06
Forest/lowlands/improved manual	3500	60	40	1.11	0.80	0.80
North/upland/improved animal traction	1800	60	35	1.07	0.76	1.23
Forest/upland/improved manual	30	60	30	1.11	0.80	0.79
Mali						
Office/irrigation/intensive	5386	70	35	1.10	0.83	0.82
Mopti/traditional flooding	700	70	35	1.10	0.83	0.83
Office/irrigation/semi-intensive	3544	70	35	1.10	0.83	0.83
Mopti/controlled flooding	1200	70	30	1.10	0.83	0.86
Office/irrigation/non-intensive	2603	70	25	1.10	0.83	0.83

Note: 1/ NPC stands for nominal protection coefficient
2/ NNPC refers to net nominal protection coefficient
3/ NEPC is net effective protection coefficient

Source: Appendix B

Table 6-2b. Returns to Household Labor from Producing Millet/sorghum and Paddy

Region/production system	Yields Kg/ha	Labor Day/ha	Financial Profit CFAF/kg	NPC	NNPC	NEPC
Côte d'Ivoire/millet/sorghum						
North/traditional manual	600	49	860	1.04	0.74	0.74
North/animal traction	800	41	1300	1.04	0.74	0.74
Mali/millet/sorghum						
South/traditional manual	600	61	458	0.65	0.49	0.46
South/animal traction	800	50	570	0.65	0.49	0.42
Côte d'Ivoire						
Forest/upland/traditional manual	1300	120	570	1.11	0.80	0.80
North/upland/traditionalmanual	900	85	535	1.07	0.76	1.23
North/irrigation/improvedmanual	4000	247	800	1.07	0.76	1.06
Forest/lowlands/improved manual	3500	240	605	1.11	0.80	0.80
North/upland/improvedanimal traction	1800	90	750	1.07	0.76	1.23
Forest/upland/improved manual	2200	121	590	1.11	0.80	0.79
Mali						
Office/irrigation/intensive	5386	135	1475	1.10	0.83	0.82
Mopti/traditional flooding	700	92	1270	1.10	0.83	0.83
Office/irrigation/semi-intensive	3544	59	1210	1.10	0.83	0.83
Mopti/controlled flooding	1200	69	530	1.10	0.83	0.86
Office/irrigation/non-intensive	2603	53	475	1.10	0.83	0.83

Note: 1/ NPC stands for nominal protection coefficient
2/ NNPC refers to net nominal protection coefficient
3/ NEPC is net effective protection coefficient

Source: Appendix B

Mali because the Ivorian farming systems, based in general on manual cultivation, use fewer purchased inputs than those of Mali, where paddy production uses relies on animal traction as a source of power.

In contrast to the results of the financial profitability per unit of output, the results of the returns to household labor appear to be much greater in general for paddy produced in Mali than that of Côte d'Ivoire, owing probably to the higher price received by the Malian farmers than those of Côte d'Ivoire. Despite this fact, farmers in Mali seem to receive disincentives because of the overvalued exchange rate and taxes on imported inputs, as suggested by the NNPCs and NEPCs.

6.4 Sensitivity Analysis

This section discusses farmers' incentives under alternative scenarios. Such incentives are measured by the change in the returns to family labor under different on-farm yield and farmgate price levels, which are varied by increments of 25 percent.

6.4.1 Effects of On-Farm Yields on Returns to Household Labor

The level of on-farm yields is a critical element in determining the financial profitability of a commodity and the returns to household labor. For instance, an increase in on-farm yields, ceteris paribus, induces a fall in the unit cost of the commodity. The increase in yields may not, however, be fully transmitted to the fall in the unit cost because an increase in yields results in an increase in labor inputs required to harvest the commodity. If the increase in on-farm yields is widespread, this may induce the market price of the commodity to fall if the commodity is nontraded and its demand is maintained constant. However, if the increase in yield is localized and limited to a few farmers, who are not large enough to affect market conditions, the market price of the commodity may remain unchanged. As the increase in yields may affect both the unit cost and market price, the net effect of the yield increase may be undetermined. Two assumptions are made to predict the effect of the change in on-farm yields on the returns to family labor. First, it is assumed that the change in yield is localized and limited to a few small farmers because the relationship between market prices and the quantity supplies is not known. As such, the market price of the commodity is assumed to be unaffected. Second, labor requirements for harvest are unchanged. As a result, the change in yields is assumed to be fully transmitted to the farm unit cost.

Based on these assumptions, the results of the sensitivity analysis, which are reported in table 6-3a and 6-3b, suggest that the returns to household labor would generally be greater than the daily wage rate if cotton yields increased by at least 25 percent in central Côte d'Ivoire and southern Mali. In contrast, family labor would still earn less than the daily wage rate if maize yield increased between 25 and 50 percent. Such increases in millet/sorghum and paddy yields would help household labor earn income, which is in general higher than the daily wage rate in the production zones of both countries.

Table 6-3a. Effects of Yield Changes on Returns to Family Labor from Producing Cotton and Maize						
Region/production system		Original	Returns to Family Labor (CFAF/kg) Due To			
	Yield kg/ha	Original Returns CFAF/day	Yields 50 % Lower	Yields 25 % Lower	Yields 25 % Higher	Yields 50 % Higher
Côte d'Ivoire/cotton						
North/improved animal traction	1300	745	45	395	1095	1445
Center/improved manual	1100	505	20	260	745	985
North/semi-mechanized	1500	1025	-105	460	1590	2150
Mali/cotton						
South/improved animal traction	1500	905	5	615	1095	1240
South/improved manual	1200	650	-30	430	790	900
Côte d'Ivoire/maize						
Center/traditional manual	700	325	130	230	420	520
Center/improved animal traction	2000	315	-80	120	510	710
Center/improved manual	1500	150	-70	40	260	370
Forest/semi-mechanized	4000	550	-1785	-615	1720	2890
Mali/maize						
South/improved animal traction	2000	300	-90	105	495	690
South/improved manual	1600	160	-55	50	265	375

Note: The numbers from column 4 to column 7 are the returns to household labor (CFAF/day), due to percentage changes in the original prices.

Source: Computed from Appendix B

Table 6-3b. Effects of Yield Changes on Returns to Family Labor from Producing Millet/sorghum and Paddy

Region/production system	Yields kg/ha	Original Returns CFAF/day	Returns to Family Labor (CFAF/kg) Due To: Yields 50 % Lower	Yields 25 % Lower	Yields 25 % Higher	Yields 50 % Higher
Côte d'Ivoire/millet/sorghum						
North/traditional manual	600	860	380	620	1100	1340
North/animal traction	800	1300	530	915	1680	2065
Mali/millet/sorghum						
South/traditional manual	600	485	220	355	615	745
South/animal traction	800	570	145	355	785	1000
Côte d'Ivoire/paddy						
Forest/upland/traditional manual	1300	570	250	410	730	885
North/upland/traditional manual	900	535	225	380	690	845
North/irrigation/improved manual	4000	800	325	565	1035	1275
Forest/lowlands/improved manual	3500	605	175	390	815	1030
North/upland/animal traction	1800	750	165	455	1040	1335
Forest/upland/improved manual	2000	590	55	320	855	1120
Mali/paddy						
Office/irrigation/intensive	5386	1475	320	895	2050	2625
Mopti/traditional flooding	700	1270	155	715	1825	2385
Office/irrigation/semi-intensive	3544	1210	-65	570	1840	2485
Mopti/controlled flooding	1200	530	25	280	780	1035
Office/irrigation/non-intensive	2603	475	90	285	665	855

Note: The numbers from column 4 to column 7 are the returns to household labor (CFAF/day), due to percentage changes in the original yields.

Source: Computed from Appendix B

6.4.2 Output Price and Returns to Household Labor

The returns to family labor at the farm level can be influenced by, among other things, the farmgate output price, which is in general relatively low at harvest time and rises throughout the year until the next harvest. This is, however, not the case for cotton price, which is fixed by decree in both Côte d'Ivoire and Mali. Nevertheless, the effect of different price levels on cotton financial profitability is assessed in this section. For each product analyzed in this study, the by-products, such as maize stover used as animal feed, are not valued.

It appears in table 6-4a and 6-4b that cotton produced under the improved manual cultivation in Côte d'Ivoire would provide to family labor returns that are higher than the on-going wage rate if cotton price was 25 percent higher than the current price. With such increases in maize yields, the returns to household labor would generally be lower than the daily market wage rate if the market price of maize was 25 percent higher than the price assumed above. It appears that most of family labor that engages in maize production would still earn income lower than the daily wage rate if maize price was 50 percent higher than the original price. Unlike maize, millet/sorghum and rice would generally provide household labor with returns that are higher than the daily wage rate if the price of these commodities was 25 percent higher than the original price.

Table 6-4a. Effects of Price Changes on Returns to Family Labor from Producing Cotton and Maize						
Region/production system		Original	Returns to Family Labor (CFAF/kg) Due To			
	Price CFAF/kg	Original Returns CFAF/day	Price 50 % Lower	Price 25 % Lower	Price 25 % Higher	Price 50 % Higher
Côte d'Ivoire/cotton						
North/improved animal traction	105	745	45	395	1095	1445
Center/improved manual	105	505	20	260	745	985
North/semi-mechanized	105	1025	-105	460	1590	2150
Mali/cotton						
South/improved animal traction	85	905	5	454	1360	1810
South/improved manual	85	650	-15	320	980	1315
Côte d'Ivoire/maize						
Center/traditional manual	40	325	135	230	420	515
Center/improved animal traction	40	315	-95	110	515	725
Center/improved manual	40	150	-75	35	265	380
Forest/semi-mechanized	40	550	-1875	-660	1760	2975
Mali/maize						
South/improved animal traction	45	300	-150	75	525	750
South/improved manual	45	160	-90	35	280	405

Note: The numbers from column 4 to column 7 are the returns to household labor (CFAF/day), due to percentage changes in the original prices.

Source: Computed from Appendix B

Table 6-4b. Effects of Price Changes on Returns to Family Labor from Producing Millet/sorghum and Paddy						
Region/production system		Original	Returns to Family Labor (CFAF/kg) Due To			
	Price CFAF/kg	Original Returns CFAF/day	Yields 50 % Lower	Yields 25 % Lower	Yields 25 % Higher	Yields 50 % Higher
Côte d'Ivoire/millet/sorghum						
North/traditional manual	80	860	385	625	1090	1320
North/animal traction	80	1300	550	925	1675	2050
Mali/millet/sorghum						
South/traditional manual	60	485	195	340	630	775
South/animal traction	60	570	95	335	805	1045
Côte d'Ivoire/paddy						
Forest/upland/traditional manual	60	570	260	415	725	880
North/upland/traditionalmanual	60	535	240	390	685	830
North/irrigation/improvedmanual	60	800	315	555	1045	1285
Forest/lowlands/improved manual	60	605	165	385	820	1040
North/upland/animaltraction	60	750	150	450	1050	1350
Forest/upland/improved manual	60	590	40	315	860	1135
Mali/paddy						
Office/irrigation/intensive	70	1475	190	830	2115	2760
Mopti/traditional flooding	70	1270	30	650	1890	2510
Office/irrigation/semi-intensive	70	1210	-210	500	1920	2630
Mopti/controlled flooding	70	530	- 30	250	810	1090
Office/irrigation/non-intensive	70	475	130	305	645	815

Note: The numbers from column 4 to column 7 are the returns to household labor (CFAF/day), due to percentage changes in the original yields.

Source: Computed from Appendix B

6.5 Summary

This chapter showed that the financial profitability per unit output was positive for all the farming systems. This financial profitability is, however, not a good measure of incentives because the production systems use few purchased inputs and rely heavily on household labor, which was not valued in determining the financial profitability. As a result, the returns to family labor were used to assess whether farmers have incentives to yield surpluses, which can be traded.

It appeared that the bulk of cotton, maize and paddy produced in Côte d'Ivoire would yield income to family labor lower than the on-going market wage rate, owing to prices that are lower than the border price adjusted to the farm. Likewise, family labor in Mali would earn returns that are lower than the daily market wage rate when it produces coarse grain. In both countries, it appeared that maize would still yield returns that are lower than the wage rate if either yields or prices were 25 percent higher than the values assumed originally.

In contrast, paddy production in Mali and millet/sorghum farming in Côte d'Ivoire appeared to help household labor earn returns, which are generally higher than the daily wage rate in the production of these commodities, despite the disincentives provided by the overvalued exchange rate.

CHAPTER VII

SUMMARY, POLICY IMPLICATIONS, AND FURTHER RESEARCH

Regional economic integration, seen as a instrument for bringing rapid transformation in the West African economies to spur economic growth, has gained increased attention in the circle of policy makers, who created several regional organizations. Notwithstanding the apparent efforts, an impartial assessment of the record can point out that little progress has been made in fostering intraregional trade, despite the immense resources in the region.

The poor performance of the integrative efforts is attributable to numerous factors among which the most important constraints are outlined briefly below. First, intraregional trade has been hampered by a deficient communication and transportation network reinforced by the roadblocks that are rife in the region and make the movement of products difficult across countries. The second leading factor in the marginal achievement of the integrative efforts appears to be the very focus of the regional discussions, which in general emphasize trade of manufactured goods, even though the industrial base is very weak in the region and agriculture represents the most dominant sector in the individual economies. It is not uncommon that the agricultural sector is not even mentioned in the discussions of regional economic integration, as its performance is often considered a by-product of the achievement in the industrial sector. The third constraint on improved intraregional trade seems to be linked to the industrial strategy based on import-substitution, which, given the relatively recent industrialization process in West Africa and the high production costs in the region, lead the policy makers to adopt high tariffs and quotas to protect the inefficient industries against imports. Obviously, the adoption of high protective measures by each country induces in general inward-looking strategies, which are often incompatible with enhancing trade with neighboring countries.

Intraregional trade might have grown noticeably had trade barriers been dismantled and more importantly, if regional economic integration had been geared toward increasing trade of local agricultural commodities, which are the most dominant economic activities in West Africa. The increase in constructive trade requires, however, that the major distortions be removed and that trade be based on each country's comparative advantage.

7.1 Methodology and Specific Features

This study relied on the domestic resource cost method to address the issue of comparative advantage, as most studies have done. Despite the fact that the DRC analysis is based on valuing all resources at their opportunity cost, most studies about West Africa have generally assigned a zero opportunity cost to land to circumvent certain difficulties related to the lack of a competitive land market. This approach would remain valid and unchallenged as long as land was not a scarce resource and its value was not affected by its use. Contrary to this, a growing concern on land degradation and erosion has emerged in recent years in West Africa. It appears that this concern will become even more important in the future because of the stagnation in agricultural productivity. Owing to these reasons, this study, unlike most others, assigned an economic value to land by treating the return to land as the residual between the economic value of outputs and the return to other resources. As such, the results of this study differed significantly from those of others. Nonetheless, this study did not overlook the results of other studies and assigned a zero economic value to land to compare its outcome to the results of these studies.

This study also differs from others in the use of the DRC method, which has been the means for most analyses to assess the competitiveness of commodities within the context of a single country. The novel element that this study added to the use of the DRC method was to determine, given two countries and the rest of the world, the direction of commodity trade flows, based on comparative advantage, between not only these countries, but also between them and the rest of the world. Determination of these trade flows was based on computing the DRC coefficients of each country in its domestic markets and in the markets located in the other country. Such trade flows were compared with actual trade flows to explain the similarity and differences between them. The theoretical trade flows were analyzed under not only current economic policies, but also alternative policies and different scenarios.

7.2 Summary of Major Findings and Policy Implications

Focusing on cotton and cereals, such as maize, millet/sorghum, and rice, the results of the DRC coefficients suggested that Côte d'Ivoire and Mali produce and market cotton efficiently and could exchange cotton. Despite this fact, cotton appears to be nontraded between the two countries, owing to two major reasons: the profits from selling cotton to the world market are much higher than those from trading within West Africa because of the small downstream demand for cotton in the region. The prospects for increasing the local demand for cotton appear to be remote unless appropriate policy actions are taken to render the local textile industries more competitive. It appears that the competitiveness of these industries is hampered by an overvalued currency that discourages local production in favor of imports.

The results of the study found that maize and millet/sorghum trade flows predicted by comparative advantage were generally consistent with actual trade flows because the effects of government interventions on these flows are negligible and prices are determined in a competitive market. Despite the concordance between theoretical and actual trade flows, the exports of the Malian millet/sorghum to central Côte d'Ivoire and beyond were out of line with the results of the DRC coefficients, which suggested that this coarse grain should not be competitive in these markets. One contributing element to the discordance between these results may be the fact that the international price of red sorghum used to calculate the DRC coefficients was not the true opportunity cost of the local millet/sorghum, which is not traded in the world market. As such, the true opportunity cost of the local millet/sorghum may be higher than the world price of red sorghum.

The results of the DRC coefficients appeared to be in accord with the lack of actual trade flows of local rice between the two countries, as local rice seemed to be at best marginally competitive in the production zones. Owing to the comparative disadvantage of Côte d'Ivoire and Mali, sensitivity analyses were performed to determine which factors, including a lower opportunity cost of land, increased productivity at the farm and processing levels, reduction in transfer costs, changed rice world price, and the exchange rate policy, would reverse the noncompetitive position of local rice in most markets and foster intraregional trade based on comparative advantage.

According to the results of these sensitivity analyses, the prospects for increasing cross-border trade of local rice appear slim under the following individual scenarios: economic value of land was halved, opportunity cost of labor was 25 percent lower, on-farm yields improved by 25 percent, transfer costs were halved, a 50 percent devaluation of the CFA Franc, and a relatively high projected world price. It appeared that the two countries would trade local rice only if these sectoral and macroeconomic policies were undertaken simultaneously. Nonetheless, the bulk of rice would be noncompetitive in the coastal markets.

Similar sensitivity analyses performed on the DRC coefficients of maize and millet/sorghum also appeared to indicate that although the competitiveness of these coarse grains would generally improve in most markets, most trade would take place between central Côte d'Ivoire and Mali even when most improvements were made simultaneously.

A broad lesson that can be learned from these results is that efforts to foster intraregional trade would succeed if they are directed toward cereals exchange between the production zones and the consumption centers located inland. These efforts would, however, likely fail if most of the interest focused on making local cereals, especially rice, competitive in the coastal markets. Given that the options are limited to make cereals produced inland competitive in the coastal markets, protectionist policies do not seem the most appropriate options to overcome the lack of competitiveness of the local cereals in these markets. The protectionist policies appear to have social costs that outweigh the social benefits, especially if these policies are put in a food security framework instead of a food self-sufficiency context that overlooks the urban poor and the net buyers of cereals in the rural areas, as illustrated by Dioné (1989) and Weber et al. (1988).

Allowing cereal imports does not suggest, by any means that governments should neglect local production. It rather suggests they should use these imports, which are cheaper than local production, to satisfy consumption in the coastal markets, as a means to save resources that can be partly invested in research and extension to render agricultural production less dependent on rainfall levels and enhance agricultural productivity in order to increase marketable agricultural surpluses and lower the unit costs of commodities. Reducing the unit costs at the farm level cannot be overemphasized on the grounds that most production activities yielded negative financial profitability when family labor was valued at the market wage rate.

Some of these resources may also be invested in improving the communication network between the arid zones and inland consumption centers to help foster intraregional trade. The prerequisite to fostering this integration is, however, a sound exchange rate policy that brings the official exchange rate in line with the opportunity cost of resources. In the long-run, an equilibrium exchange rate may help to diversify agricultural production, promote exports of other commodities such as fruits and vegetables, and eventually regenerate the sluggish economies.

7.3 Future Research

This study focused its attention on cotton and cereals production and marketing. For these commodities, data were not available on certain farming systems practiced in certain regions. A case in point is intercropped maize produced in southern Mali. Information on different rice farming systems in southern Mali, where large quantities of rice are produced, was also lacking. Gathering this information to estimate the production costs of these farming systems would greatly complement the present study.

For a long time, Sahelian countries, such as Mali, were known to export livestock to Côte d'Ivoire, and this flow of livestock contributed greatly to the process of regional economic integration. The movement of livestock has, however, considerably slowed down. Evaluating the competitiveness of the Malian livestock in different markets of Côte d'Ivoire could shed some light on the causes of the reduction of the Malian livestock in Côte d'Ivoire. Equally important in future research is to expand the range of products to commodities, such as fruits and vegetables, plantain, yam, sweet potato, pineapple, etc. to determine the comparative advantage of not only Côte d'Ivoire and Mali, but also other neighboring countries.

Most likely, policy makers were not enthusiastic about making decisions to spur regional economic integration because they did not have empirical evidence of the welfare gains from increased intraregional trade. Such evidence requires information on elasticities, which are generally missing in West Africa. Future research geared toward providing estimates of demand and supply elasticities in different countries could be useful in helping to inform policy makers about the impacts of future decisions on different economic agents.

This study could also be complemented by research to determine, given each commodity produced and its costs of production and marketing, the optimum quantity that can be traded between production zones and consumption centers of different countries to compare those quantities with the actual trade flows. Such a study, in combination with a broader updated comparative advantage study, may provide some insight into the determinants of intraregional trade and the constraints to improving regional economic integration in West Africa.

APPENDIX A

DATA COLLECTION AND SOURCES

The first data set collected by AIRD was data on crop budgets for cotton and cereals (maize, millet/sorghum and rice), for different production systems and different regions within each country. The technical coefficients in the crop budgets originated from different sources. For instance, those of cotton produced in Côte d'Ivoire were provided by the Ministry of Agriculture and Animal Resources (MARA), which obtained them from the regional development agency in charge of cotton production, known as Compagnie Ivoirienne du Développement des Textiles (CIDT). The technical coefficients for maize also originated from MARA, as well as the Savannah Research Institute (IDESSA). In the meantime, those of millet/sorghum cultivated in Côte d'Ivoire were obtained from interviews with researchers at IDESSA, CIDT extension agents, and some producers North Côte d'Ivoire. For rice, the West African Rice Development Association (WARDA), located in Bouaké, Côte d'Ivoire, was consulted and did have crop budgets other than those published in Rice in West Africa by the Food Research Institute at Stanford University (Pearson et al., 1981).

For Mali, the technical coefficients for cotton and coarse grains were drawn primarily from a study conducted by AIRD (Stryker et al., 1987). The coefficients for rice originated from the study published by the Institute of Rural Economy (IER, 1989) to determine production costs and from the study undertaken by Cebron (1992) on rice production costs at the Office du Niger.

To the extent possible, data on input and factor prices for both Côte d'Ivoire and Mali covered the year 1990. For Côte d'Ivoire, the price data for chemical fertilizers, fungicides, and agricultural equipment were obtained from CIDT and other regional development agencies, such as the Compagnie Ivoirienne de Développement des Cultures Vivrières (CIDV). Meanwhile, the price data for Mali were drawn from IER (1989), Cebron (1992) and obtained from interviews in the evaluation unit at the Compagnie Malienne de Développement des Textiles (CMDT).

Information on agricultural labor wage rates was the most difficult to gather. Data on wage rates in Mali were obtained from interviews with producers and extension agents in the regional development agencies in November 1990 in the Sikasso region and Niono, located at the Office du Niger. For Côte d'Ivoire, data on wage rates were collected by interviewing producers and extension agents in the Bouaké and Korhogo regions between October and November 1991.

Cotton price data at the farmgate level for 1990 in Côte d'Ivoire and Mali were gathered from CIDT and CMDT, respectively. For paddy farmgate prices in both Côte d'Ivoire and Mali for 1990, we used the official producer price published by the governments. Producer price data on coarse grains for Mali were obtained from the data set collected weekly in different rural markets since October 1988 by the Market Information System (MIS), located at the Office des Produits Agricoles du Mali (OPAM). Moreover, the MIS has been gathering retail prices for these cereals in most urban markets on a weekly basis. Both sets of prices were averaged to generate monthly prices.

Monthly retail price data for cereals were also available in Côte d'Ivoire, because the Office de Commercialisation des Produits Vivriers (OCPV), a government agency, has been collecting them since 1988 in the major cities. OCPV has also been gathering wholesale price data for these cereals. Nevertheless, OCPV, unlike MIS, has not collected producer price data for agricultural commodities. As a result, the 1990 farmgate prices for coarse grains were obtained from interviews with maize producers and traders in Bouaké, and millet/sorghum producers and traders in Korhogo in October and November 1991. These prices are, however, only those of the 1990 harvest season.

While data on cotton marketing costs were readily available at CIDT and CMDT, those for local cereals were obtained from interviews with traders and transporters. Data on marketing costs for rice imported into Mali were also obtained from interviews with one of the major rice importers in Mali. Meanwhile, marketing costs for imported rice in Côte d'Ivoire were provided by the Caisse Générale de Péréquation et de Stabilisation des Prix (CGPSP), the parastatal with the monopoly of rice imports in Côte d'Ivoire. This parastatal and the Malian rice importer provided the costs of insurance and freight from the international market to West Africa. Those of cotton were obtained from CIDT and CMDT. The FOB price for rice and coarse grains, as well as the CIF price for cotton, were drawn from the publication of the International Economics Department at the World Bank (1990). Meanwhile, the average exchange rate between CFA franc and the US Dollar for 1990 originated from the International Monetary Fund (IMF, 1991).

APPENDIX B

TABLE B-1. CALCULATION OF COTTON DRC, FINANCIAL PROFITABILITY AND PROTECTION COEFFICIENTS

FILE NAME: CONORATR.WK1 CROP: COTTON, NORTH-COTE D'IVOIRE, ANIMAL TRACTION

CROP: COTTON, NORTH-COTE D'IVOIRE, ANIMAL TRACTION
SENSITIVITY ANALYSIS + KEY PARAMETERS

	16-Feb-94	RESULTS AND SENSITIVITY ANALYSIS		
	12:16:23 AM	FARM	KORHOGO	ABIDJAN
FINANCIAL PROFITABILITY, cash basis				
...CFAF/kg		126.31	118.03	118.03
...CFAF/hectare		73072.06	68279.58	68279.58
...CFAF/total labor		745.63	696.73	696.73
...CFAF/total family labor		745.63	696.73	696.73
FINANCIAL PROFITABILITY, imputed value				
...CFAF/kg		7.73	7.73	7.73
...CFAF/hectare		4472.06	4472.06	4472.06
ECONOMIC PROFITABILITY				
...CFAF/kg		170.89	170.89	170.89
...CFAF/hectare		98858.83	98858.83	98858.83
...CFAF/total labor		4386.76	4579.94	4643.13
...CFAF/total family labor		2813.73	3116.80	3179.98
NOMINAL PROTECTION COEFFICIENT, OUTPUTS		0.67	0.74	0.79
NET NOMINAL PROTECTION COEFFICIENT, OUTPUTS		0.48	0.53	0.56
EFFECTIVE PROTECTION COEFFICIENT		0.58	0.64	0.69
NET EFFECTIVE PROTECTION COEFFICIENT		0.41	0.45	0.49
DOMESTIC RESOURCE COST		0.61	0.63	0.66
DISCOUNT RATE			0.120	
YIELD (kg/ha)			1300.000	
PROCESSING CONVERSION FACTOR			0.445	
WORLD FOB PRICE ($/ton)			1820.000	
FARMGATE PRICE (CFAF/kg, seed cotton)			106.415	
RURAL MARKET PRICE (CFAF/kg, fiber)			282.402	
WHOLESALE PRICE (CFAF/kg, fiber)			344.150	
OFFICIAL EXCHANGE RATE			275.000	
SHADOW EXCHANGE RATE		0.40	385.000	
FAMILY LABOR WAGE RATE			700.000	
EXTENSION COSTS (CFAF/ha)			20295.000	
LAND ECONOMIC COST (CFAF/HA)			49845.000	

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT TRAD.	TAXES/SUBSIDIES INPUTS ONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC TRAD.	TAXES/S UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
FARM PRODUCTION															
LABOR	person days														
land clearing		20.00													
land preparation		9.00													
manure application		0.00													
plowing		0.00													
seeding		1.00													
weed treatment		1.00													
thinning		8.00													
insecticide application		6.00													
fertilizer application		3.00													
second weeding		0.00													
urea application		0.00													
threshing		0.00													
harvesting and transport		50.00													
uprooting		0.00													
Sub-total, family labor		98.00	700.00	68600.00	0.00	0.00	68600.00	0.00	0.00	68600.00	0.00	68600.00	0.00	0.00	0.00
Sub-total, hired labor		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Labor		98.00		68600.00	0.00	0.00	68600.00	0.00	0.00	68600.00	0.00	68600.00	0.00	0.00	0.00
SEED															
improved	kg	30.00	50.00	0.00	-495.00	-1005.00	1500.00	60.00	60.00	1380.00	435.00	0.00	795.00	150.00	0.00
unimproved	kg							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT INPUTS TRAD.	TAXES/SUBSIDIES DIRECT INPUTS NONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIRECT INPUTS TRAD.	TAXES/SUBSIDIES INDIRECT INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	NON-TRADABLE INPUTS FAMILY LABOR	NON-TRADABLE INPUTS HIRED LABOR	NON-TRADABLE INPUTS CAPITAL	LAND
OTHER INPUTS															
insecticides	litres			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
fertilizer															
NPK	kg	200.00	131.00	26200.00	0.00	0.00	26200.00	5502.00	2096.00	18602.00	10218.00	0.00	7336.00	1048.00	0.00
Urea	kg	50.00	114.00	5700.00	0.00	0.00	5700.00	1197.00	456.00	4047.00	2223.00	0.00	1596.00	228.00	0.00
sacks	number			250.00	0.00	0.00	250.00	37.50	12.50	200.00	137.50	0.00	45.00	17.50	0.00
herbicide	litres	4.00	3360.00	13440.00	0.00	0.00	13440.00	1612.80	806.40	11020.80	9408.00	0.00	940.80	672.00	0.00
storage chemical	grams			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
seed dressing	grams		25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
batteries	number			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
extension	lumpsum	1.00		0.00	-4057.00	-16228.00	20285.00	1014.25	3651.30	15619.45	3042.75	0.00	11968.15	608.55	0.00
Land Economic Cost	CFAF/ha									49845.00					49845.00

CAPITAL RECOVERY	VESTMENT COST	EXPECTED LIFE	ANNUITY COEFF	AP RECOV COST											
land clearing labor			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
small tools	2500.00	2.00	0.59	1479.25	0.00	0.00	1479.25	221.89	73.96	1183.40	813.58	0.00	266.26	103.56	0.00
multicultivator	0.00	10.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
seeder	0.00	10.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sacks			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
harrow			0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
cart	7200.00	5.00	0.26	1907.35	0.00	0.00	1907.35	0.00	39.95	1867.40	1867.54	0.00	99.87	0.00	0.00
plow			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sprayer	8500.00	5.00	0.28	2357.98	0.00	0.00	2357.98	0.00	47.16	2310.82	2192.92	0.00	117.90	0.00	0.00
irrigation, labor			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
animals (a pair)	13786.32	5.00	0.28	3824.46	0.00	0.00	3824.46	0.00	0.00	3824.46	0.00	0.00	0.00	3824.46	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT INPUTS TRAD.	TAXES/SUBSIDIES DIRECT INPUTS NONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC T INPUTS TRAD.	TAXES/S UBSIDIES INDIREC T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
OPERATING COST															
land rent	cost/ha			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O + M, implements	cost/ha			1570.00	0.00	0.00	1570.00	188.40	125.60	1256.00	628.00	0.00	565.20	62.80	0.00
O + M, tractor	cost/ha			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O + M, animal	cost/ha			2355.00	0.00	0.00	2355.00	0.00	47.10	2307.90	2072.40	0.00	117.75	117.75	0.00
WORKING CAPITAL															
3-month				2058.00	0.00	0.00	2058.00	0.00	0.00	2058.00	0.00	0.00	0.00	2058.00	0.00
6-month				2735.40	0.00	-1307.10	4042.50	0.00	0.00	4042.50	0.00	0.00	0.00	4042.50	0.00
TOTAL FARM COSTS (raw)	CFAF/ha	seed cotton		132567.44	-4552.00	-18540.10	155659.54	9833.84	7415.97	188264.73	33028.69	68600.00	23847.93	12933.11	49845.00
Total Value of (By-product)	CFAF/ha	60.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NET TOTAL FARM COSTS (raw)	CFAF/ha	seed cotton		132567.44	-4552.00	-18540.10	155659.54	9833.84	7415.97	188264.73	33028.69	68600.00	23847.93	12933.11	49845.00
YIELD	kg/ha	1300.00													
NET UNIT TOTAL FARM COSTS (raw)	CFAF/kg	seed cotton		101.97	-3.50	-14.26	119.74	7.56	5.70	144.81	25.41	52.77	18.34	9.95	38.34
NET UNIT TOTAL FARM COSTS (proc)	CFAF/kg	(fibre)		229.16	-7.87	-32.06	269.07	17.00	12.82	325.42	57.09	118.58	41.22	22.36	86.16

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIE DIRECT TRAD.	INPUTS ONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC TRAD.	T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
COLLECTION (FARM-TO-RURAL MA															
Transport	CFAF/ton	seed cotton		4200.00	0.00	0.00	4200.00	1050.00	210.00	2940.00	1218.00	0.00	714.00	1008.00	0.00
Handling, storage, margins	CFAF/ton	seed cotton		4795.00	0.00	0.00	4795.00	143.86	767.20	3883.96	527.45	0.00	2013.90	1342.60	0.00
Losses (3% /ton prod cost)	% prod cost	seed cotton		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL COLLECTION COSTS (raw)	CFAF/ton	seed cotton		8995.00	0.00	0.00	8995.00	1193.86	977.20	6823.96	1745.45	0.00	2727.90	2350.60	0.00
TOTAL COLLECTION COSTS (proc)	CFAF/ton	(fiber)		20213.48	0.00	0.00	20213.48	2682.81	2196.96	15334.72	3922.36	0.00	6130.11	5282.25	0.00
	CFAF/kg	(fiber)		20.21	0.00	0.00	20.21	2.68	2.20	15.33	3.92	0.00	6.13	5.28	0.00
TOTAL PRODUCTION + COLLECTIO	CFAF/kg	seed cotton		110.97	-3.50	-14.26	128.73	8.76	6.68	151.64	27.15	52.77	21.07	12.30	38.34
PROCESSING															
Milling	CFAF/ton	(fiber)		53986.00	0.00	0.00	53986.00	5938.46	2699.30	45348.24	12956.64	0.00	23753.84	8637.76	0.00
By-Products	CFAF/ton			-28685.39	0.00	0.00	-28685.39	-2307.28	-1472.75	-30924.79	-6296.75	-8284.33	-7037.36	-3286.92	-6019.43
TOTAL PROCESSING COSTS	CFAF/ton	(fiber)		25300.61	0.00	0.00	25300.61	3631.18	1226.55	14423.45	6659.89	-8284.33	16716.48	5350.84	-6019.43
	CFAF/kg	(fiber)		25.30	0.00	0.00	25.30	3.63	1.23	14.42	6.66	-8.28	16.72	5.35	-6.02
TOTAL PRODUCTION + COLLECTION + PROCESSING	CFAF/kg	(fiber)		274.67	-7.87	-32.05	314.59	23.31	16.24	355.18	67.68	110.30	64.07	32.99	80.14
DISTRIBUTION (RURAL MARKET-TO-WHOLESAL															
Handling, bulking, other costs	CFAF/ton	(fiber)		6594.76	0.00	0.00	6594.76	187.84	1065.16	5341.76	725.42	0.00	2769.80	1846.53	0.00
Transport	FAF/ton-km	(fiber)		19939.50	0.00	0.00	19939.50	4795.48	986.98	14157.06	5583.06	0.00	1993.96	6580.04	0.00
Finance Charge	CFAF/ton	(fiber)		30210.00	0.00	0.00	30210.00	0.00	0.00	30210.00	0.00	0.00	0.00	30210.00	0.00
CIDT remuneration	CFAF/ton	(fiber)		5004.00	0.00	0.00	5004.00	0.00	0.00	5004.00	0.00	0.00	0.00	5004.00	0.00
TOTAL DISTRIBUTION COSTS (proc)	CFAF/ton	(fiber)		61748.26	0.00	0.00	61748.26	4983.32	2052.14	54712.80	6308.48	0.00	4763.76	43640.57	0.00
TOTAL DISTRIBUTION COSTS (proc)	CFAF/kg	(fiber)		61.75	0.00	0.00	61.75	4.98	2.05	54.71	6.31	0.00	4.76	43.64	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/S DIRECT TRAD.	UBSIDIES INPUTS NONTRAD.	FINANCIAL COST	TAXES/S INDIREC TRAD.	UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
TOTAL COSTS INCL. PRODUCTION, COLLECTION, PROCESSING, DISTRIBUTION	CFAF/kg			336.42	-7.87	-32.05	376.34	28.30	18.29	409.89	73.98	110.30	68.83	76.63	80.14
PRODUCTION SUBSIDY	CFAF/kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NET TOTAL COSTS INCLUSIVE OF PRODUCTION TAX/SUBSIDY	CFAF/kg			336.42	-7.87	-32.05	376.34	28.30	18.29	409.89	73.98	110.30	68.83	76.63	80.14
				376.34			329.75			409.89					

INTERNATIONAL REFERENCE PRICE a185...p212	UNITS	UANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/S UBSIDIES DIRECT INPUTS TRAD.	TAXES/S UBSIDIES DIRECT INPUTS NONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC T INPUTS TRAD.	TAXES/S UBSIDIES INDIREC T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
CIF Price in $ US	$/ton	1.00	1820.00	1820.00			1820.00			1820.00	1820.00				
Freight, Insurance	$/ton	1.00	109.09	109.09			109.09			109.09	109.09				
Quality Adjustment	%	-3.00	0.00	-54.60			-54.60			-54.60	-54.60				
FOB Price in $ US	$/ton			1656.31			1656.31			1656.31	1656.31				
Official Exchange Rate	CFAF/$			275.00			275.00			275.00	275.00				
FOB Price in Local Currency	CFAF/ton			455485.00			455485.00			455485.00	455485.00				
FOB Price in Local Currency	CFAF/kg			455.49			455.49			455.49	455.49				
Port Charges															
Sales Commission	CFAF/ton			4170.00	0.00	0.00	4170.00	0.00	0.00	4170.00	4170.00	0.00	0.00	0.00	0.00
Port Fees	CFAF/ton			5513.00	0.00	0.00	5513.00	0.00	0.00	5513.00	5513.00	0.00	0.00	0.00	0.00
Storage, handling, insurance	CFAF/ton			9822.24	0.00	0.00	9822.24	0.00	0.00	9822.24	9822.24	0.00	0.00	0.00	0.00
Insurance	CFAF/ton			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Delivery charges, border-to-port															
Transport	CFAF/ton			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FOB REFERENCE PRICE, BORDER (CFAF/kg)				435.98	0.00	0.00	435.98	0.00	0.00	435.98	435.98	0.00	0.00	0.00	0.00
FOB REFERENCE PRICE, BORDER EQUIVALENT AT RURAL MARKET				374.23	0.00	0.00	374.23	-4.98	-2.06	381.27	429.67	0.00	-4.76	-43.64	0.00
FOB REFERENCE PRICE, BORDER EQUIVALENT AT FARM (CFAF/kg)				328.72	0.00	0.00	328.72	-11.30	-6.47	361.51	419.09	8.28	-27.61	-54.27	6.02

CALCULATION OF ECON INDICATORS: FARM LEVEL AND RURAL MARKET LEVEL

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ANALYSIS OF FARM PRODUCTION ONLY	CASH BASIS	IMPUTED VALUE	ANALYSIS OF FARM PRODUCTION, COLLECTION	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS			FINANCIAL PROFITABILITY ANALYSIS		
FARMGATE PRICE (CFAF/kg)	236.88	236.88	RURAL MARKET PRICE (CFAF/kg)	282.40	282.40
TRADABLES, FINANCIAL PRICES	66.22	66.22	TRADABLES, FINANCIAL PRICES	83.12	83.12
VALUE ADDED IN FINANCIAL PRICES	170.66	170.66	VALUE ADDED IN FINANCIAL PRICES	199.28	199.28
VALUE OF NON-TRADABLES IN FINANCIAL PRICES			VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	118.58	FAMILY LABOR COSTS	0.00	110.30
HIRED LABOR COSTS	41.22	41.22	HIRED LABOR COSTS	64.07	64.07
CAPITAL COSTS	22.36	22.36	CAPITAL COSTS	32.99	32.99
LAND COSTS	0.00	0.00	LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	-19.23	-19.23	TAXES/SUBSIDIES ON NONTRADABLES	-15.81	-15.81
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PR	44.35	162.93	TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	81.25	191.55
FINANCIAL PROFITABILITY TO FARMER (CFAF/kg)	126.31	7.73	FINANCIAL PROFITABILITY TO RURAL INTERMEDIARY (CFAF/	118.03	7.73

ECONOMIC PROFITABILITY ANALYSIS	
TRADABLE FARM PARITY PRICE, ECONOMIC @ OER (CFAF/kg)	351.51
TRADABLES IN ECONOMIC PRICES @ OER	57.09
VALUE ADDED IN ECONOMIC PRICES @ OER	294.42
TRADABLE FARM PARITY PRICE, ECONOMIC @ SER (CFAF/kg)	519.14
TRADABLES IN ECONOMIC PRICES @ SER	79.93
VALUE ADDED IN ECONOMIC PRICES @ SER	439.21
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	118.58
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	41.22
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	22.36
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	86.16
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	268.33
ECONOMIC PROFITABILITY AT FARM LEVEL (CFAF/kg)	170.89

ECONOMIC PROFITABILITY ANALYSIS	
TRADABLE RURAL PARITY PRICE, ECONOMIC @ OER (CFAF/kg)	381.27
TRADABLES IN ECONOMIC PRICES @ OER	67.68
VALUE ADDED IN ECONOMIC PRICES @ OER	313.59
TRADABLE RURAL PARITY PRICE, ECONOMIC @ SER (CFAF/kg)	553.14
TRADABLES IN ECONOMIC PRICES @ SER	94.75
VALUE ADDED IN ECONOMIC PRICES @ SER	458.39
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	110.30
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	64.07
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	32.99
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	80.14
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	287.50
ECONOMIC PROFITABILITY AT RURAL MARKET LEVEL (CFAF/kg)	170.89

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS		PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.67	NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.74
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.48	NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.53
NOMINAL PROTECTION COEFFICIENT, INPUTS	1.16	NOMINAL PROTECTION COEFFICIENT, INPUTS	1.23
NET NOMINAL PROTECTION COEFFICIENT, INPUTS	0.83	NET NOMINAL PROTECTION COEFFICIENT, INPUTS	0.88
EFFECTIVE PROTECTION COEFFICIENT	0.58	EFFECTIVE PROTECTION COEFFICIENT	0.64
NET EFFECTIVE PROTECTION COEFFICIENT	0.41	NET EFFECTIVE PROTECTION COEFFICIENT	0.45
EFFECTIVE SUBSIDY COEFFICIENT	0.64	EFFECTIVE SUBSIDY COEFFICIENT	0.69
NET EFFECTIVE SUBSIDY COEFFICIENT	0.46	NET EFFECTIVE SUBSIDY COEFFICIENT	0.49
DOMESTIC RESOURCE COST COEFFICIENT	0.61	DOMESTIC RESOURCE COST COEFFICIENT	0.63

CALCULATION OF ECON INDICATORS: FARM LEVEL AND RURAL MARKET LEVEL

ANALYSIS OF FARM PRODUCTION, COLLECTION, PROCESSING, DELIVERY	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
WHOLESALE PRICE (CFAF/kg)	344.15	344.15
TRADABLES, FINANCIAL PRICES	94.41	94.41
VALUE ADDED IN FINANCIAL PRICES	249.74	249.74
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	110.30
HIRED LABOR COSTS	68.83	68.83
CAPITAL COSTS	76.63	76.63
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	-13.75	-13.75
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	131.71	242.01
FINANCIAL PROFITABILITY TO WHOLESALER (CFAF/kg)	118.03	7.73

ECONOMIC PROFITABILITY ANALYSIS

TRADABLE WHOLESALE PARITY PRICE, ECONOMIC @ OER (CFAF/kg)	435.98
TRADABLES IN ECONOMIC PRICES @ OER	73.98
VALUE ADDED IN ECONOMIC PRICES @ OER	362.00
TRADABLE WHOLESALE PARITY PRICE, ECONOMIC @ SER (c/kg)	610.37
TRADABLES IN ECONOMIC PRICES @ SER	103.58
VALUE ADDED IN ECONOMIC PRICES @ SER	506.79
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	110.30
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	68.83
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	76.63
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	80.14
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	335.91
ECONOMIC PROFITABILITY AT WHOLESALE LEVEL (CFAF/kg)	170.88

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS

NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.79
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.56
NOMINAL PROTECTION COEFFICIENT, INPUTS	1.28
NET NOMINAL PROTECTION COEFFICIENT, INPUTS	0.81
EFFECTIVE PROTECTION COEFFICIENT	0.69
NET EFFECTIVE PROTECTION COEFFICIENT	0.49
EFFECTIVE SUBSIDY COEFFICIENT	0.73
NET EFFECTIVE SUBSIDY COEFFICIENT	0.52
DOMESTIC RESOURCE COST COEFFICIENT	0.66

TABLE B-2. CALCULATION OF MAIZE DRC, FINANCIAL PROFITABILITY AND PROTECTION COEFFICIENTS

FILE NAME: MACENTMA.WK1 CROP: MAIZE, CENTER - COTE D'IVOIRE, TRADITIONAL - MANUAL

CROP: MAIZE, CENTER - COTE D'IVOIRE, TRADITIONAL - MANUAL

SENSITIVITY ANALYSIS + KEY PARAMETERS

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18-Feb-94		............RESULT SUMMARY AND SENSITIVITY ANALYSIS............					
10:51 AM		FARM	BOUAKE	ABIDJAN	KORHOGO	SIKASSO	BAMAKO
FINANCIAL PROFITABILITY, cash basis							
...CFAF/kg		22.97	42.48	28.47	26.04	13.96	28.80
...CFAF/hectare		16078.70	29737.20	19929.67	17529.20	9762.70	19757.70
...CFAF/total labor		229.67	424.82	284.71	250.42	139.47	267.97
...CFAF/total family labor		229.67	424.82	284.71	250.42	139.47	267.97
FINANCIAL PROFITABILITY, imputed value							
...CFAF/kg		-47.03	-27.52	-41.53	-44.96	-56.06	-43.20
...CFAF/hectare		-32923.30	-19262.90	-29070.33	-31470.90	-39237.30	-30242.30
ECONOMIC PROFITABILITY							
...CFAF/kg		-26.34	-41.81	-69.83	-43.94	-16.39	-47.02
...CFAF/hectare		-18436.66	-29266.07	-48879.09	-30759.57	-11476.12	-32912.99
...CFAF/total labor		451.55	324.80	85.15	323.69	594.51	288.27
...CFAF/total family labor		-248.45	-375.40	-614.96			
NOMINAL PROTECTION COEFFICIENT, OUTPUTS		0.42	0.92	1.19	0.76	0.59	0.88
NET NOMINAL PROTECTION COEFFICIENT, OUTPUTS		0.30	0.66	0.96	0.54	0.42	0.63
EFFECTIVE PROTECTION COEFFICIENT		0.40	0.88	1.11	0.66	0.44	0.75
NET EFFECTIVE PROTECTION COEFFICIENT		0.28	0.63	0.80	0.47	0.32	0.54
DOMESTIC RESOURCE COST		1.29	1.51	2.09	1.51	1.14	1.57
DISCOUNT RATE			0.120				
YIELD (kg/ha)			700.000				
PROCESSING CONVERSION FACTOR			1.000				
WORLD FOB PRICE ($/ton)			108.000				
FARMGATE PRICE (CFAF/kg)			30.000				
WHOLESALE PRICE BOUAKE (CFAF/kg)			60.000				
WHOLESALE PRICE ABIDJAN (CFAF/kg)			65.000				
WHOLESALE PRICE KORHOGO (CFAF/kg)			55.000				
WHOLESALE PRICE SIKASSO (CFAF/kg)			50.000				
WHOLESALE PRICE BAMAKO (CFAF/kg)			70.000				
OFFICIAL EXCHANGE RATE			275.000				
SHADOW EXCHANGE RATE IN COTE D'IVOIRE		0.40	385.000				
SHADOW EXCHANGE RATE IN MALI		0.33	365.750				
TRANSPORT RATE, PAVED ROAD (CFAF/ton-km)			35.000				
TRANSPORT RATE, DIRTY ROAD (CFAF/ton-km)			100.000				
TRANSPORT COST, RCI-MALI BORDER-TO-SIKASSO (CFAF/ton)			2000.000				
TRANSPORT COST, RCI-MALI BORDER-TO-BAMAKO (CFAF/ton)			9000.000				
TRANSPORT COST, DAKAR-TO-MALI BORDER (CFAF/ton)			13500.000				
TRANSPORT COST, SENEGAL-MALI BORDER-TO-BAMAKO (CFAF/ton)			9677.000				
LABOR WAGE RATE (CFAF/day)			700.000				
EXTENSION COSTS (CFAF/ha)			0.000				
LAND ECONOMIC COST (CFAF/ha)			30955.000				

CROP: MAIZE, CENTER - COTE D' FARM BUDGET	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT INPUTS TRAD.	NONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIREC T INPUTS TRAD.	NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
FARM PRODUCTION															
LABOR	person days														
spring maintenance															
plowing															
harrowing before seeding															
seeding															
weeding															
fertilizer application															
irrigation															
thinning															
pest control															
harvesting															
binding															
transport															
threshing															
winnowing															
miscellaneous															
Sub-total, family labor		70.00	700.00	49000.00	0.00	0.00	49000.00	0.00	0.00	49000.00	0.00	49000.00	0.00	0.00	0.00
Sub-total, hired labor		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Labor		70.00		49000.00	0.00	0.00	49000.00	0.00	0.00	49000.00	0.00	49000.00	0.00	0.00	0.00
SEED															
improved	kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
unimproved	kg	30.00	30.00	900.00	0.00	0.00	900.00	9.00	0.00	891.00	81.00	0.00	594.00	216.00	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT INPUTS TRAD.	NONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIRECT INPUTS TRAD.	NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
OTHER INPUTS															
herbicides	litres			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
fertilizer															
ammonia phosphate	kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urea	kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sacks	kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sheets	number			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
storage chemical	grams			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
seed dressing	grams			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
batteries	number			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
extension	lumpsum	1.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Land Economic Cost	CFAF/ha									30955.00					30955.00

CAPITAL RECOVERY	INVESTMENT COST	EXPECTED LIFE	ANNUITY COEFF	CAP RECOV COST											
land clearing labor			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
small tools	2600.00	2.00	0.59	1479.26	0.00	0.00	1479.26	221.89	73.96	1183.40	813.58	0.00	266.26	103.56	0.00
sickles			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
cutlasses			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sacks	2450.00	3.00	0.42	1020.06	0.00	0.00	1020.06	153.01	51.00	816.04	561.03	0.00	183.61	71.40	0.00
harrow			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
cart			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
plow			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
pump			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
irrigation, labor			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
animals (a pair)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT TRAD.	INPUTS NONTRAD.	FINANCIAL COST	TAXES/S INDIREC TRAD.	UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	RADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
OPERATING COST															
O + M, irrigation	cost/ha			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O + M, implements	cost/ha			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
threshing	cost/ha			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O + M, animal	cost/ha			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WORKING CAPITAL															
3-month				1470.00	0.00	0.00	1470.00	0.00	0.00	1470.00	0.00	0.00	0.00	1470.00	0.00
6-month				54.00	0.00	0.00	54.00	0.00	0.00	54.00	0.00	0.00	0.00	54.00	0.00
TOTAL FARM COSTS (raw)	CFAF/ha			53923.30	0.00	0.00	53923.30	383.90	124.97	84369.44	1455.62	49000.00	1043.87	1914.96	30955.00
Total Value of (By-product)	CFAF/ha			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NET TOTAL FARM COSTS (raw)	CFAF/ha			53923.30	0.00	0.00	53923.30	383.90	124.97	84369.44	1455.62	49000.00	1043.87	1914.96	30955.00
YIELD	kg/ha	700.00													
NET UNIT TOTAL FARM COSTS (raw)	CFAF/kg			77.03	0.00	0.00	77.03	0.55	0.18	120.53	2.08	70.00	1.49	2.74	44.22
NET UNIT TOTAL FARM COSTS (proc)	CFAF/kg			77.03	0.00	0.00	77.03	0.55	0.18	120.53	2.08	70.00	1.49	2.74	44.22

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT TRAD.	INPUTS NONTRAD.	FINANCIAL COST	TAXES/S INDIREC TRAD.	UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	RADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
COLLECTION (FARM-TO-BOUAKE WHOLESALE															
Transport	AF/ton-km	100.00	50.00	5000.00	0.00	0.00	5000.00	1250.00	250.00	3500.00	1450.00	0.00	850.00	1200.00	0.00
Handling, storage, margins	CFAF/ton			4585.00	0.00	0.00	4585.00	137.56	733.80	3713.86	504.36	0.00	1925.70	1283.80	0.00
Losses (3% /ton prod cost)	prod cost			900.00	0.00	0.00	900.00	0.00	0.00	900.00	900.00	0.00	0.00	0.00	0.00
TOTAL COLLECTION COSTS (raw)	CFAF/ton			10485.00	0.00	0.00	10485.00	1387.56	983.80	8113.86	2854.36	0.00	2775.70	2483.80	0.00
TOTAL COLLECTION COSTS (proc)	CFAF/ton			10485.00	0.00	0.00	10485.00	1387.56	983.80	8113.86	2854.36	0.00	2775.70	2483.80	0.00
	CFAF/kg			10.49	0.00	0.00	10.49	1.39	0.98	8.11	2.85	0.00	2.78	2.48	0.00
TOTAL PRODUCTION + COLLECTION	CFAF/kg			87.52	0.00	0.00	87.52	1.94	1.16	128.64	4.93	70.00	4.27	5.22	44.22
PROCESSING															
Milling and packaging	CFAF/ton	(proc)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
By-Products	CFAF/ton			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PROCESSING COSTS	CFAF/ton	(proc)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CFAF/kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRODUCTION + COLLECTION + PROCESSING	CFAF/kg			87.52	0.00	0.00	87.52	1.94	1.16	128.64	4.93	70.00	4.27	5.22	44.22
DISTRIBUTION (WHSALE BOUAKE-TO-WHSALE															
Handling, bulking, other costs	CFAF/ton			6795.75	0.00	0.00	6795.75	203.87	1087.32	5504.56	747.53	0.00	2854.22	1902.81	0.00
Transport	AF/ton-km	35.00	349.00	12215.00	0.00	0.00	12215.00	2931.60	610.75	8672.65	3420.20	0.00	1221.50	4030.95	0.00
TOTAL DISTRIBUTION COSTS (proc)	CFAF/ton			19010.75	0.00	0.00	19010.75	3135.47	1698.07	14177.21	4167.73	0.00	4075.72	5933.76	0.00
TOTAL DISTRIBUTION COSTS (proc)	CFAF/kg			19.01	0.00	0.00	19.01	3.14	1.70	14.18	4.17	0.00	4.08	5.93	0.00
TOTAL COST TO ABIDJAN	CFAF/kg			106.53	0.00	0.00	106.53	5.07	2.86	142.82	9.10	70.00	8.34	11.15	44.22

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT TRAD.	INPUTS NONTRAD.	FINANCIAL COST	TAXES/S INDIREC TRAD.	UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	RADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
DISTRIBUTION (BOUAKE-TO KORHOGO)															
Handling, storage, other costs	CFAF/ton			2600.00	0.00	0.00	2600.00	75.00	400.00	2025.00	275.00	0.00	1050.00	700.00	0.00
Transport	CFAF/ton	35.00	284.00	9840.00	0.00	0.00	9840.00	2385.60	497.00	7057.40	2783.20	0.00	994.00	3280.20	0.00
TOTAL DISTRIBUTION COSTS TO KO	CFAF/ton			12440.00	0.00	0.00	12440.00	2460.60	897.00	9082.40	3058.20	0.00	2044.00	3980.20	0.00
TOTAL DISTRIBUTION COSTS TO KO	CFAF/kg			12.44	0.00	0.00	12.44	2.46	0.90	9.08	3.06	0.00	2.04	3.98	0.00
TOTAL COST TO KORHOGO	CFAF/kg			99.96	0.00	0.00	99.96	4.40	2.06	137.72	7.99	70.00	6.31	9.20	44.22
DISTRIBUTION (BOUAKE-TO-BORDER)															
Handling	CFAF/ton			500.00	0.00	0.00	500.00	15.00	80.00	405.00	55.00	0.00	210.00	140.00	0.00
Transport	CFAF/ton	35.00	391.00	13686.00	0.00	0.00	13686.00	3284.40	684.25	9716.35	3831.80	0.00	1368.50	4516.05	0.00
TOTAL DISTRIBUTION COSTS TO BO	CFAF/ton			14186.00	0.00	0.00	14186.00	3299.40	764.25	10121.35	3886.80	0.00	1578.50	4656.05	0.00
TOTAL DISTRIBUTION COSTS TO BO	CFAF/kg			14.19	0.00	0.00	14.19	3.30	0.76	10.12	3.89	0.00	1.58	4.66	0.00
TOTAL COST TO BORDER	CFAF/kg			101.70	0.00	0.00	101.70	5.24	1.93	138.76	8.82	70.00	5.85	9.88	44.22

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT TRAD.	TAXES/SUBSIDIES INPUTS ONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIRECT TRAD.	TAXES/SUBSIDIES INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
DISTRIBUTION (BORDER-TO-WHSALE SIKASSO)															
Handling, storage, other costs	CFAF/ton			2350.00	0.00	0.00	2350.00	0.00	0.00	2350.00	2350.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton			2000.00	0.00	0.00	2000.00	0.00	0.00	2000.00	2000.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO SIKASSO	CFAF/ton			4350.00	0.00	0.00	4350.00	0.00	0.00	4350.00	4350.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO SIKASSO	CFAF/kg			4.35	0.00	0.00	4.35	0.00	0.00	4.35	4.35	0.00	0.00	0.00	0.00
TOTAL COST TO SIKASSO	CFAF/kg			108.05	0.00	0.00	108.05	5.24	1.93	143.11	13.17	70.00	5.86	9.88	44.22
DISTRIBUTION (BORDER-TO-WHSALE BAMAKO)															
Handling, storage, other costs	CFAF/ton			2500.00	0.00	0.00	2500.00	0.00	0.00	2500.00	2500.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton			9000.00	0.00	0.00	9000.00	0.00	0.00	9000.00	9000.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO BAMAKO	CFAF/ton			11500.00	0.00	0.00	11500.00	0.00	0.00	11500.00	11500.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO BAMAKO	CFAF/kg			11.50	0.00	0.00	11.50	0.00	0.00	11.50	11.50	0.00	0.00	0.00	0.00
TOTAL COST TO BAMAKO	CFAF/kg			113.20	0.00	0.00	113.20	5.24	1.93	150.26	20.32	70.00	5.86	9.88	44.22

INTERNATIONAL REFERENCE PRICE	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT INPUTS TRAD.	TAXES/SUBSIDIES DIRECT INPUTS NONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIRECT INPUTS TRAD.	TAXES/SUBSIDIES INDIRECT INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	NON-TRADABLE INPUTS FAMILY LABOR	NON-TRADABLE INPUTS HIRED LABOR	NON-TRADABLE INPUTS CAPITAL	NON-TRADABLE INPUTS LAND
FOB Price in $ US	$/ton	1.00	108.00	108.00			108.00			108.00	108.00				
Freight, Insurance	$/ton	1.00	48.00	48.00			48.00			48.00	48.00				
Quality Adjustment	0.00	1.00	0.00	0.00			0.00			0.00	0.00				
CIF Price in $ US	$/ton			157.00			157.00			157.00	157.00				
Official Exchange Rate	CFAF/$			275.00			275.00			275.00	275.00				
CIF Price in Local Currency	CFAF/ton			43175.00			43175.00			43175.00	43175.00				
CIF Price in Local Currency	CFAF/kg			43.18			43.18			43.18	43.18				
Port Charges															
Port fees	CFAF/ton			5198.50			5198.50			5198.50	5198.50				
Storage and handling	CFAF/ton			3707.50			3707.50			3707.50	3707.50				
Transit	CFAF/ton			2000.00			2000.00			2000.00	2000.00				
Interest & Insurance (1.52% CIF)	CFAF/ton			656.26			656.26			656.26	656.26				
CIF price, border	CFAF/ton			54737.26	0.00	0.00	54737.26	0.00	0.00	54737.26	54737.26	0.00	0.00	0.00	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/S DIRECT TRAD.	UBSIDIES INPUTS NONTRAD.	FINANCIAL COST	TAXES/S INDIREC TRAD.	UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
Delivery charges, border-to-wholesale Abidjan															
Customs duties	0%			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Import duties	0%			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Special tax on rice	CFAF/ton			5000.00	5000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Statistic tax	2.5%			1368.43	1368.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TVA	ies + tax)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OIC tax	0,8%			328.42	328.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Port tax	CFAF/ton			110.00	110.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal tax	CFAF/ton			22.00	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tax on bag value	100.00														
Customs duties	5%			5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Import duties	34%			34.00	34.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Statistic tax	2.5%			2.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TVA	25%			35.38	35.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OIC tax	0.8%			0.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Delivery charges, Abidjan to rural market (Bouake)															
Transport	CFAF/ton	35.00	349.00	12215.00	0.00	0.00	12215.00	2931.60	610.75	8672.65	3420.20	0.00	1221.50	4030.95	0.00
Distribution	CFAF/ton			2500.00	0.00	0.00	2500.00	75.00	400.00	2025.00	275.00	0.00	1050.00	700.00	0.00
Delivery charges, rural market-to-farm															
Transport	CFAF/ton	100.00	50.00	5000.00	0.00	0.00	5000.00	1250.00	250.00	3500.00	1450.00	0.00	850.00	1200.00	0.00
Distribution	CFAF/ton			2500.00	0.00	0.00	2500.00	75.00	400.00	2025.00	275.00	0.00	1050.00	700.00	0.00
Delivery charges, Abidjan to Korhogo															
Transport	CFAF/ton	35.00	633.00	22155.00	0.00	0.00	22155.00	5317.20	1107.75	15730.05	6203.40	0.00	2215.50	7311.15	0.00
Distribution	CFAF/ton			2500.00	0.00	0.00	2500.00	75.00	400.00	2025.00	275.00	0.00	1050.00	700.00	0.00

UNITS QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/S UBSIDIES DIRECT TRAD.	INPUTS NONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC T TRAD.	INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
DELIVERY CHARGES PORT-TO-ABIDJAN (CFAF/ton)		6906.33	6906.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DELIVERY CHARGES PORT-TO-ABIDJAN (CFAF/kg)		6.91	6.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DELIVERY CHARGES ABIDJAN-TO-BOUAKE (CFAF/ton)		14715.00	0.00	0.00	14715.00	3006.60	1010.75	10697.65	3695.20	0.00	2271.50	4730.95	0.00
DELIVERY CHARGES ABIDJAN-TO-BOUAKE (CFAF/kg)		14.72	0.00	0.00	14.72	3.01	1.01	10.70	3.70	0.00	2.27	4.73	0.00
DELIVERY CHARGES RURAL MARKET-TO-FARM (CFAF/ton)		7500.00	0.00	0.00	7500.00	1325.00	650.00	5525.00	1725.00	0.00	1900.00	1900.00	0.00
DELIVERY CHARGES RURAL MARKET-TO-FARM (CFAF/kg)		7.50	0.00	0.00	7.50	1.33	0.65	5.53	1.73	0.00	1.90	1.90	0.00
DELIVERY CHARGES ABIDJAN-TO-KORHOGO (CFAF/ton)		24655.00	0.00	0.00	24655.00	5392.20	1507.75	17755.05	6478.40	0.00	3265.50	8011.15	0.00
DELIVERY CHARGES ABIDJAN-TO-KORHOGO (CFAF/kg)		24.66	0.00	0.00	24.66	5.39	1.51	17.76	6.48	0.00	3.27	8.01	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT IN ABIDJAN (CFAF/kg)		61.64	6.91	0.00	54.74	0.00	0.00	54.74	54.74	0.00	0.00	0.00	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT IN BOUAKE (CFAF/kg)		76.36	6.91	0.00	69.45	3.01	1.01	65.43	58.43	0.00	2.27	4.73	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT AT FARM (CFAF/kg)		83.86	6.91	0.00	76.95	4.33	1.66	70.96	60.16	0.00	4.17	6.63	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT IN KORHOGO (CFAF/kg)		86.30	6.91	0.00	79.39	5.39	1.51	72.49	61.22	0.00	3.27	8.01	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/S UBSIDIES DIRECT INPUTS TRAD.	TAXES/S UBSIDIES DIRECT INPUTS NONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC T INPUTS TRAD.	TAXES/S UBSIDIES INDIREC T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	NON-TRADABLE INPUTS FAMILY LABOR	NON-TRADABLE INPUTS HIRED LABOR	NON-TRADABLE INPUTS CAPITAL	NON-TRADABLE INPUTS LAND
Port charges for Malian imports in Abidjan															
Port fees	CFAF/ton			5270.00			5270.00			5270.00	5270.00				
Storage and handling	CFAF/ton			3680.00			3680.00			3680.00	3680.00				
Transit	CFAF/ton			2000.00			2000.00			2000.00	2000.00				
Interest and insurance (5% CIF)	CFAF/ton			2158.75			2158.75			2158.75	2158.75				
Delivery charges, Abidjan to Border															
Transport	CFAF/ton	35.00	740.00	25900.00	0.00	0.00	25900.00	0.00	0.00	25900.00	25900.00	0.00	0.00	0.00	0.00
CIF price, Cote d'Ivoire-Mali border	CFAF/ton			82183.75	0.00	0.00	82183.75	0.00	0.00	82183.75	82183.75	0.00	0.00	0.00	0.00
Delivery charges, border-to-wholesale Sikasso															
Customs duties	5 %			4109.19	4109.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Import duties	10 %			8218.38	8218.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sales tax 11.1 % (CIF frontier + import tax)				10034.64	10034.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPS	5 %			4109.19	4109.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OSRP	CFAF/ton			5000.00	5000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton			2000.00	0.00	0.00	2000.00	0.00	0.00	2000.00	2000.00	0.00	0.00	0.00	0.00
Total Delivery, RCI border-to-Sikasso	CFAF/ton			33471.39	31471.39	0.00	2000.00	0.00	0.00	2000.00	2000.00	0.00	0.00	0.00	0.00
Delivery charges, Dakar to Senegal-Mali Border															
Transport	CFAF/ton			13600.00	0.00	0.00	13600.00	0.00	0.00	13600.00	13600.00	0.00	0.00	0.00	0.00
CIF price, Senegal-Mali border	CFAF/ton			69783.75	0.00	0.00	69783.75	0.00	0.00	69783.75	69783.75	0.00	0.00	0.00	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/S DIRECT TRAD.	UBSIDIES INPUTS NONTRAD.	FINANCIAL COST	TAXES/S INDIREC TRAD.	UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
Delivery charges, border-to-wholesale Bamako															
Customs duties	5 %			3489.19	3489.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Import duties	10 %			6978.38	6978.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sales tax 11.1 % (CIF frontier + import tax)				8520.60	8520.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPS	5 %			3489.19	3489.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OSRP	CFAF/ton			5000.00	5000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton			9677.00	0.00	0.00	9677.00	0.00	0.00	9677.00	9677.00	0.00	0.00	0.00	0.00
Total delivery, Senegal border-to-Bamak	CFAF/ton			37154.36	27477.36	0.00	9677.00	0.00	0.00	9677.00	9677.00	0.00	0.00	0.00	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT IN SIKASSO (CFAF/kg)				115.66	31.47	0.00	84.18	0.00	0.00	84.18	84.18	0.00	0.00	0.00	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT IN BAMAKO (CFAF/kg)				106.94	27.48	0.00	79.46	0.00	0.00	79.46	79.46	0.00	0.00	0.00	0.00

CROP: MAIZE, CENTER - COTE D'IVOIRE, TRADITIONAL - MANUAL

CALCULATION OF ECON INDICATORS: FARM LEVEL AND RURAL MARKET LEVEL

a249...m314,t314

ANALYSIS OF FARM PRODUCTION ONLY	CASH BASIS	IMPUTED VALUE	ANALYSIS OF FARM PRODUCTION, COLLECTION (RURAL MARKET BOUAKE)	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS			FINANCIAL PROFITABILITY ANALYSIS		
FARMGATE PRICE (CFAF/kg)	30.00	30.00	RURAL MARKET PRICE (CFAF/kg)	60.00	60.00
TRADABLES, FINANCIAL PRICES	2.63	2.63	TRADABLES, FINANCIAL PRICES	6.87	6.87
VALUE ADDED IN FINANCIAL PRICES	27.37	27.37	VALUE ADDED IN FINANCIAL PRICES	53.13	53.13
VALUE OF NON-TRADABLES IN FINANCIAL PRICES			VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	70.00	FAMILY LABOR COSTS	0.00	70.00
HIRED LABOR COSTS	1.49	1.49	HIRED LABOR COSTS	4.27	4.27
CAPITAL COSTS	2.74	2.74	CAPITAL COSTS	5.22	5.22
LAND COSTS	0.00	0.00	LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	0.18	0.18	TAXES/SUBSIDIES ON NONTRADABLES	1.16	1.16
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	4.41	74.41	TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	10.65	80.65
FINANCIAL PROFITABILITY TO FARMER (CFAF/kg)	22.97	-47.03	FINANCIAL PROFITABILITY AT WHOLESALE BOUAKE (CFAF/kg)	42.48	-27.52

ECONOMIC PROFITABILITY ANALYSIS		ECONOMIC PROFITABILITY ANALYSIS	
TRADABLE FARM PARITY PRICE, ECONOMIC ● OER (CFAF/kg)	70.96	TRADABLE RURAL PARITY PRICE, ECONOMIC ● OER (CFAF/kg)	65.43
TRADABLES IN ECONOMIC PRICES ● OER	2.08	TRADABLES IN ECONOMIC PRICES ● OER	4.93
VALUE ADDED IN ECONOMIC PRICES ● OER	68.88	VALUE ADDED IN ECONOMIC PRICES ● OER	60.50
TRADABLE FARM PARITY PRICE, ECONOMIC ● SER (CFAF/kg)	95.02	TRADABLE RURAL PARITY PRICE, ECONOMIC ● SER (CFAF/kg)	88.81
TRADABLES IN ECONOMIC PRICES ● SER	2.91	TRADABLES IN ECONOMIC PRICES ● SER	6.91
VALUE ADDED IN ECONOMIC PRICES ● SER	92.11	VALUE ADDED IN ECONOMIC PRICES ● SER	81.90
VALUE OF NON-TRADABLES IN SHADOW PRICES		VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00	SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	70.00	FAMILY LABOR COSTS IN SHADOW PRICES	70.00
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00	SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	1.49	HIRED LABOR COSTS IN SHADOW PRICES	4.27
SHADOW CAPITAL COST COEFFICIENT	1.00	SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	2.74	CAPITAL COSTS IN SHADOW PRICES	5.22
SHADOW LAND COST COEFFICIENT	1.00	SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	44.22	LAND COSTS IN SHADOW PRICES	44.22
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	118.45	TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	123.71
ECONOMIC PROFITABILITY AT FARM LEVEL (CFAF/kg)	-26.34	ECONOMIC PROFITABILITY AT WHOLESALE BOUAKE (CFAF/kg)	-41.81

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.42
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.30
EFFECTIVE PROTECTION COEFFICIENT	0.40
NET EFFECTIVE PROTECTION COEFFICIENT	0.28
DOMESTIC RESOURCE COST COEFFICIENT	1.29

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.92
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.85
EFFECTIVE PROTECTION COEFFICIENT	0.88
NET EFFECTIVE PROTECTION COEFFICIENT	0.63
DOMESTIC RESOURCE COST COEFFICIENT	1.51

CROP: MAIZE, CENTER - COTE D'IVOIRE, TRADITIONAL - MANUAL

CALCULATION OF ECON INDICATORS: FARM LEVEL AND RURAL MARKET LEVEL

ANALYSIS OF FARM PRODUCTION, COLLECTION, PROCESSING, DELIVERY TO ABIDJAN	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
WHOLESALE PRICE (CFAF/kg)	65.00	65.00
TRADABLES, FINANCIAL PRICES	14.17	14.17
VALUE ADDED IN FINANCIAL PRICES	50.83	50.83
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	70.00
HIRED LABOR COSTS	8.34	8.34
CAPITAL COSTS	11.16	11.16
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	2.86	2.86
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	22.36	92.36
FINANCIAL PROFITABILITY AT WHOLESALE ABIDJAN (CFAF/kg)	28.47	-41.53

ANALYSIS AT WHOLESALE KORHOGO	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
WHOLESALE PRICE (CFAF/kg)	55.00	55.00
TRADABLES, FINANCIAL PRICES	12.39	12.39
VALUE ADDED IN FINANCIAL PRICES	42.61	42.61
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	70.00
HIRED LABOR COSTS	6.31	6.31
CAPITAL COSTS	9.20	9.20
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	2.06	2.06
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	17.57	87.57
FINANCIAL PROFITABILITY AT WHOLESALE KORHOGO (CFAF/kg)	25.04	-44.96

ECONOMIC PROFITABILI

ECONOMIC PROFITABILITY ANALYSIS

TRADABLE WHOLESALE PARITY PRICE, ECONOMIC @ OER (CFAF/kg	54.74
TRADABLES IN ECONOMIC PRICES @ OER	9.10
VALUE ADDED IN ECONOMIC PRICES @ OER	45.64
TRADABLE WHOLESALE PARITY PRICE, ECONOMIC @ SER (c/kg)	76.63
TRADABLES IN ECONOMIC PRICES @ SER	12.74
VALUE ADDED IN ECONOMIC PRICES @ SER	63.89
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	70.00
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	8.34
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	11.15
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	44.22
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	133.72
ECONOMIC PROFITABILITY AT WHOLESALE ABIDJAN (CFAF/kg)	-69.83

ECONOMIC PROFITABILITY ANALYSIS

TRADABLE WHOLESALE PARITY PRICE, ECONOMIC @ OER (CFAF/kg)	72.49
TRADABLES IN ECONOMIC PRICES @ OER	7.99
VALUE ADDED IN ECONOMIC PRICES @ OER	64.50
TRADABLE WHOLESALE PARITY PRICE, ECONOMIC @ SER (c/kg)	96.98
TRADABLES IN ECONOMIC PRICES @ SER	11.19
VALUE ADDED IN ECONOMIC PRICES @ SER	85.79
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	70.00
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	6.31
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	9.20
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	44.22
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	#####
ECONOMIC PROFITABILITY AT WHOLESALE KORHOGO (CFAF/kg)	-43.94

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS

NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.18
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.85
EFFECTIVE PROTECTION COEFFICIENT	1.11
NET EFFECTIVE PROTECTION COEFFICIENT	0.80
DOMESTIC RESOURCE COST COEFFICIENT	2.08

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS

NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.76
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.54
EFFECTIVE PROTECTION COEFFICIENT	0.66
NET EFFECTIVE PROTECTION COEFFICIENT	0.47
DOMESTIC RESOURCE COST COEFFICIENT	1.51

ANALYSIS AT WHOLESALE SIKASSO	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
WHOLESALE PRICE (CFAF/kg)	50.00	50.00
TRADABLES, FINANCIAL PRICES	18.41	18.41
VALUE ADDED IN FINANCIAL PRICES	31.59	31.59
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	70.00
HIRED LABOR COSTS	5.86	5.86
CAPITAL COSTS	9.88	9.88
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	1.93	1.93
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	17.65	87.65
FINANCIAL PROFITABILITY AT WHOLESALE SIKASSO (CFAF/kg)	13.95	-56.06

ANALYSIS AT WHOLESALE BAMAKO	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
RURAL MARKET PRICE (CFAF/kg)	70.00	70.00
TRADABLES, FINANCIAL PRICES	25.56	25.56
VALUE ADDED IN FINANCIAL PRICES	44.44	44.44
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	70.00
HIRED LABOR COSTS	5.86	5.86
CAPITAL COSTS	9.88	9.88
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	1.93	1.93
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	17.65	87.65
FINANCIAL PROFITABILITY AT WHOLESALE BAMAKO (CFAF/kg)	26.80	-43.20

ECONOMIC PROFITABILITY ANALYSIS		ECONOMIC PROFITABILITY ANALYSIS	
TRADABLE FARM PARITY PRICE, ECONOMIC ● OER (CFAF/kg)	84.18	TRADABLE RURAL PARITY PRICE, ECONOMIC ● OER (CFAF/kg)	79.46
TRADABLES IN ECONOMIC PRICES ● OER	13.17	TRADABLES IN ECONOMIC PRICES ● OER	20.32
VALUE ADDED IN ECONOMIC PRICES ● OER	71.01	VALUE ADDED IN ECONOMIC PRICES ● OER	59.14
TRADABLE FARM PARITY PRICE, ECONOMIC ● SER (CFAF/kg)	131.68	TRADABLE RURAL PARITY PRICE, ECONOMIC ● SER (CFAF/kg)	110.57
TRADABLES IN ECONOMIC PRICES ● SER	18.13	TRADABLES IN ECONOMIC PRICES ● SER	27.64
VALUE ADDED IN ECONOMIC PRICES ● SER	113.55	VALUE ADDED IN ECONOMIC PRICES ● SER	82.92
VALUE OF NON-TRADABLES IN SHADOW PRICES		VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00	SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	70.00	FAMILY LABOR COSTS IN SHADOW PRICES	70.00
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00	SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	5.86	HIRED LABOR COSTS IN SHADOW PRICES	5.86
SHADOW CAPITAL COST COEFFICIENT	1.00	SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	9.86	CAPITAL COSTS IN SHADOW PRICES	9.86
SHADOW LAND COST COEFFICIENT	1.00	SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	44.22	LAND COSTS IN SHADOW PRICES	44.22
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	129.94	TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	129.94
ECONOMIC PROFITABILITY AT WHOLESALE SIKASSO (CFAF/kg)	-16.39	ECONOMIC PROFITABILITY AT WHOLESALE BAMAKO (CFAF/kg)	-47.02

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.59
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.42
EFFECTIVE PROTECTION COEFFICIENT	0.44
NET EFFECTIVE PROTECTION COEFFICIENT	0.32
DOMESTIC RESOURCE COST COEFFICIENT	1.14

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.98
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.83
EFFECTIVE PROTECTION COEFFICIENT	0.75
NET EFFECTIVE PROTECTION COEFFICIENT	0.54
DOMESTIC RESOURCE COST COEFFICIENT	1.57

TABLE B-3. CALCULATION OF MILLET/SORGHUM DRC, FINANCIAL PROFITABILITY AND PROTECTION COEFFICIENTS

FILE NAME: MISOMSAT.WK1 CROP: MILLET/SORGHUM, MALI SUD, ANIMAL TRACTION

CROP: MILLET/SORGHUM, MALI SUD, ANIMAL TRACTION

SENSITIVITY ANALYSIS + KEY PARAMETERS

a3...q57 (IMPORT-SUBSTITUTION)

19-Feb-94	..............RESULT SUMMARY AND SENTIVITY ANALYSIS..............					
03:35 PM	FARM	SIKASSO	BAMAKO	KORHOGO	BOUAKE	ABIDJAN
FINANCIAL PROFITABILITY, cash basis						
...CFAF/kg	35.65	32.23	29.23	57.33	53.54	56.33
...CFAF/hectare	28520.69	25780.69	23380.69	45860.69	42832.69	45060.69
...CFAF/total labor	570.41	515.61	467.61	917.21	856.65	901.21
...CFAF/total family labor	570.41	515.61	467.61	917.21	856.65	901.21
FINANCIAL PROFITABILITY, imputed value						
...CFAF/kg	-8.10	-11.52	-14.52	13.58	9.79	12.58
...CFAF/hectare	-6479.31	-9219.31	-11619.31	10860.69	7832.69	10060.69
ECONOMIC PROFITABILITY						
...CFAF/kg	55.41	37.02	14.83	11.31	-14.90	-52.60
...CFAF/hectare	44328.72	29615.06	11866.40	9050.78	-11921.22	-42082.82
...CFAF/total labor	1631.49	1401.88	1104.02	998.75	579.31	-23.92
...CFAF/total family labor	931.49	701.88	404.02	298.75	-120.69	-723.92
NOMINAL PROTECTION COEFFICIENT, OUTPUTS	0.65	0.80	0.97	1.35	1.62	2.34
NET NOMINAL PROTECTION COEFFICIENT, OUTPUTS	0.49	0.60	0.73	1.01	1.22	1.76
EFFECTIVE PROTECTION COEFFICIENT	0.56	0.71	0.91	1.49	2.25	15.01
NET EFFECTIVE PROTECTION COEFFICIENT	0.42	0.53	0.68	1.12	1.69	11.28
DOMESTIC RESOURCE COST	0.48	0.61	0.82	0.84	1.33	8.57

DISCOUNT RATE		0.080
YIELD (kg/ha)		800.000
PROCESSING CONVERSION FACTOR		1.000
WORLD FOB PRICE ($/ton)		104.000
FARMGATE PRICE (CFAF/kg)		60.000
RURAL MARKET PRICE (Sikasso: CFAF/kg)		70.000
WHOLESALE PRICE BAMAKO (CFAF/kg)		80.000
WHOLESALE PRICE KORHOGO (CFAF/kg)		105.000
WHOLESALE PRICE BOUAKE (CFAF/kg)		110.000
WHOLESALE PRICE ABIDJAN (CFAF/kg)		125.000
OFFICIAL EXCHANGE RATE		275.000
SHADOW EXCHANGE RATE IN MALI	0.33	365.750
SHADOW EXCHANGE RATE IN COTE D'IVOIRE	0.40	385.000
TRANSPORT COST, FARM-TO-SIKASSO (CFAF/ton)		3125.000
TRANSPORT COST, SIKASSO-TO-BAMAKO (CFAF/ton)		7000.000
TRANSPORT COST, SIKASSO-TO-RCI-BORDER (CFAF/ton)		2000.000
TRANSPORT COST, DAKAR-TO-MALI BORDER (CFAF/ton)		13500.000
TRANSPORT COST, SENEGAL-MALI BORDER-TO-BAMAKO (CFAF/ton)		9677.000
TRANSPORT RATE IN COTE D'IVOIRE (CFAF/ton-km)		35.000
LABOR WAGE RATE (CFAF/day)		700.000
EXTENSION COSTS (CFAF/ha)		0.000
LAND ECONOMIC COST (CFAF/ha)		0.000

CROP: MILLET/SORGHUM, MALI FARM BUDGET	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT TRAD.	INPUTS NONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC TRAD.	T INPUTS ONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
FARM PRODUCTION															
LABOR	person days														
spring maintenance															
plowing															
harrowing before seeding															
seeding															
weeding															
fertilizer application															
irrigation															
thinning															
pest control															
harvesting															
binding															
transport															
threshing															
winnowing															
miscellaneous															
Sub-total, family labor		50.00	700.00	35000.00	0.00	0.00	35000.00	0.00	0.00	35000.00	0.00	35000.00	0.00	0.00	0.00
Sub-total, hired labor		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Labor		50.00		35000.00	0.00	0.00	35000.00	0.00	0.00	35000.00	0.00	35000.00	0.00	0.00	0.00
SEED															
improved	kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
unimproved	kg	10.00	60.00	600.00	0.00	0.00	600.00	6.00	0.00	594.00	54.00	0.00	396.00	144.00	0.00

	UNITS	QUANTITY	UNIT	FINANCIAL	TAXES/SUBSIDIES		FINANCIAL	TAXES/S	UBSIDIES	ECONOMIC	TRADABLE	.........NON-TRADABLE INPUTS.........			
			PRICE	EXPENDITU	DIRECT	INPUTS	COST	INDIREC	T INPUTS	COST	INPUTS	FAMILY	HIRED	CAPITAL	LAND
					TRAD.	NONTRAD.		TRAD.	ONTRAD.			LABOR	LABOR		
OTHER INPUTS															
insecticides	kg	10.00	50.00	500.00	0.00	0.00	500.00	80.00	10.00	410.00	350.00	0.00	35.00	25.00	0.00
fertilizer															
ammonia phosphate	kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urea	kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sacks	kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sheets	number			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
storage chemical	grams			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
seed dressing	grams			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
batteries	number			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
extension	lumpsum	1.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Land Economic Cost	CFAF/ha									0.00					0.00
CAPITAL RECOVERY	INVESTMENT	EXPECTED	ANNUITY	AP RECOV											
	COST	LIFE	COEFF	COST											
land clearing labor			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
hoes			0.00	500.00	0.00	0.00	500.00	75.00	25.00	400.00	275.00	0.00	90.00	35.00	0.00
sickles			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
cutlasses			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sacks			0.00	5250.00	0.00	0.00	5250.00	787.50	262.50	4200.00	2887.50	0.00	945.00	367.50	0.00
seeder	1707.00	5.00	0.25	427.53	0.00	0.00	427.53	0.00	8.55	418.98	397.60	0.00	21.38	0.00	0.00
cart	7702.00	5.00	0.25	1929.02	0.00	0.00	1929.02	0.00	38.58	1890.44	1793.98	0.00	96.46	0.00	0.00
plow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
multicultivator	6953.00	5.00	0.25	1741.42	0.00	0.00	1741.42	0.00	34.83	1706.60	1619.52	0.00	87.07	0.00	0.00
irrigation, labor			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
animals (a pair)	8322.56	5.00	0.25	2084.44	0.00	0.00	2084.44	0.00	0.00	2084.44	0.00	0.00	0.00	2084.44	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT INPUTS TRAD.	NONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC T INPUTS TRAD.	ONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
OPERATING COST															
O + M, irrigation	cost/ha			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O + M, implements	cost/ha			940.90	0.00	0.00	940.90	112.91	75.27	752.72	376.36	0.00	338.72	37.64	0.00
threshing	cost/ha			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O + M, animal	cost/ha			4762.00	0.00	0.00	4762.00	0.00	95.24	4666.76	4190.56	0.00	238.10	238.10	0.00
WORKING CAPITAL															
3-month				700.00	0.00	0.00	700.00	0.00	0.00	700.00	0.00	0.00	0.00	700.00	0.00
6-month				44.00	0.00	0.00	44.00	0.00	0.00	44.00	0.00	0.00	0.00	44.00	0.00
TOTAL FARM COSTS (raw)	CFAF/ha			54479.31	0.00	0.00	54479.31	1061.41	549.97	52867.93	11944.53	35000.00	2247.72	3675.68	0.00
Total Value of (By-product)	CFAF/ha			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NET TOTAL FARM COSTS (raw)	CFAF/ha			54479.31	0.00	0.00	54479.31	1061.41	549.97	52867.93	11944.53	35000.00	2247.72	3675.68	0.00
YIELD	kg/ha	800.00													
NET UNIT TOTAL FARM COSTS (raw)	CFAF/kg			68.10	0.00	0.00	68.10	1.33	0.69	66.08	14.93	43.75	2.81	4.59	0.00
NET UNIT TOTAL FARM COSTS (proc)	CFAF/kg			68.10	0.00	0.00	68.10	1.33	0.69	66.08	14.93	43.75	2.81	4.59	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT TRAD.	TAXES/SUBSIDIES INPUTS NONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIREC TRAD.	TAXES/SUBSIDIES T INPUTS ONTRAD.	ECONOMIC COST	TRADABLE INPUTS	NON-TRADABLE INPUTS FAMILY LABOR	NON-TRADABLE INPUTS HIRED LABOR	NON-TRADABLE INPUTS CAPITAL	NON-TRADABLE INPUTS LAND
COLLECTION (FARM TO SIKASSO)															
Transport	FAF/ton-km			3125.00	0.00	0.00	3125.00	312.50	156.25	2656.25	1375.00	0.00	468.75	812.50	0.00
Handling, storage, margins	CFAF/ton			8500.00	0.00	0.00	8500.00	255.00	1360.00	6885.00	935.00	0.00	3570.00	2380.00	0.00
Losses (3% /ton prod cost)	prod cost			1800.00	0.00	0.00	1800.00	0.00	0.00	1800.00	1800.00	0.00	0.00	0.00	0.00
TOTAL COLLECTION COSTS (raw)	CFAF/ton			13425.00	0.00	0.00	13425.00	567.50	1516.25	11341.25	4110.00	0.00	4038.75	3192.50	0.00
TOTAL COLLECTION COSTS (proc)	CFAF/ton			13425.00	0.00	0.00	13425.00	567.50	1516.25	11341.25	4110.00	0.00	4038.75	3192.50	0.00
	CFAF/kg			13.43	0.00	0.00	13.43	0.57	1.52	11.34	4.11	0.00	4.04	3.19	0.00
TOTAL PRODUCTION + COLLECTION	CFAF/kg			81.52	0.00	0.00	81.52	1.89	2.20	77.43	19.04	43.75	6.85	7.79	0.00
PROCESSING															
Milling and packaging	CFAF/ton			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
By-Products	CFAF/ton			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PROCESSING COSTS	CFAF/ton			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CFAF/kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRODUCTION + COLLECTION + PROCESSING	CFAF/kg			81.52	0.00	0.00	81.52	1.89	2.20	77.43	19.04	43.75	6.85	7.79	0.00
DISTRIBUTION (SIKASSO TO BAMAKO)															
Handling, bulking, other costs	CFAF/ton			6000.00	0.00	0.00	6000.00	180.00	960.00	4860.00	660.00	0.00	2520.00	1680.00	0.00
Transport	FAF/ton-km			7000.00	0.00	0.00	7000.00	700.00	350.00	5950.00	3080.00	0.00	1050.00	1820.00	0.00
TOTAL DISTRIBUTION COSTS (proc)	CFAF/ton			13000.00	0.00	0.00	13000.00	880.00	1310.00	10810.00	3740.00	0.00	3570.00	3500.00	0.00
TOTAL DISTRIBUTION COSTS (proc)	CFAF/kg			13.00	0.00	0.00	13.00	0.88	1.31	10.81	3.74	0.00	3.57	3.50	0.00
TOTAL COST TO BAMAKO	CFAF/kg			94.52	0.00	0.00	94.52	2.77	3.51	88.24	22.78	43.75	10.42	11.29	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT TRAD.	INPUTS NONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIREC TRAD.	T INPUTS ONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
DISTRIBUTION (SIKASSO-TO-BORDER)															
Handling	CFAF/ton			500.00	0.00	0.00	500.00	16.00	80.00	405.00	55.00	0.00	210.00	140.00	0.00
Transport	CFAF/ton			2000.00	0.00	0.00	2000.00	200.00	100.00	1700.00	880.00	0.00	300.00	520.00	0.00
TOTAL DISTRIBUTION COSTS TO BO	CFAF/ton			2500.00	0.00	0.00	2500.00	216.00	180.00	2105.00	935.00	0.00	510.00	660.00	0.00
TOTAL DISTRIBUTION COSTS TO BO	CFAF/kg			2.50	0.00	0.00	2.50	0.22	0.18	2.11	0.94	0.00	0.51	0.66	0.00
TOTAL COST TO BORDER	CFAF/kg			84.02	0.00	0.00	84.02	2.11	2.38	79.53	19.98	43.75	7.36	8.45	0.00
DISTRIBUTION (BORDER-TO-KORHOGO)															
Handling, storage, other costs	CFAF/ton			2500.00	0.00	0.00	2500.00	0.00	0.00	2500.00	2500.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton	35.00	140.00	4900.00	0.00	0.00	4900.00	0.00	0.00	4900.00	4900.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO KO	CFAF/ton			7400.00	0.00	0.00	7400.00	0.00	0.00	7400.00	7400.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO KO	CFAF/kg			7.40	0.00	0.00	7.40	0.00	0.00	7.40	7.40	0.00	0.00	0.00	0.00
TOTAL COST TO KORHOGO	CFAF/kg			91.42	0.00	0.00	91.42	2.11	2.38	86.93	27.38	43.75	7.36	8.45	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/SUBSIDIES DIRECT INPUTS TRAD.	NONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIRECT INPUTS TRAD.	NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
DISTRIBUTION (BORDER-TO-BOUAKE)															
Handling, storage, other costs	CFAF/ton			2500.00	0.00	0.00	2500.00	0.00	0.00	2500.00	2500.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton	35.00	391.00	13685.00	0.00	0.00	13685.00	0.00	0.00	13685.00	13685.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO BO	CFAF/ton			16185.00	0.00	0.00	16185.00	0.00	0.00	16185.00	16185.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO BO	CFAF/kg			16.19	0.00	0.00	16.19	0.00	0.00	16.19	16.19	0.00	0.00	0.00	0.00
TOTAL COST TO BOUAKE	CFAF/kg			100.21	0.00	0.00	100.21	2.11	2.38	96.72	36.16	43.75	7.36	8.45	0.00
DISTRIBUTION (BORDER-TO-ABIDJAN)															
Handling, storage, other costs	CFAF/ton			2500.00	0.00	0.00	2500.00	0.00	0.00	2500.00	2500.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton	35.00	740.00	25900.00	0.00	0.00	25900.00	0.00	0.00	25900.00	25900.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO ABI	CFAF/ton			28400.00	0.00	0.00	28400.00	0.00	0.00	28400.00	28400.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO ABI	CFAF/kg			28.40	0.00	0.00	28.40	0.00	0.00	28.40	28.40	0.00	0.00	0.00	0.00
TOTAL COST TO ABIDJAN	CFAF/kg			112.42	0.00	0.00	112.42	2.11	2.38	107.83	48.38	43.75	7.36	8.45	0.00

INTERNATIONAL REFERENCE PRICE	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITU	TAXES/S DIRECT TRAD.	UBSIDIES INPUTS NONTRAD.	FINANCIAL COST	TAXES/S INDIREC TRAD.	UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
FOB Price in $ US	$/ton	1.00	104.00	104.00			104.00			104.00	104.00				
Freight, Insurance	$/ton	1.00	48.00	48.00			48.00			48.00	48.00				
Quality Adjustment	0.00	1.00	0.00	0.00			0.00			0.00	0.00				
CIF Price in $ US	$/ton			152.00			152.00			152.00	152.00				
Official Exchange Rate	CFAF/$			275.00			275.00			275.00	275.00				
CIF Price in Local Currency	CFAF/ton			41800.00			41800.00			41800.00	41800.00				
CIF Price in Local Currency	CFAF/kg			41.80			41.80			41.80	41.80				
Port Charges in Dakar															
Port fees	CFAF/ton			5270.00			5270.00			5270.00	5270.00				
Storage and handling	CFAF/ton			3680.00			3680.00			3680.00	3680.00				
Transit	CFAF/ton			2000.00			2000.00			2000.00	2000.00				
Interest and Insurance (5% CIF)	CFAF/ton			2080.00			2080.00			2080.00	2080.00				
Delivery charges, port-to-border															
Transport	CFAF/ton			13500.00	0.00	0.00	13500.00	0.00	0.00	13500.00	13500.00	0.00	0.00	0.00	0.00
CIF price, Mali-Senegal frontier	CFAF/ton			68340.00	0.00	0.00	68340.00	0.00	0.00	68340.00	68340.00	0.00	0.00	0.00	0.00

	UNITS	UANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/S UBSIDIES DIRECT TRAD.	TAXES/S UBSIDIES INPUTS NONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC TRAD.	TAXES/S UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
Delivery charges, border of Senegal-to-Bamako															
Customs duties	5%			3417.00	3417.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Import duties	10%			6834.00	6834.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Handling	CFAF/ton	1.00		1250.00	0.00	0.00	1250.00	125.00	25.00	1100.00	637.50	0.00	412.50	50.00	0.00
Finance Charge	CFAF/ton	1.00		3456.00	0.00	0.00	3456.00	0.00	0.00	3456.00	0.00	0.00	0.00	3456.00	0.00
Insurance	CFAF/ton			1424.00	0.00	0.00	1424.00	0.00	0.00	1424.00	0.00	0.00	0.00	0.00	0.00
Sales tax 11.1% CIF frontier + import tax				7965.03	7965.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPS	5% CIF			3417.00	3417.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OSRP	CFAF/ton			5000.00	5000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton			9677.00	0.00	0.00	9677.00	967.70	193.54	8515.76	4935.27	0.00	3193.41	387.08	0.00
DELIVERY CHARGES BORDER-TO-WHSALE BAMAKO (CFAF/ton)				42440.03	26633.03	0.00	15807.00	1092.70	218.54	14495.76	5572.77	0.00	3605.91	3893.08	0.00
DELIVERY CHARGES BORDER-TO-WHSALE BAMAKO (CFAF/kg)				42.44	26.63	0.00	15.81	1.09	0.22	14.50	5.57	0.00	3.61	3.89	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT AT RURAL BAMAKO (CFAF/kg)				110.78	26.63	0.00	84.15	1.09	0.22	82.84	73.91	0.00	3.61	3.89	0.00

	UNITS	UANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/S DIRECT TRAD.	UBSIDIES INPUTS NONTRAD.	FINANCIAL COST	TAXES/S INDIREC TRAD.	UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
Port Charges and delivery charges in Abidjan															
Port fees	CFAF/ton			5198.50			5198.50			5198.50	5198.50				
Storage and handling	CFAF/ton			3707.50			3707.50			3707.50	3707.50				
Transit	CFAF/ton			2000.00			2000.00			2000.00	2000.00				
Interest and Insurance (1.52% CIF)	CFAF/ton			635.36			635.36			635.36	635.36				
Transport	CFAF/ton			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Delivery charges Abidjan-to-Wholesale Bouake															
Transport		35.00	349.00	12215.00	0.00	0.00	12215.00	0.00	0.00	12215.00	12215.00	0.00	0.00	0.00	0.00
Distribution				2500.00	0.00	0.00	2500.00	0.00	0.00	2500.00	2500.00	0.00	0.00	0.00	0.00
Delivery charges Abidjan-to-Wholesale Korhogo															
Transport		35.00	633.00	22155.00	0.00	0.00	22155.00	0.00	0.00	22155.00	22155.00	0.00	0.00	0.00	0.00
Distribution				2500.00	0.00	0.00	2500.00	0.00	0.00	2500.00	2500.00	0.00	0.00	0.00	0.00
Delivery charges Abidjan-to-Border															
Transport		35.00	740.00	25900.00	0.00	0.00	25900.00	0.00	0.00	25900.00	25900.00	0.00	0.00	0.00	0.00
Distribution				2500.00	0.00	0.00	2500.00	0.00	0.00	2500.00	2500.00	0.00	0.00	0.00	0.00
CIF Price, RCI-Mali Frontier	CFAF/ton			81741.36	0.00	0.00	39941.36	0.00	0.00	39941.36	39941.36	0.00	0.00	0.00	0.00

	UNITS	UANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/S DIRECT TRAD.	UBSIDIES INPUTS NONTRAD.	FINANCIAL COST	TAXES/S INDIREC TRAD.	UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
Delivery charges Border-to-Wholesale Sikasso															
Customs duties	5%			4087.07	4087.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Import duties	10%			8174.14	8174.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Handling	CFAF/ton			1250.00	0.00	0.00	1250.00	125.00	25.00	1100.00	637.50	0.00	412.50	50.00	0.00
Finance Charge	CFAF/ton			3456.00	0.00	0.00	3456.00	0.00	0.00	3456.00	0.00	0.00	0.00	3456.00	0.00
Insurance	CFAF/ton			1424.00	0.00	0.00	1424.00	0.00	0.00	1424.00	0.00	0.00	0.00	0.00	0.00
Sales tax	11.1% CIF frontier + import tax			9980.62	9980.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPS	5% CIF			4087.07	4087.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OSRP	CFAF/ton			5000.00	5000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton			2000.00	0.00	0.00	2000.00	200.00	100.00	1700.00	880.00	0.00	300.00	520.00	0.00
Delivery charges Sikasso-to-farm															
Transport	CFAF/ton			3125.00	0.00	0.00	3125.00	312.50	156.25	2656.25	1375.00	0.00	468.75	812.50	0.00
Distribution	CFAF/ton			2500.00	0.00	0.00	2500.00	75.00	400.00	2025.00	275.00	0.00	1050.00	700.00	0.00

	UNITS	UANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/S UBSIDIES DIRECT TRAD.	INPUTS NONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC TRAD.	T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
DELIVERY CHARGES ABIDJAN-TO-WHSALE BOUAKE (CFAF/ton)				14715.00	0.00	0.00	14715.00	0.00	0.00	14715.00	14715.00	0.00	0.00	0.00	0.00
DELIVERY CHARGES ABIDJAN-TO-WHSALE BOUAKE (CFAF/kg)				14.72	0.00	0.00	14.72	0.00	0.00	14.72	14.72	0.00	0.00	0.00	0.00
DELIVERY CHARGES ABIDJAN-TO-WHSALE KORHOGO (CFAF/ton)				24655.00	0.00	0.00	24655.00	0.00	0.00	24655.00	24655.00	0.00	0.00	0.00	0.00
DELIVERY CHARGES ABIDJAN-TO-WHSALE KORHOGO (CFAF/kg)				24.66	0.00	0.00	24.66	0.00	0.00	24.66	24.66	0.00	0.00	0.00	0.00
DELIVERY CHARGES ABIDJAN-TO-BORDER (CFAF/ton)				28400.00	0.00	0.00	28400.00	0.00	0.00	28400.00	28400.00	0.00	0.00	0.00	0.00
DELIVERY CHARGES ABIDJAN-TO-BORDER (CFAF/kg)				28.40	0.00	0.00	28.40	0.00	0.00	28.40	28.40	0.00	0.00	0.00	0.00
DELIVERY CHARGES BORDER-TO-SIKASSO (CFAF/ton)				39458.80	31328.80	0.00	8130.00	325.00	125.00	7680.00	1517.50	0.00	712.50	4026.00	0.00
DELIVERY CHARGES BORDER-TO-SIKASSO (CFAF/kg)				39.46	31.33	0.00	8.13	0.33	0.13	7.68	1.52	0.00	0.71	4.03	0.00
DELIVERY CHARGES SIKASSO-TO-FARM (CFAF/ton)				5625.00	0.00	0.00	5625.00	387.50	556.25	4681.25	1650.00	0.00	1518.75	1512.50	0.00
DELIVERY CHARGES SIKASSO-TO-FARM (CFAF/kg)				5.63	0.00	0.00	5.63	0.39	0.56	4.68	1.65	0.00	1.52	1.51	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT IN ABIDJAN (CFAF/kg)				53.34	0.00	0.00	53.34	0.00	0.00	53.34	53.34	0.00	0.00	0.00	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT IN BOUAKE (CFAF/kg)				68.06	0.00	0.00	68.06	0.00	0.00	68.06	68.06	0.00	0.00	0.00	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT IN KORHOGO (CFAF/kg)				78.00	0.00	0.00	78.00	0.00	0.00	78.00	78.00	0.00	0.00	0.00	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT IN BORDER (CFAF/kg)				81.74	0.00	0.00	81.74	0.00	0.00	81.74	81.74	0.00	0.00	0.00	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT IN SIKASSO (CFAF/kg)				121.20	31.33	0.00	89.87	0.33	0.13	89.42	83.26	0.00	0.71	4.03	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT AT FARM (CFAF/kg)				126.83	31.33	0.00	95.50	0.71	0.68	94.10	84.81	0.00	2.23	5.54	0.00

CROP: MILLET/SORGHUM, MALI SUD, ANIMAL TRACTION

CALCULATION OF ECON INDICATORS: FARM LEVEL AND RURAL MARKET LEVEL

a249...m314,t314

ANALYSIS OF FARM PRODUCTION ONLY	CASH BASIS	IMPUTED VALUE	ANALYSIS AT RURAL MARKET	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS			FINANCIAL PROFITABILITY ANALYSIS		
FARMGATE PRICE (CFAF/kg)	60.00	60.00	RURAL MARKET PRICE (CFAF/kg)	70.00	70.00
TRADABLES, FINANCIAL PRICES	16.26	16.26	TRADABLES, FINANCIAL PRICES	20.93	20.93
VALUE ADDED IN FINANCIAL PRICES	43.74	43.74	VALUE ADDED IN FINANCIAL PRICES	49.07	49.07
VALUE OF NON-TRADABLES IN FINANCIAL PRICES			VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	43.75	FAMILY LABOR COSTS	0.00	43.76
HIRED LABOR COSTS	2.81	2.81	HIRED LABOR COSTS	6.86	6.86
CAPITAL COSTS	4.59	4.59	CAPITAL COSTS	7.79	7.79
LAND COSTS	0.00	0.00	LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	0.69	0.69	TAXES/SUBSIDIES ON NONTRADABLES	2.20	2.20
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	8.09	51.84	TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	16.84	60.59
FINANCIAL PROFITABILITY TO FARMER (CFAF/kg)	35.65	-8.10	FINANCIAL PROFITABILITY AT WHOLESALE SIKASSO (CFAF/kg)	32.23	-11.52

ECONOMIC PROFITABILITY ANALYSIS		ECONOMIC PROFITABILITY ANALYSIS	
TRADABLE FARM PARITY PRICE, ECONOMIC @ OER (CFAF/kg)	92.68	TRADABLE RURAL PARITY PRICE, ECONOMIC @ OER (CFAF/kg)	88.00
TRADABLES IN ECONOMIC PRICES @ OER	14.93	TRADABLES IN ECONOMIC PRICES @ OER	19.04
VALUE ADDED IN ECONOMIC PRICES @ OER	77.75	VALUE ADDED IN ECONOMIC PRICES @ OER	68.96
TRADABLE FARM PARITY PRICE, ECONOMIC @ SER (CFAF/kg)	126.42	TRADABLE RURAL PARITY PRICE, ECONOMIC @ SER (CFAF/kg)	120.73
TRADABLES IN ECONOMIC PRICES @ SER	19.86	TRADABLES IN ECONOMIC PRICES @ SER	25.32
VALUE ADDED IN ECONOMIC PRICES @ SER	106.56	VALUE ADDED IN ECONOMIC PRICES @ SER	95.40
VALUE OF NON-TRADABLES IN SHADOW PRICES		VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00	SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	43.75	FAMILY LABOR COSTS IN SHADOW PRICES	43.75
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00	SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	2.81	HIRED LABOR COSTS IN SHADOW PRICES	6.85
SHADOW CAPITAL COST COEFFICIENT	1.00	SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	4.59	CAPITAL COSTS IN SHADOW PRICES	7.79
SHADOW LAND COST COEFFICIENT	1.00	SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	0.00	LAND COSTS IN SHADOW PRICES	0.00
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	51.16	TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	58.39
ECONOMIC PROFITABILITY AT FARM LEVEL (CFAF/kg)	55.41	ECONOMIC PROFITABILITY AT WHOLESALE SIKASSO (CFAF/kg)	37.02

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS		PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.65	NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.80
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.49	NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.60
NOMINAL PROTECTION COEFFICIENT, INPUTS	1.09	NOMINAL PROTECTION COEFFICIENT, INPUTS	1.10
NET NOMINAL PROTECTION COEFFICIENT, INPUTS	0.82	NET NOMINAL PROTECTION COEFFICIENT, INPUTS	0.83
EFFECTIVE PROTECTION COEFFICIENT	0.56	EFFECTIVE PROTECTION COEFFICIENT	0.71
NET EFFECTIVE PROTECTION COEFFICIENT	0.42	NET EFFECTIVE PROTECTION COEFFICIENT	0.53
EFFECTIVE SUBSIDY COEFFICIENT	0.76	EFFECTIVE SUBSIDY COEFFICIENT	0.68
NET EFFECTIVE SUBSIDY COEFFICIENT	0.57	NET EFFECTIVE SUBSIDY COEFFICIENT	0.61
DOMESTIC RESOURCE COST COEFFICIENT	0.48	DOMESTIC RESOURCE COST COEFFICIENT	0.61

CROP: MILLET/SORGHUM, MALI SUD, ANIMAL TRACTION | FINANCIAL

CALCULATION OF ECON INDICATORS: BAMAKO | CALCULATION OF ECON INDICATORS: WHOLESALE KORHOGO

ANALYSIS AT WHOLESALE BAMAKO	CASH BASIS	IMPUTED VALUE	ANALYSIS AT WHOLESALE KORHOGO	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS			FINANCIAL PROFITABILITY ANALYSIS		
WHOLESALE PRICE (CFAF/kg)	80.00	80.00	BORDER WHOLESALE MARKET PRICE (CFAF/kg)	105.00	105.00
TRADABLES, FINANCIAL PRICES	25.55	25.55	TRADABLES, FINANCIAL PRICES	29.48	29.48
VALUE ADDED IN FINANCIAL PRICES	54.45	54.45	VALUE ADDED IN FINANCIAL PRICES	75.52	75.52
VALUE OF NON-TRADABLES IN FINANCIAL PRICES			VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	43.75	FAMILY LABOR COSTS	0.00	43.75
HIRED LABOR COSTS	10.42	10.42	HIRED LABOR COSTS	7.36	7.36
CAPITAL COSTS	11.29	11.29	CAPITAL COSTS	8.45	8.45
LAND COSTS	0.00	0.00	LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	3.51	3.51	TAXES/SUBSIDIES ON NONTRADABLES	2.38	2.38
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	25.22	68.97	TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	18.19	61.94
FINANCIAL PROFITABILITY AT WHOLESALE BAMAKO (CFAF/kg)	29.23	-14.52	FINANCIAL PROFITABILITY AT WHOLESALE KORHOGO (CFAF/kg)	57.33	13.58

ECONOMIC PROFITABILITY ANALYSIS

TRADABLE WHOLESALE PARITY PRICE, ECONOMIC ● OER (CFAF	82.84
TRADABLES IN ECONOMIC PRICES ● OER	22.78
VALUE ADDED IN ECONOMIC PRICES ● OER	60.06
TRADABLE WHOLESALE PARITY PRICE, ECONOMIC ● SER (c/kg)	110.59
TRADABLES IN ECONOMIC PRICES ● SER	30.30
VALUE ADDED IN ECONOMIC PRICES ● SER	80.29
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	43.75
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	10.42
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	11.29
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	0.00
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	65.46
ECONOMIC PROFITABILITY AT WHOLESALE BAMAKO (CFAF/kg)	14.83

ECONOMIC PROFITABILITY ANALYSIS

TRADABLE WHOLESALE BORDER PARITY PRICE, ECONOMIC ● OER	78.00
TRADABLES IN ECONOMIC PRICES ● OER	27.38
VALUE ADDED IN ECONOMIC PRICES ● OER	50.62
TRADABLE RURAL PARITY PRICE, ECONOMIC ● SER (CFAF/kg)	109.19
TRADABLES IN ECONOMIC PRICES ● SER	38.33
VALUE ADDED IN ECONOMIC PRICES ● SER	70.87
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	43.75
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	7.36
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	8.45
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	0.00
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	59.56
ECONOMIC PROFITABILITY AT WHOLESALE KORHOGO (CFAF/kg)	11.31

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.87
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.73
NOMINAL PROTECTION COEFFICIENT, INPUTS	1.12
NET NOMINAL PROTECTION COEFFICIENT, INPUTS	0.84
EFFECTIVE PROTECTION COEFFICIENT	0.81
NET EFFECTIVE PROTECTION COEFFICIENT	0.68
EFFECTIVE SUBSIDY COEFFICIENT	0.86
NET EFFECTIVE SUBSIDY COEFFICIENT	0.64
DOMESTIC RESOURCE COST COEFFICIENT	0.82

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.36
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.01
NOMINAL PROTECTION COEFFICIENT, INPUTS	1.08
NET NOMINAL PROTECTION COEFFICIENT, INPUTS	0.81
EFFECTIVE PROTECTION COEFFICIENT	1.49
NET EFFECTIVE PROTECTION COEFFICIENT	1.12
EFFECTIVE SUBSIDY COEFFICIENT	1.44
NET EFFECTIVE SUBSIDY COEFFICIENT	1.09
DOMESTIC RESOURCE COST COEFFICIENT	0.84

ANALYSIS AT WHOLESALE BOUAKE	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
WHOLESALE PRICE (CFAF/kg)	110.00	110.00
TRADABLES, FINANCIAL PRICES	38.27	38.27
VALUE ADDED IN FINANCIAL PRICES	71.73	71.73
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	43.75
HIRED LABOR COSTS	7.36	7.36
CAPITAL COSTS	8.45	8.45
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	2.38	2.38
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	18.19	61.94
FINANCIAL PROFITABILITY AT WHOLESALE BOUAKE (CFAF/kg)	53.54	9.79

ANALYSIS AT WHOLESALE ABIDJAN	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
WHOLESALE PRICE (CFAF/kg)	125.00	125.00
TRADABLES, FINANCIAL PRICES	50.48	50.48
VALUE ADDED IN FINANCIAL PRICES	74.52	74.52
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	43.75
HIRED LABOR COSTS	7.36	7.36
CAPITAL COSTS	8.45	8.45
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	2.38	2.38
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	18.19	61.94
FINANCIAL PROFITABILITY AT WHOLESALE ABIDJAN (CFAF/kg)	56.33	12.58

ECONOMIC PROFITABILITY ANALYSIS

TRADABLE WHOLESALE PARITY PRICE, ECONOMIC ● OER (CFA	68.06
TRADABLES IN ECONOMIC PRICES ● OER	36.16
VALUE ADDED IN ECONOMIC PRICES ● OER	31.90
TRADABLE WHOLESALE PARITY PRICE, ECONOMIC ● SER (c/kg)	96.28
TRADABLES IN ECONOMIC PRICES ● SER	50.62
VALUE ADDED IN ECONOMIC PRICES ● SER	44.66
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	43.75
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	7.36
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	8.45
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	0.00
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	59.56
ECONOMIC PROFITABILITY AT WHOLESALE BOUAKE (CFAF/kg)	-14.90

ECONOMIC PROFITABILITY ANALYSIS

TRADABLE WHOLESALE PARITY PRICE, ECONOMIC ● OER (CFAF	53.34
TRADABLES IN ECONOMIC PRICES ● OER	48.38
VALUE ADDED IN ECONOMIC PRICES ● OER	4.97
TRADABLE WHOLESALE PARITY PRICE, ECONOMIC ● SER (c/kg)	74.68
TRADABLES IN ECONOMIC PRICES ● SER	67.73
VALUE ADDED IN ECONOMIC PRICES ● SER	6.96
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	43.75
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	7.36
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	8.45
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	0.00
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	59.56
ECONO PROFITABILITY AT WHOLESALE ABIDJAN (CFAF/kg)	-52.60

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.62
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.22
NOMINAL PROTECTION COEFFICIENT, INPUTS	1.06
NET NOMINAL PROTECTION COEFFICIENT, INPUTS	0.80
EFFECTIVE PROTECTION COEFFICIENT	2.26
NET EFFECTIVE PROTECTION COEFFICIENT	1.69
EFFECTIVE SUBSIDY COEFFICIENT	2.17
NET EFFECTIVE SUBSIDY COEFFICIENT	1.63
DOMESTIC RESOURCE COST COEFFICIENT	1.33

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	2.34
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.76
NOMINAL PROTECTION COEFFICIENT, INPUTS	1.04
NET NOMINAL PROTECTION COEFFICIENT, INPUTS	0.78
EFFECTIVE PROTECTION COEFFICIENT	15.01
NET EFFECTIVE PROTECTION COEFFICIENT	11.28
EFFECTIVE SUBSIDY COEFFICIENT	14.53
NET EFFECTIVE SUBSIDY COEFFICIENT	10.82
DOMESTIC RESOURCE COST COEFFICIENT	8.57

TABLE B-4. CALCULATION OF RICE DRC, FINANCIAL PROFITABILITY AND PROTECTION COEFFICIENTS

FILE NAME: RETAIL.WK1 CROP: RICE, OFFICE DU NIGER, INTENSIVE IRRIGATION

CROP: RICE, OFFICE DU NIGER, INTENSIVE IRRIGATION
SENSITIVITY ANALYSIS + KEY PARAMETERS
a3...q57 (IMPORT-SUBSTITUTION)

19-Feb-94	.....................RESULT SUMMARY AND SENTIVITY ANALYSIS..................						
03:19 PM	FARM	NIONO	BAMAKO	SIKASSO	KORHOGO	BOUAKE	ABIDJAN
FINANCIAL PROFITABILITY (RICE), cash basis							
...CFAF/kg	58.61	67.64	85.70	81.36	30.70	41.82	38.70
...CFAF/hectare	198861.04	229515.56	290796.39	276036.06	104171.49	142226.01	134710.11
...CFAF/total labor	1473.04	1700.12	2154.05	2044.71	771.64	1053.53	997.86
...CFAF/total family labor	1473.04	1700.12	2154.05	2044.71	771.64	1053.53	997.86
FINANCIAL PROFITABILITY (RICE), imputed value							
...CFAF/kg	32.75	42.44	60.50	56.15	5.50	16.72	14.50
...CFAF/hectare	111111.04	144019.50	205300.33	190539.99	18675.43	56729.94	49214.05
ECONOMIC PROFITABILITY (RICE)							
...CFAF/kg	27.47	13.54	-10.13	-9.93	-41.59	-61.84	-102.58
...CFAF/hectare	93209.52	45938.01	-34359.65	-33687.90	-141133.37	-209848.65	-348063.06
...CFAF/total labor	2831.16	2660.38	1935.47	2024.64	823.56	15.62	-1609.48
...CFAF/total family labor	1799.41	1656.13	930.23	1019.40	-181.69	-988.63	-2614.72
NOMINAL PROTECTION COEFFICIENT, OUTPUTS	1.10	1.34	1.76	1.81	1.52	1.81	2.30
NET NOMINAL PROTECTION COEFFICIENT, OUTP	0.83	1.01	1.33	1.36	1.14	1.36	1.73
EFFECTIVE PROTECTION COEFFICIENT	1.10	1.43	2.14	2.29	2.00	3.25	32.67
NET EFFECTIVE PROTECTION COEFFICIENT	0.82	1.08	1.61	1.71	1.51	2.44	24.56
DOMESTIC RESOURCE COST	0.74	0.87	1.11	1.10	1.61	2.28	14.29

DISCOUNT RATE		0.080
YIELD (kg/ha)		5396.000
PROCESSING CONVERSION FACTOR		0.630
WORLD FOB PRICE ($/ton)		287.000
FARMGATE PRICE (CFAF/kg paddy)		70.000
RURAL MARKET PRICE (CFAF/kg rice)		150.000
WHOLESALE PRICE BAMAKO (CFAF/kg rice)		185.000
WHOLESALE PRICE SIKASSO (CFAF/kg rice)		190.000
WHOLESALE PRICE KORHOGO (CFAF/kg rice)		160.000
WHOLESALE PRICE BOUAKE (CFAF/kg rice)		180.000
WHOLESALE PRICE ABIDJAN (CFAF/kg rice)		190.000
OFFICIAL EXCHANGE RATE		275.000
SHADOW EXCHANGE RATE IN MALI	0.33	365.750
SHADOW EXCHANGE RATE IN COTE D'IVOIRE	0.40	385.000
TRANSPORT COST, FARM-TO-NIONO (CFAF/ton)		3125.000
TRANSPORT COST, NIONO-TO-BAMAKO (CFAF/ton)		6000.000
TRANSPORT COST, BAMAKO-TO-SIKASSO (CFAF/ton)		7000.000
TRANSPORT COST, BAMAKO-TO-RCI BORDER (CFAF/ton)		9000.000
TRANSPORT COST, DAKAR-TO-MALI BORDER (CFAF/ton)		13500.000
TRANSPORT COST, SENEGAL-MALI BORDER-TO-BAMAKO		9677.000
TRANSPORT RATE, PRIVATE, COTE D'IVOIRE (CFAF/ton-km)		35.000
TRANSPORT RATE, CGPP, COTE D'IVOIRE (CFAF/ton-km)		20.000
TRANSPORT COST, RCI-MALI BORDER-TO-SIKASSO (CFAF/ton)		2000.000
LABOR WAGE RATE (CFAF/day)		650.000
EXTENSION COSTS (CFAF/ha)		13000.000
LAND ECONOMIC VALUE (CFAF/ha)		96260.000

CROP: RICE, OFFICE DU NIGER, I FARM BUDGET a60...p181	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/SUBSIDIES DIRECT TRAD.	TAXES/SUBSIDIES INPUTS ONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC T TRAD.	TAXES/S UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
FARM PRODUCTION															
LABOR	person days														
spring maintenance															
plowing															
harrowing before seeding															
seeding															
weeding															
fertilizer application															
irrigation															
thinning															
pest control															
harvesting															
binding															
transport															
threshing															
winnowing															
miscellaneous															
Sub-total, family labor		135.00	650.00	87750.00	0.00	0.00	87750.00	0.00	0.00	87750.00	0.00	87750.00	0.00	0.00	0.00
Sub-total, hired labor		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Labor		135.00		87750.00	0.00	0.00	87750.00	0.00	0.00	87750.00	0.00	87750.00	0.00	0.00	0.00
SEED															
improved	kg	150.00	130.00	19500.00	0.00	0.00	19500.00	780.00	780.00	17940.00	5655.00	0.00	10335.00	1950.00	0.00
unimproved	kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITURE	TAXES/SUBSIDIES DIRECT INPUTS TRAD.	NONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC T INPUTS TRAD.	NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
OTHER INPUTS															
insecticides	litres	0.00					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
fertilizer															
ammonia phosphate	kg	113.00	130.00	14690.00	0.00	0.00	14690.00	1322.10	440.70	12927.20	7051.20	0.00	5141.50	734.50	0.00
Urea	kg	175.00	110.00	19250.00	0.00	0.00	19250.00	1732.50	577.50	16940.00	9240.00	0.00	6737.50	962.50	0.00
sacks	kg			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sheets	number			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
storage chemical	grams			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
seed dressing	grams			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
batteries	number			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
extension	lumpsum	1.00		0.00	-2600.00	-10400.00	13000.00	650.00	2340.00	10010.00	1950.00	0.00	7670.00	390.00	0.00
Land Economic Cost	CFAF/ha									96260.00					96260.00
CAPITAL RECOVERY	INVESTMENT COST	EXPECTED LIFE	NNUITY COEFF	CAP RECOV COST											
land clearing labor			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
hoes			0.00	500.00	0.00	0.00	500.00	75.00	25.00	400.00	275.00	0.00	90.00	35.00	0.00
sickles			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
cutlasses			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sacks			0.00	35345.63	0.00	0.00	35345.63	5301.84	1767.28	28276.50	19440.09	0.00	6362.21	2474.19	0.00
harrow	3757.50	5.00	0.25	941.09	0.00	0.00	941.09	0.00	18.82	922.27	875.21	0.00	47.06	0.00	0.00
cart	5635.00	5.00	0.25	1411.32	0.00	0.00	1411.32	0.00	28.23	1383.10	1312.53	0.00	70.57	0.00	0.00
plow	8000.00	5.00	0.25	2003.65	0.00	0.00	2003.65	0.00	40.07	1963.58	1863.40	0.00	100.18	0.00	0.00
pump			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
irrigation, labor			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
animals (a pair)	7833.00	5.00	0.25	1961.83	0.00	0.00	1961.83	0.00	0.00	1961.83	0.00	0.00	0.00	1961.83	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/SUBSIDIES DIRECT INPUTS TRAD.	NONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC T INPUTS TRAD.	NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
OPERATING COST															
O + M, irrigation	cost/ha			42000.00	0.00	0.00	42000.00	2520.00	1680.00	37800.00	17640.00	0.00	16380.00	3780.00	0.00
O + M, implements	cost/ha			1739.25	0.00	0.00	1739.25	208.71	139.14	1391.40	695.70	0.00	626.13	69.57	0.00
threshing	cost/ha			30161.60	0.00	0.00	30161.60	0.00	1809.70	28351.90	22017.97	0.00	6032.32	301.62	0.00
O + M, animal	cost/ha			4762.00	0.00	0.00	4762.00	0.00	95.24	4666.76	4190.56	0.00	238.10	238.10	0.00
WORKING CAPITAL															
3-month				1755.00	0.00	0.00	1755.00	0.00	0.00	1755.00	0.00	0.00	0.00	1755.00	0.00
6-month				2137.60	0.00	0.00	2137.60	0.00	0.00	2137.60	0.00	0.00	0.00	2137.60	0.00
TOTAL FARM COSTS (raw)	CFAF/ha			265908.96	-2600.00	-10400.00	278908.96	12580.15	9741.68	362837.13	92206.66	87750.00	59830.57	16789.91	96260.00
Total Value of (By-product)	CFAF/ha	125.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NET TOTAL FARM COSTS (r	CFAF/ha			265908.96	-2600.00	-10400.00	278908.96	12580.15	9741.68	362837.13	92206.66	87750.00	59830.57	16789.91	96260.00
YIELD	kg/ha	5386.00													
NET UNIT TOTAL FARM COS	CFAF/kg		·	49.37	-0.48	-1.93	51.78	2.34	1.81	65.51	17.12	16.29	11.11	3.12	17.87
NET UNIT TOTAL FARM COS	CFAF/kg			78.37	-0.77	-3.06	82.20	3.71	2.87	103.96	27.17	25.86	17.63	4.96	28.37

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/SUBSIDIE DIRECT TRAD.	INPUTS ONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC TRAD.	T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
COLLECTION (FARM-TO-RURAL MARKET)															
Transport	FAF/ton-km			3125.00	0.00	0.00	3125.00	312.50	156.25	2656.25	1375.00	0.00	468.75	812.50	0.00
Handling, storage, margins	CFAF/ton			5640.00	0.00	0.00	5640.00	169.20	902.40	4568.40	620.40	0.00	2368.80	1579.20	0.00
Losses (3% /ton prod cost)	prod cost			2100.00	0.00	0.00	2100.00	0.00	0.00	2100.00	2100.00	0.00	0.00	0.00	0.00
TOTAL COLLECTION COSTS (Pad	CFAF/ton			10865.00	0.00	0.00	10865.00	481.70	1058.65	9324.65	4095.40	0.00	2837.55	2391.70	0.00
TOTAL COLLECTION COSTS (Rice	CFAF/ton			17246.03	0.00	0.00	17246.03	764.60	1680.40	14801.03	6500.63	0.00	4504.05	3796.35	0.00
	CFAF/kg			17.25	0.00	0.00	17.25	0.76	1.68	14.80	6.50	0.00	4.50	3.80	0.00
TOTAL PRODUCTION + COLLECT	CFAF/kg			95.61	-0.77	-3.06	98.44	4.48	4.56	118.79	33.67	25.86	22.14	8.74	28.37
PROCESSING															
Milling and packaging	CFAF/ton	(Rice)		14880.95	0.00	0.00	14880.95	1636.90	744.05	12500.00	3571.43	0.00	6547.62	2380.95	0.00
By-Products	CFAF/ton			-2936.51	0.00	0.00	-2936.51	-156.99	-136.02	-3372.17	-958.70	-664.25	-736.78	-285.77	-728.67
TOTAL PROCESSING COSTS	CFAF/ton	(Rice)		11944.44	0.00	0.00	11944.44	1479.91	608.03	9127.83	2614.73	-664.25	5810.84	2095.18	-728.67
	CFAF/kg			11.94	0.00	0.00	11.94	1.48	0.61	9.13	2.61	-0.66	5.81	2.10	-0.73
TOTAL PRODUCTION + COLLECTION + PROCESSING	CFAF/kg			107.56	-0.77	-3.06	111.39	5.96	5.16	127.91	36.29	25.20	27.95	10.84	27.64
DISTRIBUTION (RURAL MARKET-TO-WHSALE															
Handling, bulking, other costs	CFAF/ton			10840.00	0.00	0.00	10840.00	328.20	1750.40	8881.40	1203.40	0.00	4584.80	3083.20	0.00
Transport	FAF/ton-km			6000.00	0.00	0.00	6000.00	600.00	300.00	5100.00	2640.00	0.00	900.00	1560.00	0.00
Losses	CFAF/ton			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS (pro	CFAF/ton			16840.00	0.00	0.00	16840.00	928.20	2050.40	13981.40	3843.40	0.00	5484.80	4623.20	0.00
TOTAL DISTRIBUTION COSTS (pro	CFAF/kg			16.84	0.00	0.00	16.84	0.93	2.05	13.98	3.84	0.00	5.48	4.62	0.00
TOTAL COSTS INCL. PRODUCTION, COLLECTION, PROCESSING, DISTRIBUTION	CFAF/kg			124.50	-0.77	-3.06	128.33	6.89	7.21	141.87	40.13	25.20	33.44	15.46	27.64

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/SUBSIDIE DIRECT TRAD.	TAXES/SUBSIDIE INPUTS ONTRAD.	FINANCIAL COST	TAXES/S UBSIDIES INDIREC TRAD.	TAXES/S UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
DISTRIBUTION (BAMAKO-TO-WHSALE SIKASS															
Handling, storage, other costs	CFAF/ton			2360.00	0.00	0.00	2360.00	70.50	378.00	1903.50	258.50	0.00	987.00	658.00	0.00
Transport	CFAF/ton			7000.00	0.00	0.00	7000.00	700.00	350.00	5960.00	3080.00	0.00	1050.00	1820.00	0.00
TOTAL DISTRIBUTION COSTS TO	CFAF/ton			9360.00	0.00	0.00	9360.00	770.50	728.00	7863.50	3338.50	0.00	2037.00	2478.00	0.00
TOTAL DISTRIBUTION COSTS TO	CFAF/kg			9.36	0.00	0.00	9.36	0.77	0.73	7.86	3.34	0.00	2.04	2.48	0.00
TOTAL COST TO SIKASSO	CFAF/kg			133.86	-0.77	-3.06	137.68	7.65	7.94	149.73	43.47	26.20	35.48	17.94	27.64
DISTRIBUTION (BAMAKO-TO-BORDER)															
Handling	CFAF/ton			500.00	0.00	0.00	500.00	15.00	80.00	405.00	55.00	0.00	210.00	140.00	0.00
Transport	CFAF/ton			9000.00	0.00	0.00	9000.00	900.00	450.00	7660.00	3960.00	0.00	1350.00	2340.00	0.00
TOTAL DISTRIBUTION COSTS TO	CFAF/ton			9500.00	0.00	0.00	9500.00	915.00	530.00	8065.00	4015.00	0.00	1560.00	2480.00	0.00
TOTAL DISTRIBUTION COSTS TO	CFAF/kg			9.50	0.00	0.00	9.50	0.92	0.53	8.06	4.02	0.00	1.56	2.48	0.00
TOTAL COST TO BORDER	CFAF/kg			134.00	-0.77	-3.06	147.18	8.57	8.47	157.78	47.49	26.20	37.04	20.42	27.64
DISTRIBUTION (BORDER-TO-KORHOGO)															
Handling, storage, other costs	CFAF/ton			6250.00	0.00	0.00	6250.00	0.00	0.00	6250.00	6250.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton	35.00	140.00	4900.00	0.00	0.00	4900.00	0.00	0.00	4900.00	4900.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO	CFAF/ton			11150.00	0.00	0.00	11150.00	0.00	0.00	11150.00	11150.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO	CFAF/kg			11.15	0.00	0.00	11.15	0.00	0.00	11.15	11.15	0.00	0.00	0.00	0.00
TOTAL COST TO KORHOGO	CFAF/kg			145.15	-0.77	-3.06	158.33	8.57	8.47	168.93	58.64	26.20	37.04	20.42	27.64

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/SUBSIDIE DIRECT TRAD.	TAXES/SUBSIDIE INPUTS ONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIRECT INPUTS TRAD.	TAXES/SUBSIDIES INDIRECT INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	NON-TRADABLE INPUTS: FAMILY LABOR	NON-TRADABLE INPUTS: HIRED LABOR	NON-TRADABLE INPUTS: CAPITAL	NON-TRADABLE INPUTS: LAND
DISTRIBUTION (BORDER-TO-BOUAKE)															
Handling, storage, other costs	CFAF/ton			6250.00	0.00	0.00	6250.00	0.00	0.00	6250.00	6250.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton	35.00	391.00	13685.00	0.00	0.00	13685.00	0.00	0.00	13685.00	13685.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO	CFAF/ton			19935.00	0.00	0.00	19935.00	0.00	0.00	19935.00	19935.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO	CFAF/kg			19.94	0.00	0.00	19.94	0.00	0.00	19.94	19.94	0.00	0.00	0.00	0.00
TOTAL COST TO BOUAKE	CFAF/kg			153.93	-0.77	-3.06	167.11	8.57	8.47	177.72	67.42	26.20	37.04	20.42	27.64
DISTRIBUTION (BORDER-TO-ABIDJAN)															
Handling, storage, other costs	CFAF/ton			6250.00	0.00	0.00	6250.00	0.00	0.00	6250.00	6250.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton	35.00	740.00	25900.00	0.00	0.00	25900.00	0.00	0.00	25900.00	25900.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO	CFAF/ton			32150.00	0.00	0.00	32150.00	0.00	0.00	32150.00	32150.00	0.00	0.00	0.00	0.00
TOTAL DISTRIBUTION COSTS TO	CFAF/kg			32.15	0.00	0.00	32.15	0.00	0.00	32.15	32.15	0.00	0.00	0.00	0.00
TOTAL COST TO ABIDJAN				166.15	-0.77	-3.06	179.33	8.57	8.47	189.93	79.64	26.20	37.04	20.42	27.64

INTERNATIONAL REFERENCE PRICE	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/SUBSIDIES DIRECT INPUTS TRAD.	TAXES/SUBSIDIES DIRECT INPUTS NONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIRECT INPUTS TRAD.	TAXES/SUBSIDIES INDIRECT INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	........NON-TRADABLE INPUTS........ FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
FOB Price in $ US	$/ton	1.00	287.00	287.00			287.00			287.00	287.00				
Freight, Insurance	$/ton	1.00	48.00	48.00			48.00			48.00	48.00				
Quality Adjustment	-30%	1.00	-86.10	-86.10			-86.10			-86.10	-86.10				
CIF Price in $ US	$/ton			248.90			248.90			248.90	248.90				
Official Exchange Rate	CFAF/$			275.00			275.00			275.00	275.00				
CIF Price in Local Currency	CFAF/ton			68447.50			68447.50			68447.50	68447.50				
CIF Price in Local Currency	CFAF/kg			68.45			68.45			68.45	68.45				
Port Charges in Dakar															
Port fees	CFAF/ton			5270.00			5270.00			5270.00	5270.00				
Storage and handling	CFAF/ton			3680.00			3680.00			3680.00	3680.00				
Transit	CFAF/ton			2000.00			2000.00			2000.00	2000.00				
Interest and Insurance (5% CIF)	CFAF/ton			3422.38			3422.38			3422.38	3422.38				
Delivery charges, port-to-border															
Transport	CFAF/ton			13500.00	0.00	0.00	13500.00	0.00	0.00	13500.00	13500.00	0.00	0.00	0.00	0.00
CIF price, Mali-Senegal frontier	CFAF/ton			96319.88	0.00	0.00	96319.88	0.00	0.00	96319.88	96319.88	0.00	0.00	0.00	0.00

	UNITS QUANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/SUBSIDIES DIRECT TRAD.	INPUTS NONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIRECT TRAD.	INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	NON-TRADABLE INPUTS FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
Delivery charges, border of Senegal-to-Bamako														
Customs duties	5%		4815.90	4815.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Import duties	10%		9631.80	9631.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sales tax	11.1% CIF frontier + import tax		11228.08	11228.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPS	5% CIF		4815.90	4815.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OSRP	CFAF/ton		5000.00	5000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton		9677.00	0.00	0.00	9677.00	967.70	193.54	8515.76	4935.27	0.00	3193.41	387.08	0.00
Delivery charges, Bamako to rural market (Niono)														
Transport	CFAF/ton		6000.00	0.00	0.00	6000.00	600.00	300.00	5100.00	2640.00	0.00	900.00	1560.00	0.00
Distribution	CFAF/ton		2360.00	0.00	0.00	2360.00	236.00	47.00	2068.00	1198.50	0.00	775.50	94.00	0.00
Delivery charges, Rural Market to Farm														
Transport	CFAF/ton		3125.00	0.00	0.00	3125.00	312.50	156.25	2656.25	1375.00	0.00	468.75	812.50	0.00
Distribution	CFAF/ton		2350.00	0.00	0.00	2350.00	235.00	47.00	2068.00	1198.50	0.00	775.50	94.00	0.00
DELIVERY CHARGES BORDER-TO-WHSALE BAMAKO (CFAF/ton)			45167.08	35490.08	0.00	9677.00	967.70	193.54	8515.76	4935.27	0.00	3193.41	387.08	0.00
DELIVERY CHARGES BORDER-TO-WHSALE BAMAKO (CFAF/kg)			45.17	35.49	0.00	9.68	0.97	0.19	8.52	4.94	0.00	3.19	0.39	0.00
DELIVERY CHARGES BORDER-TO-RURAL MKT (CFAF/ton)			53517.08	35490.08	0.00	18027.00	1802.70	540.54	15683.76	8773.77	0.00	4868.91	2041.08	0.00
DELIVERY CHARGES BORDER-TO-RURAL MKT (CFAF/Kg)			53.52	35.49	0.00	18.03	1.80	0.54	15.68	8.77	0.00	4.87	2.04	0.00
DELIVERY CHARGES BORDER-TO-FARM (CFAF/ton)			56902.08	35490.08	0.00	5475.00	547.50	203.25	4724.25	2573.50	0.00	1244.25	906.50	0.00
DELIVERY CHARGES BORDER-TO-FARM (CFAF/Kg)			56.90	35.49	0.00	5.48	0.55	0.20	4.72	2.57	0.00	1.24	0.91	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT AT RURAL BAMAKO (CFAF			141.49	35.49	0.00	106.00	0.97	0.19	104.84	101.28	0.00	3.19	0.39	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT AT RURAL MKT (CFAF/kg)			149.84	35.49	0.00	114.35	1.80	0.54	112.00	105.08	0.00	4.87	2.04	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT AT FARM (CFAF/kg)			156.31	35.49	0.00	101.79	0.55	0.20	101.04	98.89	0.00	1.24	0.91	0.00

	UNITS	QUANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/SUBSIDIES DIRECT TRAD.	TAXES/SUBSIDIES INPUTS NONTRAD.	FINANCIAL COST	TAXES/SUBSIDIES INDIRECT TRAD.	TAXES/SUBSIDIES INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	NON-TRADABLE INPUTS: FAMILY LABOR	NON-TRADABLE INPUTS: HIRED LABOR	NON-TRADABLE INPUTS: CAPITAL	NON-TRADABLE INPUTS: LAND
Port Charges and delivery charges in Abidjan															
Port fees	CFAF/ton			5198.50			5198.50			5198.50	5198.50				
Storage and handling	CFAF/ton			3707.50			3707.50			3707.50	3707.50				
Transit	CFAF/ton			2000.00			2000.00			2000.00	2000.00				
Interest and Insurance (5% CIF)	CFAF/ton			3422.38			3422.38			3422.38	3422.38				
Transport	CFAF/ton			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Delivery charges Abidjan-to-Wholesale Bouake															
Transport		20.00	348.00	6960.00	0.00	0.00	11960.00	0.00	0.00	11960.00	11960.00	0.00	0.00	0.00	0.00
Distribution				4900.00	0.00	0.00	4900.00	0.00	0.00	4900.00	4900.00	0.00	0.00	0.00	0.00
Delivery charges Abidjan-to-Wholesale Korhogo															
Transport		20.00	633.00	12660.00	0.00	0.00	17660.00	0.00	0.00	17660.00	17660.00	0.00	0.00	0.00	0.00
Distribution				4900.00	0.00	0.00	4900.00	0.00	0.00	4900.00	4900.00	0.00	0.00	0.00	0.00
Delivery charges Abidjan-to-Border															
Transport		20.00	740.00	14800.00	0.00	0.00	19800.00	0.00	0.00	19800.00	19800.00	0.00	0.00	0.00	0.00
Distribution				500.00	0.00	0.00	500.00	0.00	0.00	500.00	500.00	0.00	0.00	0.00	0.00
CIF Price, RCI-Mali Frontier	CFAF/ton			98075.88	0.00	0.00	34628.38	0.00	0.00	34628.38	34628.38	0.00	0.00	0.00	0.00
Delivery charges Border-to-Wholesale Sikasso															
Customs duties	5%			4903.79	4903.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Import duties	10%			9807.58	9807.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sales tax	11.1% CIF frontier + import tax			11976.06	11976.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPS	5% CIF			4903.79	4903.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OSRP	CFAF/ton			5000.00	5000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transport	CFAF/ton			2000.00	0.00	0.00	2000.00	200.00	40.00	1760.00	1020.00	0.00	660.00	80.00	0.00

UNITS	UANTITY	UNIT PRICE	FINANCIAL EXPENDITUR	TAXES/S DIRECT TRAD.	UBSIDIES INPUTS NONTRAD.	FINANCIAL COST	TAXES/S INDIREC TRAD.	UBSIDIES T INPUTS NONTRAD.	ECONOMIC COST	TRADABLE INPUTS	.........NON-TRADABLE INPUTS......... FAMILY LABOR	HIRED LABOR	CAPITAL	LAND
DELIVERY CHARGES ABIDJAN-TO-WHSALE BOUAKE (CFAF/ton)			11880.00	0.00	0.00	16880.00	0.00	0.00	16880.00	16880.00	0.00	0.00	0.00	0.00
DELIVERY CHARGES ABIDJAN-TO-WHSALE BOUAKE (CFAF/kg)			11.88	0.00	0.00	16.88	0.00	0.00	16.88	16.88	0.00	0.00	0.00	0.00
DELIVERY CHARGES ABIDJAN-TO-WHSALE KORHOGO (CFAF/ton)			17560.00	0.00	0.00	22560.00	0.00	0.00	22560.00	22560.00	0.00	0.00	0.00	0.00
DELIVERY CHARGES ABIDJAN-TO-WHSALE KORHOGO (CFAF/kg)			17.56	0.00	0.00	22.56	0.00	0.00	22.56	22.56	0.00	0.00	0.00	0.00
DELIVERY CHARGES ABIDJAN-TO-BORDER (CFAF/ton)			15300.00	0.00	0.00	20300.00	0.00	0.00	20300.00	20300.00	0.00	0.00	0.00	0.00
DELIVERY CHARGES ABIDJAN-TO-BORDER (CFAF/kg)			15.30	0.00	0.00	20.30	0.00	0.00	20.30	20.30	0.00	0.00	0.00	0.00
DELIVERY CHARGES BORDER-TO-SIKASSO (CFAF/ton)			38590.24	36590.24	0.00	2000.00	200.00	40.00	1760.00	1020.00	0.00	660.00	80.00	0.00
DELIVERY CHARGES BORDER-TO-SIKASSO (CFAF/kg)			38.59	36.59	0.00	2.00	0.20	0.04	1.76	1.02	0.00	0.66	0.08	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT AT WHSALE ABIDJAN (CFAF/kg			82.78	0.00	0.00	82.78	0.00	0.00	82.78	82.78	0.00	0.00	0.00	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT AT BOUAKE (CFAF/kg)			94.66	0.00	0.00	99.66	0.00	0.00	99.66	99.66	0.00	0.00	0.00	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT AT KORHOGO (CFAF/kg)			100.34	0.00	0.00	105.34	0.00	0.00	105.34	105.34	0.00	0.00	0.00	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT AT BORDER (CFAF/kg)			98.08	0.00	0.00	103.08	0.00	0.00	103.08	103.08	0.00	0.00	0.00	0.00
CIF REFERENCE PRICE, BORDER EQUIVALENT AT SIKASSO (CFAF/kg)			136.67	36.59	0.00	105.08	0.20	0.04	104.84	104.10	0.00	0.66	0.08	0.00

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CALCULATION OF ECON INDICATORS: FARM LEVEL AND RURAL MARKET LEVEL

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ANALYSIS OF FARM PRODUCTION ONLY	CASH BASIS	IMPUTED VALUE	ANALYSIS AT RURAL MARKET	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS			FINANCIAL PROFITABILITY ANALYSIS		
FARMGATE PRICE (CFAF/kg)	111.11	111.11	RURAL MARKET PRICE (CFAF/kg)	150.00	150.00
TRADABLES, FINANCIAL PRICES	30.12	30.12	TRADABLES, FINANCIAL PRICES	41.48	41.48
VALUE ADDED IN FINANCIAL PRICES	80.99	80.99	VALUE ADDED IN FINANCIAL PRICES	108.52	108.52
VALUE OF NON-TRADABLES IN FINANCIAL PRICES			VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	25.96	FAMILY LABOR COSTS	0.00	25.20
HIRED LABOR COSTS	17.63	17.63	HIRED LABOR COSTS	27.96	27.96
CAPITAL COSTS	4.86	4.86	CAPITAL COSTS	10.84	10.84
LAND COSTS	0.00	0.00	LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	-0.19	-0.19	TAXES/SUBSIDIES ON NONTRADABLES	2.08	2.08
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	22.30	48.26	TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	40.88	66.08
FINANCIAL PROFITABILITY TO FARMER (CFAF/kg)	58.61	32.75	FINANCIAL PROFITABILITY TO RURAL INTERMEDIARY (CFAF/kg	67.64	42.44

ECONOMIC PROFITABILITY ANALYSIS	
TRADABLE FARM PARITY PRICE, ECONOMIC ● OER (CFAF/kg)	101.04
TRADABLES IN ECONOMIC PRICES ● OER	27.17
VALUE ADDED IN ECONOMIC PRICES ● OER	73.87
TRADABLE FARM PARITY PRICE, ECONOMIC ● SER (CFAF/kg)	140.42
TRADABLES IN ECONOMIC PRICES ● SER	36.14
VALUE ADDED IN ECONOMIC PRICES ● SER	104.28
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	25.86
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	17.63
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	4.96
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	28.37
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	76.81
ECONOMIC PROFITABILITY AT FARM LEVEL (CFAF/kg)	27.47

ECONOMIC PROFITABILITY ANALYSIS	
TRADABLE RURAL PARITY PRICE, ECONOMIC ● OER (CFAF/kg)	112.00
TRADABLES IN ECONOMIC PRICES ● OER	36.29
VALUE ADDED IN ECONOMIC PRICES ● OER	75.71
TRADABLE RURAL PARITY PRICE, ECONOMIC ● SER (CFAF/kg)	153.43
TRADABLES IN ECONOMIC PRICES ● SER	48.27
VALUE ADDED IN ECONOMIC PRICES ● SER	105.16
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	25.20
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	27.96
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	10.84
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	27.64
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	91.62
ECONOMIC PROFITABILITY AT RURAL MARKET LEVEL (CFAF/kg	13.54

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.10
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	0.83
EFFECTIVE PROTECTION COEFFICIENT	1.10
NET EFFECTIVE PROTECTION COEFFICIENT	0.82
DOMESTIC RESOURCE COST COEFFICIENT	0.74

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.34
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.01
EFFECTIVE PROTECTION COEFFICIENT	1.43
NET EFFECTIVE PROTECTION COEFFICIENT	1.08
DOMESTIC RESOURCE COST COEFFICIENT	0.87

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CALCULATION OF ECON INDICATORS: FARM LEVEL AND RURAL MARKET LEVEL

ANALYSIS AT WHOLESALE BAMAKO	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
WHOLESALE PRICE (CFAF/kg)	185.00	185.00
TRADABLES, FINANCIAL PRICES	46.25	46.25
VALUE ADDED IN FINANCIAL PRICES	138.75	138.75
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	25.20
HIRED LABOR COSTS	33.44	33.44
CAPITAL COSTS	15.48	15.48
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	4.14	4.14
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	53.06	78.26
FINANCIAL PROFITABILITY AT WHOLESALE BAMAKO (CFAF/kg)	85.70	60.50

FINANCIAL

CALCULATION OF ECON INDICATORS: WHOLESALE SIKASSO

ANALYSIS AT WHOLESALE SIKASSO	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
WHOLESALE PRICE (CFAF/kg)	190.00	190.00
TRADABLES, FINANCIAL PRICES	50.36	50.36
VALUE ADDED IN FINANCIAL PRICES	139.64	139.64
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	25.20
HIRED LABOR COSTS	35.48	35.48
CAPITAL COSTS	17.94	17.94
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	4.87	4.87
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	58.29	83.49
FINANCIAL PROFITABILITY AT WHOLESALE SIKASSO (CFAF/kg)	81.35	56.15

ECONOMIC PROFITABILITY ANALYSIS

TRADABLE WHOLESALE PARITY PRICE, ECONOMIC @ OER (CFAF/kg)	104.84
TRADABLES IN ECONOMIC PRICES @ OER	40.13
VALUE ADDED IN ECONOMIC PRICES @ OER	64.70
TRADABLE WHOLESALE PARITY PRICE, ECONOMIC @ SER (c/kg)	144.99
TRADABLES IN ECONOMIC PRICES @ SER	53.38
VALUE ADDED IN ECONOMIC PRICES @ SER	91.62
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	26.20
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	33.44
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	15.46
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	27.64
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	101.74
ECONOMIC PROFITABILITY AT WHOLESALE BAMAKO (CFAF/kg)	-10.13

ECONOMIC PROFITABILITY ANALYSIS

TRADABLE WHOLESALE PARITY PRICE, ECONOMIC @ OER (CF	104.84
TRADABLES IN ECONOMIC PRICES @ OER	43.47
VALUE ADDED IN ECONOMIC PRICES @ OER	61.36
TRADABLE WHOLESALE PARITY PRICE, ECONOMIC @ SER (CF	154.15
TRADABLES IN ECONOMIC PRICES @ SER	57.82
VALUE ADDED IN ECONOMIC PRICES @ SER	96.33
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	26.20
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	36.48
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	17.94
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	27.64
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	106.26
ECONOMIC PROFITABILITY AT WHOLESALE SIKASSO (CFAF/kg)	-9.93

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS

NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.76
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.33
EFFECTIVE PROTECTION COEFFICIENT	2.14
NET EFFECTIVE PROTECTION COEFFICIENT	1.61
DOMESTIC RESOURCE COST COEFFICIENT	1.11

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS

NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.81
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.36
EFFECTIVE PROTECTION COEFFICIENT	2.26
NET EFFECTIVE PROTECTION COEFFICIENT	1.71
DOMESTIC RESOURCE COST COEFFICIENT	1.10

ANALYSIS AT WHOLESALE KORHOGO	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
BORDER WHOLESALE MARKET PRICE (CFAF/kg)	160.00	160.00
TRADABLES, FINANCIAL PRICES	66.44	66.44
VALUE ADDED IN FINANCIAL PRICES	93.56	93.56
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	25.20
HIRED LABOR COSTS	37.04	37.04
CAPITAL COSTS	20.42	20.42
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	5.40	5.40
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRICES	62.86	88.06
FINANCIAL PROFITABILITY AT WHOLESALE KORHOGO (CFAF/kg)	30.70	5.50

ANALYSIS AT WHOLESALE BOUAKE	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
WHOLESALE PRICE (CFAF/kg)	180.00	180.00
TRADABLES, FINANCIAL PRICES	75.22	75.22
VALUE ADDED IN FINANCIAL PRICES	104.78	104.78
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	25.20
HIRED LABOR COSTS	37.04	37.04
CAPITAL COSTS	20.42	20.42
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	5.40	5.40
TOTAL VALUE OF NON-TRADABLES IN FI	62.86	88.06
FINANCIAL PROFITABILITY AT WHOLESAL	41.92	16.72

ECONOMIC PROFITABILITY ANALYSIS	
TRADABLE WHOLESALE BORDER PARITY PRICE, ECONOMIC @ OER (CF	105.34
TRADABLES IN ECONOMIC PRICES @ OER	58.64
VALUE ADDED IN ECONOMIC PRICES @ OER	46.70
TRADABLE RURAL PARITY PRICE, ECONOMIC @ SER (CFAF/kg)	147.47
TRADABLES IN ECONOMIC PRICES @ SER	78.77
VALUE ADDED IN ECONOMIC PRICES @ SER	68.70
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	25.20
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	37.04
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	20.42
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	27.64
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRICES	110.30
ECONOMIC PROFITABILITY AT WHOLESALE KORHOGO (CFAF/kg)	-41.59

ECONOMIC PROFITABILITY ANALYSIS	
TRADABLE WHOLESALE PARITY PRICE, EC	89.65
TRADABLES IN ECONOMIC PRICES @ OER	57.42
VALUE ADDED IN ECONOMIC PRICES @ O	32.23
TRADABLE WHOLESALE PARITY PRICE, EC	130.52
TRADABLES IN ECONOMIC PRICES @ SER	81.07
VALUE ADDED IN ECONOMIC PRICES @ SE	48.46
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE C	1.00
FAMILY LABOR COSTS IN SHADOW PRI	25.20
SHADOW HIRED LABOR WAGE RATE CO	1.00
HIRED LABOR COSTS IN SHADOW PRICE	37.04
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	20.42
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	27.64
TOTAL VALUE OF NON-TRADABLES IN S	110.30
ECONOMIC PROFITABILITY AT WHOLESAL	-61.84

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.62
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.14
EFFECTIVE PROTECTION COEFFICIENT	2.00
NET EFFECTIVE PROTECTION COEFFICIENT	1.51
DOMESTIC RESOURCE COST COEFFICIENT	1.61

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS	
NOMINAL PROTECTION COEFFICIENT, OU	1.81
NET NOMINAL PROTECTION COEFFICIENT,	1.36
EFFECTIVE PROTECTION COEFFICIENT	3.26
NET EFFECTIVE PROTECTION COEFFICIEN	2.44
DOMESTIC RESOURCE COST COEFFICIENT	2.28

ANALYSIS AT WHOLESALE ABIDJAN	CASH BASIS	IMPUTED VALUE
FINANCIAL PROFITABILITY ANALYSIS		
WHOLESALE PRICE (CFAF/kg)	190.00	190.00
TRADABLES, FINANCIAL PRICES	87.44	87.44
VALUE ADDED IN FINANCIAL PRICES	102.56	102.56
VALUE OF NON-TRADABLES IN FINANCIAL PRICES		
FAMILY LABOR COSTS	0.00	25.20
HIRED LABOR COSTS	37.04	37.04
CAPITAL COSTS	20.42	20.42
LAND COSTS	0.00	0.00
TAXES/SUBSIDIES ON NONTRADABLES	5.40	5.40
TOTAL VALUE OF NON-TRADABLES IN FINANCIAL PRI	62.86	88.06
FINANCIAL PROFITABILITY AT WHOLESALE ABIDJAN (	39.70	14.50

ECONOMIC PROFITABILITY ANALYSIS

TRADABLE WHOLESALE PARITY PRICE, ECONOMIC ● O	82.78
TRADABLES IN ECONOMIC PRICES ● OER	79.64
VALUE ADDED IN ECONOMIC PRICES ● OER	3.14
TRADABLE WHOLESALE PARITY PRICE, ECONOMIC ● S	115.89
TRADABLES IN ECONOMIC PRICES ● SER	108.17
VALUE ADDED IN ECONOMIC PRICES ● SER	7.72
VALUE OF NON-TRADABLES IN SHADOW PRICES	
SHADOW FAMILY LABOR WAGE RATE COEFFICIENT	1.00
FAMILY LABOR COSTS IN SHADOW PRICES	25.20
SHADOW HIRED LABOR WAGE RATE COEFFICIENT	1.00
HIRED LABOR COSTS IN SHADOW PRICES	37.04
SHADOW CAPITAL COST COEFFICIENT	1.00
CAPITAL COSTS IN SHADOW PRICES	20.42
SHADOW LAND COST COEFFICIENT	1.00
LAND COSTS IN SHADOW PRICES	27.64
TOTAL VALUE OF NON-TRADABLES IN SHADOW PRIC	110.30
ECONO PROFITABILITY AT WHOLESALE ABIDJAN (CFAF	-102.58

PROTECTION + COMPARATIVE ADVANTAGE ANALYSIS

NOMINAL PROTECTION COEFFICIENT, OUTPUT	2.30
NET NOMINAL PROTECTION COEFFICIENT, OUTPUT	1.73
EFFECTIVE PROTECTION COEFFICIENT	32.67
NET EFFECTIVE PROTECTION COEFFICIENT	24.56
DOMESTIC RESOURCE COST COEFFICIENT	14.29

APPENDIX C

Table C5-1a.	Effect of the Official Exchange Rate on Cotton and Maize DRC coefficients Under a Positive Opportunity Cost of Land					
	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton				1/		
Center/improved manual	0.89				0.89	0.91
North/improved animal traction	0.91			0.92		0.93
North/semi-mechanized	1.89			1.86		1.73
Mali/cotton						
South/improved animal traction	0.99		0.99	0.99	1.01	
South/improved manual	1.15		1.12	1.12	1.14	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.79	1.26	0.98	1.11		1.74
Center/improved animal traction	1.27	1.76	1.21	1.58	1.59	> 2
Center/traditional manual	1.72	> 2	1.59	> 2	> 2	> 2
Center/improved manual	1.75	> 2	1.60	> 2	> 2	> 2
Mali/maize						
South/improved animal traction	0.97	1.52	1.19	1.65	> 2	> 2
South/improved manual	1.26	1.89	1.51	> 2	> 2	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

Source: Computed from Appendix B

Table C5-1b. Effect of the Official Exchange Rate on Millet/sorghum and Rice DRC Coefficients Under a Positive Opportunity Cost of Land

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	1.26	1.86	1.54	1.64	> 2	> 2
North/animal traction	1.30	1.93	1.58	1.70	> 2	> 2
Mali/millet/sorghum						
South/animal traction	0.66	1.12	0.85	1.18	1.87	> 2
South/traditional manual	0.86	1.31	1.04	1.38	1.99	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	1.49	> 2	1.92		> 2	> 2
Forest/upland/traditional manual	1.65	> 2	> 2		> 2	> 2
Forest/upland/improved manual	1.68	> 2	> 2		> 2	> 2
North/irrigation/improved manual	1.72	> 2	> 2	> 2	> 2	> 2
North/upland/traditional manual	1.89	> 2	> 2	> 2	> 2	> 2
North/upland/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	1.04	1.57	1.58	> 2	> 2	> 2
Office/irrigation/semi-intensive	1.37	1.97	1.96	> 2	> 2	> 2
Office/irrigation/non-intensive	1.72	> 2	> 2	> 2	> 2	< 0
Mopti/controlled flooding	> 2	> 2	> 2	> 2	> 2	< 0
Mopti/traditional flooding	> 2	> 2	> 2	> 2	> 2	< 0

Source: Computed from Appendix B

Table C5-2a. Effect of a 50 Percent Devaluation on Cotton and Maize DRC coefficients Under a Positive Opportunity Cost of Land						
	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.55				0.57	0.60
North/improved animal traction	0.56			0.58		0.62
North/semi-mechanized	1.17			1.17		1.15
Mali/cotton						
South/improved animal traction	0.61		0.65	0.66	0.67	
South/improved manual	0.71		0.74	0.75	0.76	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.56	0.84	0.65	0.81		1.16
Center/improved animal traction	0.90	1.17	0.81	1.13	1.11	1.68
Center/traditional manual	1.21	1.47	1.06	1.42	1.42	1.95
Center/improved manual	1.24	1.56	1.07	1.50	1.50	> 2
Mali/maize						
South/improved animal traction	0.67	1.06	0.82	1.10	1.73	> 2
South/improved manual	0.87	1.32	1.04	1.38	> 2	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

Source: Computed from Appendix B

Table C5-2b. Effect of a 50 Percent Devaluation on Millet/sorghum and Rice DRC Coefficients Under a Positive Opportunity Cost of Land

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.90	1.24	1.02	1.16	1.43	> 2
North/animal traction	0.93	1.29	1.06	1.21	1.50	> 2
Mali/millet/sorghum						
South/animal traction	0.45	0.78	0.58	0.78	1.24	> 2
South/traditional manual	0.59	0.90	0.72	0.92	1.33	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	1.05	1.53	1.28		1.66	> 2
Forest/upland/traditional manual	1.15	1.55	1.35		1.65	> 2
Forest/upland/improved manual	1.20	1.81	1.47		1.99	> 2
North/irrigation/improved manual	1.74	1.86	1.49	1.82	> 2	> 2
North/upland/traditional manual	1.31	1.72	1.71	1.68	1.91	> 2
North/upland/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.70	1.07	1.06	1.57	> 2	> 2
Office/irrigation/semi-intensive	0.92	1.34	1.31	1.99	> 2	> 2
Office/irrigation/non-intensive	1.16	1.64	1.60	> 2	> 2	< 0
Mopti/controlled flooding	> 2	> 2	> 2	> 2	> 2	< 0
Mopti/traditional flooding	> 2	> 2	> 2	> 2	> 2	< 0

Source: Computed from Appendix B

Table C5-3a. Effect of a 100 Percent Devaluation on Cotton and Maize DRC coefficients Under a Positive Opportunity Cost of Land

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.40				0.42	0.45
North/improved animal traction	0.41			0.43		0.46
North/semi-mechanized	0.85			1.17		0.86
Mali/cotton						
South/improved animal traction	0.44		0.49	0.50	0.51	
South/improved manual	0.51		0.55	0.56	0.57	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.44	0.63	0.49	0.63		0.87
Center/improved animal traction	0.70	0.88	0.61	0.88	1.11	1.26
Center/traditional manual	0.93	1.10	0.80	1.10	1.42	1.47
Center/improved manual	0.96	1.17	0.80	1.17	1.50	1.67
Mali/maize						
South/improved animal traction	0.51	0.81	0.63	0.82	1.30	> 2
South/improved manual	0.66	1.01	0.79	1.04	1.62	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

Source: Computed from Appendix B

Table C5-3b. Effect of a 100 Percent Devaluation on Millet/sorghum and Rice DRC Coefficients Under a Positive Opportunity Cost of Land

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.70	0.93	0.77	0.90	1.11	> 2
North/animal traction	0.72	0.97	0.79	0.94	1.16	> 2
Mali/millet/sorghum						
South/animal traction	0.35	0.60	0.44	0.59	0.93	> 2
South/traditional manual	0.45	0.69	0.54	0.69	1.00	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.81	1.14	0.96		1.27	1.54
Forest/upland/traditional manual	0.89	1.16	1.01		1.27	1.46
Forest/upland/improved manual	0.93	1.36	1.10		1.54	1.95
North/irrigation/improved manual	0.97	1.39	1.12	1.42	1.75	> 2
North/upland/traditional manual	1.00	1.29	1.31	1.28	1.45	> 2
North/upland/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.53	0.81	0.80	1.18	1.71	> 2
Office/irrigation/semi-intensive	0.69	1.01	0.99	1.49	> 2	> 2
Office/irrigation/non-intensive	0.87	1.25	1.20	1.87	> 2	< 0
Mopti/controlled flooding	1.58	> 2	> 2	> 2	> 2	< 0
Mopti/traditional flooding	1.96	> 2	> 2	> 2	> 2	< 0

Source: Computed from Appendix B

Table C5-4a. Effect of a Lower Opportunity Cost of Labor on Cotton and Maize DRC coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.49				0.52	0.56
North/improved animal traction	0.54			0.56		0.60
North/semi-mechanized	1.21			1.21		1.19
Mali/cotton						
South/improved animal traction	0.61		0.66	0.67	0.65	
South/improved manual	0.68		0.72	0.73	0.71	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.57	0.86	0.67	0.82		1.19
Center/improved animal traction	0.85	1.13	0.78	1.08	1.05	1.62
Center/traditional manual	1.09	1.35	0.99	1.30	1.29	1.81
Center/improved manual	1.12	1.43	0.99	1.37	1.36	> 2
Mali/maize						
South/improved animal traction	0.63	1.00	0.77	1.05	1.66	> 2
South/improved manual	0.77	1.19	0.93	1.26	1.97	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

2/In this scenario, The opportunity cost of labor is assumed to be 25 percent lower than that assumed originally. Thus, it is about 500 CFAF/day in most of Côte d'Ivoire and Mali, while it is estimated at nearly 750 CFAF/day in the forest region of Côte d'Ivoire.

Source: Computed from Appendix B

Table C5-4b. Effect of a Lower Opportunity Cost of Labor on Millet/sorghum and Rice DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.81	1.14	0.94	1.06	1.33	> 2
North/animal traction	0.89	1.26	1.03	1.16	1.47	> 2
Mali/millet/sorghum						
South/animal traction	0.38	0.68	0.50	0.68	1.08	> 2
South/traditional manual	0.48	0.76	0.59	0.77	1.12	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.90	1.37	1.15		1.47	1.75
Forest/upland/traditional manual	0.99	1.38	1.20		1.49	1.86
Forest/upland/improved manual	1.07	1.69	1.37		1.85	> 2
North/irrigation/improved manual	1.08	1.69	1.35	1.63	> 2	> 2
North/upland/traditional manual	1.16	1.69	1.65	1.60	> 2	> 2
North/upland/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.67	1.04	1.03	1.51	> 2	> 2
Office/irrigation/semi-intensive	0.90	1.31	1.31	1.90	> 2	> 2
Office/irrigation/non-intensive	1.15	1.62	1.62	> 2	> 2	< 0
Mopti/controlled flooding	> 2	> 2	> 2	> 2	> 2	< 0
Mopti/traditional flooding	> 2	> 2	> 2	> 2	> 2	< 0

Note: In this scenario, the opportunity cost of labor is assumed to be 25 percent lower than that assumed originally. Thus, it is about 500 CFAF/day in Côte d'Ivoire and southern Mali, while it is estimated at nearly 490 CFAF/day in the Office du Niger and 375 CFAF/day in the Mopti region.

Source: Computed from Appendix B

Table C5-5a. Effect of a Lower Opportunity Cost of Labor on Cotton and Maize DRC coefficients	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.39				0.43	0.48
North/improved animal traction	0.47			0.49		0.54
North/semi-mechanized	1.16			1.16		1.14
Mali/cotton						
South/improved animal traction	0.53		0.59	0.60	0.58	
South/improved manual	0.55		0.61	0.62	0.60	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.53	0.83	0.64	0.78		1.14
Center/improved animal traction	0.74	1.00	0.69	0.96	0.92	1.45
Center/traditional manual	0.89	1.13	0.83	1.09	1.07	1.53
Center/improved manual	0.91	1.20	0.83	1.15	1.13	1.74
Mali/maize						
South/improved animal traction	0.55	0.89	0.68	0.93	1.46	> 2
South/improved manual	0.62	0.99	0.76	1.04	1.63	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

2/In this scenario, The opportunity cost of labor is assumed to be 50 percent lower than that assumed originally. Thus, it is equivalent to about 350 CFAF/day in most of Côte d'Ivoire and Mali, while it is estimated at 500 CFAF/day in the forest region of Côte d'Ivoire.

Source: Computed from Appendix B

Table C5-5b. Effect of a Lower Opportunity Cost of Labor on Millet/sorghum and Rice DRC Coefficients						
	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.66	0.96	0.79	0.88	1.12	> 2
North/animal traction	0.79	1.13	0.93	1.05	1.33	> 2
Mali/millet/sorghum						
South/animal traction	0.27	0.54	0.38	0.53	0.81	> 2
South/traditional manual	0.33	0.57	0.43	0.56	0.83	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.69	1.11	0.93		1.18	1.40
Forest/upland/traditional manual	0.75	1.11	0.96		1.21	1.52
Forest/upland/improved manual	0.87	1.44	1.17		1.58	> 2
North/irrigation/improved manual	0.85	1.39	1.11	1.33	1.70	> 2
North/upland/traditional manual	0.93	1.39	1.35	1.31	> 2	> 2
North/upland/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.61	0.97	0.97	1.41	2.00	> 2
Office/irrigation/semi-intensive	0.83	1.23	1.21	1.80	> 2	> 2
Office/irrigation/non-intensive	1.08	1.55	1.51	> 2	> 2	< 0
Mopti/controlled flooding	1.95	> 2	> 2	> 2	> 2	< 0
Mopti/traditional flooding	> 2	> 2	> 2	> 2	> 2	< 0

Note: In this scenario, the opportunity cost of labor is assumed to be 50 percent lower than that assumed originally. Thus, it is about 350 CFAF/day in Côte d'Ivoire and southern Mali, while it is estimated at nearly 300 CFAF/day in the Office du Niger and 250 CFAF/day in the Mopti region.

Source: Computed from Appendix B

Table C5-6a. **Effect of Halving the Opportunity Cost of Land on Cotton and Maize DRC coefficients**

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.57				0.59	0.63
North/improved animal traction	0.52			0.54		0.58
North/semi-mechanized	0.84			0.85		0.87
Mali/cotton						
South/improved animal traction	0.58		0.64	0.65	0.63	
South/improved manual	0.74		0.77	0.78	0.76	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.47	0.76	0.59	0.72		1.04
Center/improved animal traction	0.81	1.08	0.75	1.04	1.01	1.56
Center/traditional manual	1.05	1.30	0.95	1.25	1.24	1.75
Center/improved manual	1.05	1.36	0.94	1.30	1.29	1.96
Mali/maize						
South/improved animal traction	0.60	0.96	0.74	1.00	1.58	> 2
South/improved manual	0.84	1.28	1.00	1.36	> 2	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

Source: Computed from Appendix B

Table C5-6b. Effect of Halving the Opportunity Cost of Land on Millet/sorghum and Rice DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.80	1.14	0.94	1.06	1.33	> 2
North/animal traction	0.72	1.05	0.86	0.97	1.24	> 2
Mali/millet/sorghum						
South/animal traction	0.48	0.82	0.61	0.84	1.33	> 2
South/traditional manual	0.63	0.96	0.76	0.99	1.42	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	1.21	1.86	1.51		> 2	> 2
Forest/upland/traditional manual	1.11	1.52	1.32		1.62	1.92
Forest/upland/improved manual	1.21	1.86	1.51		> 2	> 2
North/irrigation/improved manual	1.28	1.99	1.59	1.93	> 2	> 2
North/upland/traditional manual	1.19	1.60	1.58	1.55	1.78	> 2
North/upland/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.60	0.96	0.96	1.40	1.71	> 2
Office/irrigation/semi-intensive	0.75	1.15	1.14	1.69	> 2	> 2
Office/irrigation/non-intensive	0.90	1.34	1.32	> 2	> 2	< 0
Mopti/controlled flooding	1.52	> 2	> 2	> 2	> 2	< 0
Mopti/traditional flooding	1.77	> 2	> 2	> 2	> 2	< 0

Source: Computed from Appendix B

Table C5-7a. Effect of Projected World Price of Output on Cotton and Maize DRC coefficients						
	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.40				0.42	0.45
North/improved animal traction	0.41			0.43		0.46
North/semi-mechanized	0.80			0.80		0.82
Mali/cotton						
South/improved animal traction	0.46		0.50	0.51	0.49	
South/improved manual	0.53		0.57	0.58	0.56	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.40	0.65	0.54	0.63		0.82
Center/improved animal traction	0.75	0.95	0.71	0.93	0.90	1.26
Center/traditional manual	1.04	1.24	0.96	1.21	1.20	1.57
Center/improved manual	1.03	1.26	0.94	1.22	1.21	1.66
Mali/maize						
South/improved animal traction	0.59	0.87	0.71	0.90	1.26	> 2
South/improved manual	0.77	1.09	0.89	1.14	1.58	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

2/ The projected world price for cotton is about $2400/ton and that of maize is $164/ton.

Source: Computed from Appendix B

Table C5-7b. Effect of Projected World Price of Output on Millet/sorghum and Rice DRC Coefficients						
	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.79	1.05	0.90	1.00	1.20	> 2
North/animal traction	0.81	1.08	0.92	1.02	1.24	> 2
Mali/millet/sorghum						
South/animal traction	0.40	0.65	0.51	0.66	0.92	> 2
South/traditional manual	0.54	0.78	0.64	0.80	1.06	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.88	1.22	1.07		1.31	1.54
Forest/upland/traditional manual	1.01	1.31	1.17		1.39	1.59
Forest/upland/improved manual	0.97	1.38	1.19		1.49	1.80
North/irrigation/improved manual	0.99	1.39	1.19	1.37	1.62	> 2
North/upland/traditional manual	1.15	1.46	1.45	1.43	1.78	> 2
North/upland/animal traction	1.96	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.58	0.84	0.85	1.13	1.43	> 2
Office/irrigation/semi-intensive	0.75	1.04	1.04	1.39	1.77	> 2
Office/irrigation/non-intensive	0.93	1.25	1.24	1.68	> 2	> 2
Mopti/controlled flooding	1.68	> 2	> 2	> 2	> 2	> 2
Mopti/traditional flooding	> 2	> 2	> 2	> 2	> 2	> 2

Note: The projected world price for millet/sorghum is estimated at about $155/ton, while that of rice is about $389/ton.

Source: Computed from Appendix B

Table C5-8a. Effect of Higher On-Farm Yields on Cotton and Maize DRC coefficients						
	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.46				0.48	0.53
North/improved animal traction	0.47			0.49		0.54
North/semi-mechanized	0.94			0.94		0.94
Mali/cotton						
South/improved animal traction	0.54		0.60	0.61	0.59	
South/improved manual	0.63		0.67	0.68	0.66	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.45	0.70	0.56	0.67		0.94
Center/improved animal traction	0.74	0.99	0.70	0.95	0.92	1.42
Center/traditional manual	1.03	1.30	0.93	1.25	1.23	1.85
Center/improved manual	1.01	1.28	0.91	1.23	1.22	1.71
Mali/maize						
South/improved animal traction	0.55	0.89	0.69	0.92	1.42	> 2
South/improved manual	0.72	1.10	0.86	1.16	1.77	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

2/ In this scenario, on-farm yields are assumed to be 25 percent higher that those assumed originally.

Source: Computed from Appendix B

Table C5-8b. Effect of Higher On-Farm Yields on Millet/sorghum and Rice DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.76	1.08	0.90	1.01	1.26	> 2
North/animal traction	0.78	1.12	0.92	1.03	1.31	> 2
Mali/millet/sorghum						
South/animal traction	0.38	0.67	0.49	0.67	1.04	> 2
South/traditional manual	0.50	0.80	0.62	0.81	1.17	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.85	1.29	1.09		1.39	1.71
Forest/upland/traditional manual	0.98	1.46	1.21		1.59	> 2
Forest/upland/improved manual	0.93	1.37	1.19		1.46	1.73
North/irrigation/improved manual	0.95	1.45	1.19	1.40	1.72	> 2
North/upland/traditional manual	1.11	1.50	1.48	1.45	1.69	> 2
North/upland/animal traction	1.84	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.58	0.91	0.92	1.32	1.83	> 2
Office/irrigation/semi-intensive	0.75	1.12	1.11	1.61	> 2	> 2
Office/irrigation/non-intensive	0.92	1.33	1.31	1.93	> 2	> 2
Mopti/controlled flooding	1.66	> 2	> 2	> 2	> 2	> 2
Mopti/traditional flooding	1.77	> 2	> 2	> 2	> 2	> 2

Note: In this scenario, on-farm yields are assumed to be 25 percent higher than those assumed originally.

Source: Computed from Appendix B

Table C5-9a. Effect of Higher On-Farm Yields on Cotton and Maize DRC coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.37				0.40	0.45
North/improved animal traction	0.38			0.41		0.46
North/semi-mechanized	0.74			0.75		0.77
Mali/cotton						
South/improved animal traction	0.44		0.51	0.52	0.50	
South/improved manual	0.51		0.57	0.58	0.56	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.35	0.59	0.47	0.56		0.78
Center/improved animal traction	0.60	0.83	0.59	0.59	0.76	1.18
Center/traditional manual	0.85	1.09	0.79	0.79	1.02	1.53
Center/improved manual	0.82	1.08	0.77	0.77	1.01	1.46
Mali/maize						
South/improved animal traction	0.46	0.75	0.57	0.77	1.16	> 2
South/improved manual	0.59	0.92	0.72	0.96	1.44	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

2/ In this scenario, on-farm yields are assumed to be 50 percent higher that those assumed originally.

Source: Computed from Appendix B

Table C5-9b. Effect of Higher On-Farm Yields on Millet/sorghum and Rice DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.63	0.93	0.77	0.85	1.09	> 2
North/animal traction	0.64	0.95	0.78	0.87	1.12	> 2
Mali/millet/sorghum						
South/animal traction	0.31	0.57	0.42	0.57	0.86	> 2
South/traditional manual	0.42	0.69	0.53	0.69	1.00	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.69	1.08	0.92		1.17	1.43
Forest/upland/traditional manual	0.82	1.18	1.02		1.29	1.62
Forest/upland/improved manual	0.74	1.19	0.99		1.25	1.49
North/irrigation/improved manual	0.74	1.16	0.96	1.12	1.37	> 2
North/upland/traditional manual	0.92	1.28	1.36	1.23	1.43	> 2
North/upland/animal traction	1.37	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.48	0.79	0.80	1.15	1.57	> 2
Office/irrigation/semi-intensive	0.61	0.95	0.95	1.37	1.90	> 2
Office/irrigation/non-intensive	0.75	1.11	1.11	1.61	> 2	> 2
Mopti/controlled flooding	1.34	1.85	1.80	> 2	> 2	> 2
Mopti/traditional flooding	1.78	> 2	> 2	> 2	> 2	> 2

Note: In this scenario, on-farm yields are assumed to be 50 percent higher than those assumed originally.

Source: Computed from Appendix B

Table C5-10a. Effect of an Improved Milling Ratio on Cotton and Rice DRC Coeffdicients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton				1/		
Center/improved manual	0.59				0.61	0.65
North/improved animal traction	0.61			0.63		0.66
North/semi-mechanized	1.27			1.26		1.23
Mali/millet/sorghum						
South/improved animal traction	0.66		0.71	0.71	0.69	
South/traditional manual	0.77		0.80	0.81	0.78	
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.94	1.37	1.16		1.48	1.81
Forest/upland/traditional manual	1.05	1.44	1.25		1.53	1.82
Forest/upland/improved manual	1.07	1.57	1.29		1.71	> 2
North/irrigation/improved manual	1.07	1.57	1.29	1.52	1.87	> 2
North/upland/traditional manual	1.21	1.59	1.57	1.54	1.84	> 2
North/upland/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.74	1.11	1.10	1.61	> 2	> 2
Office/irrigation/semi-intensive	0.97	1.39	1.36	> 2	> 2	> 2
Office/irrigation/non-intensive	1.21	1.69	1.65	> 2	> 2	< 0
Mopti/controlled flooding	> 2	> 2	> 2	> 2	> 2	> 2
Mopti/traditional flooding	> 2	> 2	> 2	> 2	> 2	< 0

Note: 1/ The relevant market for the Malian cotton is the border instead of Korhogo

2/ In this scenario, the ginning ratio of the Malian cotton improves from 0.427 to that of Côte d'Ivoire, estimated at 0.445. Meanwhile, the Ivorian rice milling ratio increases from 0.55 to that of Mali, evaluated at 0.63.

Source: Computed from Appendix B

Table C5-10b. Effect of an Improved Milling Ratio on Cotton and Rice DRC Coefficients						
	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton				1/		
Center/improved manual	0.52				0.55	0.59
North/improved animal traction	0.54			0.56		0.60
North/semi-mechanized	1.10			1.10		1.09
Mali/millet/sorghum						
South/improved animal traction	0.57		0.62	0.63	0.61	
South/traditional manual	0.67		0.71	0.71	0.69	
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.87	1.27	1.08		1.37	1.68
Forest/upland/traditional manual	0.96	1.35	1.18		1.44	1.70
Forest/upland/improved manual	1.00	1.44	1.19		1.56	1.98
North/irrigation/improved manual	0.98	1.43	1.18	1.38	1.69	> 2
North/upland/traditional manual	1.14	1.49	1.47	1.44	1.67	> 2
North/upland/animal traction	1.91	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.68	1.02	1.02	1.47	> 2	> 2
Office/irrigation/semi-intensive	0.89	1.27	1.26	1.83	> 2	> 2
Office/irrigation/non-intensive	1.11	1.54	1.51	> 2	> 2	> 2
Mopti/controlled flooding	2.00	> 2	> 2	> 2	> 2	< 0
Mopti/traditional flooding	> 2	> 2	> 2	> 2	> 2	< 0

Note: 1/ The relevant market for the Malian cotton is the border instead of Korhogo

2/ In this scenario, the ginning ratio in Côte d'Ivoire and Mali improves to 0.50 and the rice milling ratio in both countries increases to 0.67.

Source: Computed from Appendix B

Table C5-11a. Effect of Halving Transport Cost on Cotton and Maize DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.58				0.60	0.63
North/improved animal traction	0.59			0.61		0.64
North/semi-mechanized	1.23			1.22		1.20
Mali/cotton						
South/improved animal traction	0.68		0.71	0.72	0.68	
South/improved manual	0.79		0.81	0.82	0.78	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.65	0.90	0.78	0.86		1.10
Center/improved animal traction	1.06	1.31	1.06	1.26	1.24	1.61
Center/traditional manual	1.39	1.64	1.37	1.59	1.57	1.93
Center/improved manual	1.45	1.76	1.41	1.69	1.68	> 2
Mali/maize						
South/improved animal traction	0.88	1.26	1.05	1.36	1.73	> 2
South/improved manual	1.14	1.58	1.34	1.71	> 2	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

Source: Computed from Appendix B

Table C5-11b. Effect of Halving Transport Cost on Millet/sorghum and Rice DRC Coefficients	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	1.08	1.44	1.29	1.35	1.54	> 2
North/animal traction	1.12	1.51	1.34	1.41	1.61	> 2
Mali/millet/sorghum						
South/animal traction	0.60	0.92	0.75	0.97	1.24	> 2
South/traditional manual	0.76	1.07	0.90	1.11	1.35	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	1.15	1.68	1.54		1.69	1.99
Forest/upland/traditional manual	1.26	1.70	1.57		1.71	> 2
Forest/upland/improved manual	1.31	> 2	1.79		> 2	> 2
North/irrigation/improved manual	1.40	> 2	1.90	> 2	> 2	> 2
North/upland/traditional manual	1.45	> 2	> 2	1.96	> 2	> 2
North/upland/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.82	1.24	1.19	1.47	1.72	> 2
Office/irrigation/semi-intensive	1.08	1.56	1.49	1.85	> 2	> 2
Office/irrigation/non-intensive	1.37	1.93	1.82	> 2	> 2	> 2
Mopti/controlled flooding	> 2	> 2	> 2	> 2	> 2	> 2
Mopti/traditional flooding	> 2	> 2	> 2	> 2	> 2	> 2

Source: Computed from Appendix B

Table C5-12a. Effect of Lower Opportunity Costs of Land and Labor, and Devaluation on Cotton and Maize DRC Coefficients	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.43				0.46	0.50
North/improved animal traction	0.41			0.44		0.49
North/semi-mechanized	0.73			0.74		0.77
Mali/cotton						
South/improved animal traction	0.43		0.50	0.51	0.52	
South/improved manual	0.53		0.58	0.59	0.60	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.41	0.67	0.52	0.65		0.93
Center/improved animal traction	0.66	0.89	0.62	0.86	0.82	1.30
Center/traditional manual	0.80	1.01	0.74	0.98	0.96	1.37
Center/improved manual	0.93	1.20	0.82	1.16	1.14	1.73
Mali/maize						
South/improved animal traction	0.48	0.81	0.61	0.82	1.30	> 2
South/improved manual	0.65	1.03	0.80	1.06	1.67	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

2/ In scenario, the economic value of land is assumed to be 50 percent lower than that assumed originally, while the opportunity cost of labor is assumed to be 25 percent lower than that used in the base run. In addition, it is assumed that a 50 percent devaluation took place in both countries.

Source: Computed from Appendix B

Table C5-12b. Effect of Lower Opportunity Costs of Land and Labor, and Devaluation on Millet/sorghum and Rice DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.62	0.89	0.74	0.83	1.05	> 2
North/animal traction	0.59	0.87	0.71	0.81	1.04	> 2
Mali/millet/sorghum						
South/animal traction	0.35	0.64	0.47	0.64	1.01	> 2
South/traditional manual	0.45	0.72	0.56	0.72	1.04	> 2
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.82	1.25	1.05		1.36	1.69
Forest/upland/traditional manual	0.82	1.16	1.01		1.25	1.47
Forest/upland/improved manual	0.95	1.51	1.23		> 2	> 2
North/irrigation/improved manual	1.02	1.58	1.26	1.54	1.92	> 2
North/upland/traditional manual	0.90	1.24	1.23	1.20	1.39	> 2
North/upland/animal traction	1.86	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.51	0.85	0.85	1.28	1.86	> 2
Office/irrigation/semi-intensive	0.65	1.03	1.03	1.56	> 2	> 2
Office/irrigation/non-intensive	0.80	1.23	1.23	1.90	> 2	< 0
Mopti/controlled flooding	1.34	1.94	1.87	> 2	> 2	< 0
Mopti/traditional flooding	1.55	> 2	2.00	> 2	> 2	< 0

Note: In this scenario, the economic value of land is assumed to be 50 percent of that assumed originally, while the opportunity cost of labor is assumed to 25 percent lower than that used in the base run. In addition, it is assumed that both countries undertook a 50 percent devaluation.

Source: Computed from Appendix B

Table C5-13a. Effect of Lower Opportunity Costs of Land and Labor, Devaluation, and Lower Transport Costs on Cotton and Maize DRC Coefficients						
	Farm	**Bamako**	**Sikasso**	**Korhogo**	**Bouaké**	**Abidjan**
Côte d'Ivoire/cotton						
Center/improved manual	0.43				0.45	0.49
North/improved animal traction	0.40			0.43		0.47
North/semi-mechanized	0.70			0.71		0.74
Mali/cotton						
South/improved animal traction	0.42		0.48	0.49	0.49	
South/improved manual	0.51		0.56	0.57	0.57	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.45	0.66	0.57	0.64		0.81
Center/improved animal traction	0.72	0.92	0.74	0.89	0.86	1.14
Center/traditional manual	0.86	1.05	0.87	1.02	0.99	1.24
Center/improved manual	1.02	1.26	1.00	1.22	1.19	1.55
Mali/maize						
South/improved animal traction	0.50	0.92	0.61	0.79	1.23	> 2
South/improved manual	0.81	1.17	0.98	1.23	1.56	> 2

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

2/ In scenario, the economic value of land is assumed to be 50 percent lower than that assumed originally, while the opportunity cost of labor is assumed to be 25 percent lower than that used in the base run. In addition, it is assumed that a 50 percent devaluation took place in both countries and transport costs were halved in both countries.

Source: Computed from Appendix B

Table C5-13b. Effect of Lower Opportunity Costs of Land and Labor, Devaluation, and Lower Transport Costs on Millet/sorghum and Rice DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.69	0.96	0.86	0.90	1.04	> 2
North/animal traction	0.67	0.94	0.84	0.88	1.02	> 2
Mali/millet/sorghum						
South/animal traction	0.44	0.73	0.57	0.73	0.94	1.66
South/traditional manual	0.54	0.80	0.66	0.81	0.98	1.48
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.84	1.27	1.17		1.30	1.52
Forest/upland/traditional manual	0.84	1.18	1.09		1.20	1.35
Forest/upland/improved manual	0.99	1.56	1.39		1.59	1.92
North/irrigation/improved manual	1.09	1.72	1.51	1.59	1.83	> 2
North/upland/traditional manual	0.94	1.30	1.31	1.22	1.34	> 2
North/upland/animal traction	> 2	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.57	0.93	0.90	1.13	1.32	> 2
Office/irrigation/semi-intensive	0.73	1.16	1.11	1.41	1.67	> 2
Office/irrigation/non-intensive	0.91	1.41	1.33	1.72	> 2	> 2
Mopti/controlled flooding	1.52	> 2	> 2	> 2	> 2	> 2
Mopti/traditional flooding	1.72	> 2	> 2	> 2	> 2	> 2

Note: In this scenario, the economic value of land is assumed to be 50 percent of that assumed originally, while the opportunity cost of labor is assumed to 25 percent lower than that used in the base run. In addition, it is assumed that both countries undertook a 50 percent devaluation and that transport costs were halved in both countries.

Source: Computed from Appendix B

Table C5-14a. Effect of Lower Opportunity Costs of Land and Labor, Devaluation, Lower Transport Costs, and Projected World Price of Outputs on Cotton and Maize DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.29				0.31	0.35
North/improved animal traction	0.27			0.29		0.33
North/semi-mechanized	0.45			0.46		0.49
Mali/cotton						
South/improved animal traction	0.28		0.33	0.34	0.34	
South/improved manual	0.34		0.39	0.40	0.40	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.33	0.46	0.42	0.46		0.55
Center/improved animal traction	0.55	0.68	0.58	0.67	0.64	0.82
Center/traditional manual	0.69	0.81	0.70	0.80	0.78	0.94
Center/improved manual	0.78	0.93	0.78	0.91	0.89	1.10
Mali/maize						
South/improved animal traction	0.41	0.69	0.49	0.61	0.85	1.53
South/improved manual	0.65	0.76	0.89	0.91	1.08	1.88

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

2/ In scenario, the economic value of land is assumed to be 50 percent lower than that assumed originally, while the opportunity cost of labor is assumed to be 25 percent lower than that used in the base run. In addition, it is assumed that a 50 percent devaluation took place in both countries and transport costs were halved in both countries. Moreover, the projected 2000 world price of cotton and maize are assumed to be $2400/ton and $164/ton, respectively.

Source: Computed from Appendix B

Table C5-14b. Effect of Lower Opportunity Costs of Land and Labor, Devaluation, Lower Transport Costs, and Projected World Price of Output on Millet/sorghum and Rice DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.56	0.75	0.69	0.71	0.80	> 2
North/animal traction	0.54	0.72	0.66	0.69	0.78	> 2
Mali/millet/sorghum						
South/animal traction	0.36	0.56	0.45	0.55	0.66	0.95
South/traditional manual	0.45	0.64	0.54	0.64	0.74	0.99
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.69	0.96	0.90		0.99	1.09
Forest/upland/traditional manual	0.71	0.99	0.93		1.02	1.15
Forest/upland/improved manual	0.78	1.16	1.06		1.19	1.37
North/irrigation/improved manual	0.81	1.16	1.06	1.11	1.24	> 2
North/upland/traditional manual	0.80	1.06	1.07	1.01	1.10	> 2
North/upland/animal traction	1.47	> 2	> 2	> 2	> 2	> 2
Mali/rice						
Office/irrigation/intensive	0.43	0.69	0.65	0.81	0.90	1.32
Office/irrigation/semi-intensive	0.55	0.83	0.81	0.97	1.09	1.62
Office/irrigation/non-intensive	0.67	0.99	1.15	1.30	1.30	> 2
Mopti/controlled flooding	1.13	1.52	1.46	1.75	1.98	> 2
Mopti/traditional flooding	1.33	1.69	1.63	1.89	> 2	> 2

Note: In this scenario, the economic value of land is assumed to be 50 percent of that assumed originally, while the opportunity cost of labor is assumed to 25 percent lower than that used in the base run. In addition, it is assumed that both countries undertook a 50 percent devaluation and that transport costs were halved in both countries. Moreover, the projected 2000 world price of sorghum and rice are assumed to be $155/ton and $389/ton, respectively.

Source: Computed from Appendix B

Table C5-15. Effect of Lower Opportunity Costs of Land and Labor, Lower Transport Costs, Devaluation, Projected World Prices of Output, and Improved Milling Ratios on Cotton and Rice DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton				1/		
Center/improved manual	0.25				0.28	0.32
North/improved animal traction	0.24			0.26		0.31
North/semi-mechanized	0.53			0.41		0.44
Mali/millet/sorghum						
South/improved animal traction	0.23		0.28	0.29	0.29	
South/traditional manual	0.45		0.33	0.34	0.34	
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.54	0.78	0.74		0.81	0.90
Forest/upland/traditional manual	0.58	0.79	0.74		0.81	0.91
Forest/upland/improved manual	0.60	0.88	0.81		0.91	1.04
North/irrigation/improved manual	0.61	0.87	0.80	0.83	0.93	> 2
North/upland/traditional manual	0.77	1.05	1.06	0.99	1.09	> 2
North/upland/animal traction	1.04	1.52	1.51	1.41	1.59	> 2
Mali/rice						
Office/irrigation/intensive	0.40	0.64	0.61	0.75	0.84	1.20
Office/irrigation/semi-intensive	0.51	0.77	0.75	0.89	1.00	1.47
Office/irrigation/non-intensive	0.62	0.90	0.88	1.05	1.18	1.79
Mopti/controlled flooding	1.03	1.39	1.34	1.59	1.80	> 2
Mopti/traditional flooding	1.23	1.56	1.51	1.75	1.93	> 2

Note: 1/ For the Malian cotton, the border Mali-Côte d'Ivoire is the relevant market instead of Korhogo

2/In this scenario, the opportunity costs of land and labor are assumed to be 50 and 25 percent lower than those assumed originally, and transport costs were half of their original values. In addition, it is assumed that a 50 percent devaluation took place, while the ginning ratios improved to 50 percent and the milling ratios for rice increased to 67 percent in both countries. Furthermore, the projected 2000 world prices for cotton and rice are assumed to be were $2400/ton and $389/ton, respectively.

Source: Computed from Appendix B

Table C5-16a. Effect of Lower Opportunity Costs of Land and Labor, Lower Transport Costs, Devaluation, Improved Ginning Ratios and on-Farm Yields, and Projected World Price of Outputs on Cotton and Maize DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/cotton						
Center/improved manual	0.20				0.23	0.27
North/improved animal traction	0.19			0.21		0.26
North/semi-mechanized	0.30			0.32		0.36
Mali/cotton						
South/improved animal traction	0.18		0.24	0.25	0.25	
South/improved manual	0.22		0.27	0.28	0.28	
Côte d'Ivoire/maize						
Forest/semi-mechanized	0.25	0.37	0.33	0.36		0.44
Center/improved animal traction	0.43	0.54	0.46	0.54	0.51	0.66
Center/traditional manual	0.55	0.66	0.57	0.65	0.63	0.77
Center/improved manual	0.60	0.73	0.62	0.72	0.69	0.87
Mali/maize						
South/improved animal traction	0.38	0.56	0.47	0.56	0.66	0.91
South/improved manual	0.51	0.71	0.61	0.72	0.85	1.18

Note: 1/ The border Mali-Côte d'Ivoire is the relevant market for cotton produced in Mali instead of Korhogo.

2/ In scenario, the opportunity costs of land and labor are assumed to be 50 and 25 percent lower that those assumed originally, transport costs were half of their original values, and a 50 percent devaluation took place in both countries. Moreover, the ginning ratio in both countries are assumed to improve to 50 percent, and on-farm yields increased by 25 percent. Furthermore, the projected 2000 world prices of cotton and maize are assumed to be $2400/ton and $164/ton, respectively.

Source: Computed from Appendix B

Table C5-16b. Effect of Lower Opportunity Costs of Land and Labor, Lower Transport Costs, Devaluation, Improved Milling Ratios and On-Farm Yields, and Projected World Prices of Output on Millet/sorghum and Rice DRC Coefficients

	Farm	Bamako	Sikasso	Korhogo	Bouaké	Abidjan
Côte d'Ivoire/millet/sorghum						
North/traditional manual	0.45	0.62	0.56	0.58	0.67	> 2
North/animal traction	0.43	0.59	0.54	0.56	0.64	> 2
Mali/millet/sorghum						
South/animal traction	0.28	0.46	0.37	0.44	0.53	0.74
South/traditional manual	0.36	0.53	0.45	0.53	0.61	0.82
Côte d'Ivoire/rice						
Forest/lowlands/improved manual	0.42	0.63	0.60		0.66	0.74
Forest/upland/traditional manual	0.46	0.66	0.62		0.68	0.75
Forest/upland/improved manual	0.46	0.69	0.64		0.72	0.82
North/irrigation/improved manual	0.46	0.67	0.62	0.64	0.73	> 2
North/upland/traditional manual	0.61	0.87	0.87	0.81	0.91	> 2
North/upland/animal traction	0.74	1.09	1.08	1.02	1.15	> 2
Mali/rice						
Office/irrigation/intensive	0.32	0.54	0.51	0.64	0.70	0.99
Office/irrigation/semi-intensive	0.40	0.63	0.62	0.74	0.82	1.18
Office/irrigation/non-intensive	0.47	0.73	0.72	0.85	0.95	1.39
Mopti/controlled flooding	0.79	1.10	1.07	1.26	1.41	> 2
Mopti/traditional flooding	0.98	1.27	1.23	1.42	1.57	> 2

Note: In this scenario, the opportunity costs of land and labor are assumed to be 50 and 25 percent lower than those assumed originally, transport costs were half of their original values, a 50 percent devaluation took place, and the milling ratios improved to 67 percent in both countries. Moreover, on-farm yields are assumed to increase by 25 percent in both countries. Furthermore, the projected 2000 world price for millet/sorghum and rice are assumed to be $155/ton and $389/ton, respectively.

Source: Computed from Appendix B

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