ABSTRACT

NARROWING TAIWAN'S PER CAPITA FARM/NONFARM INCOME GAP VIA INCREASED AGRICULTURAL PRODUCTION AND GUARANTEED PRICES: PROJECTIONS AND ANALYSIS, 1973-1984

By

Raphael Shen

Over the past nineteen years, Taiwan's industrial production has been increasing at a steady annual rate of 14.7 percent. Agricultural production over the same time period saw a meager annual growth rate of 4.8 percent. Agriculture has fallen in relative importance within the economic structure in Taiwan. A succession of four-year economic development plans has been focusing its attention more on the expansion of secondary and teriary sectors. As a result, the farmer's share of the rapidly increasing national per capita income has been steadily falling relative to a nonfarmer. The increasingly unfavorable income differential between farm and nonfarm people not only limits the purchasing power by farmers of industrial products, it also curtails the reinvestment ability of persons on farms. The main objective of this study is to provide decision makers with alternative per capita farm income consequences to various policy measures in the form of price support for selected major agricultural products. More specifically, this study: 1) constructs the hitherto unavailable time series data

on per hectare cash expenditures for the production of major crops in Taiwan, 1959-1972; 2) establishes projective relationships for yields of nine major crops and then projects the consequences of alternative production possibilities for the year 1973-1984; 3) projects through time four alternative per capita farm income streams and four resulting farm/nonfarm income ratios for the years 1973-1984; and, 4) makes recommendations concerning ways of closing the income gap between the farm and nonfarm populace through price support programs.

Due to the lack of detailed knowledge and data needed to construct structural equations, the projective equations set forth in this study do not weave into a system of "n" equations with "n" unknowns which can be reduced. Rather, the projective equations used in this study are probably partially reduced forms of unspecified and unknown structural equations. Each of the equations is distinct, and the endogenous variables are expressed as functions of exogenous, lagged endogenous or policy variables. Their strength is not in their individually estimated parameters as in their nonmonetary parameters and in having the estimated results fed into structural identities in a later stage.

In the projective equations, the per hectare yields of crops in time period "t" are the functions of their corresponding per hectare cash expenditures in "t", which are in turn the functions of policy determined prices of these respective crops in "t-1". Via structural identities, per hectare yields of these crops, together with their corresponding hectareages cropped and their respective prices during the time period, result in their contributions to total value product of crop productions. Incomes from cropping actitivites, in conjunction

with incomes from livestock raising activities constitute farm incomes from farming activities. The latter, added onto projected farm income from nonfarming activities, represents the total farm income. A comparison through time is then made of the per capita farm and nonfarm incomes to determine whether a given price support policy is adequate in its attempt to raise crop/livestock productions and to close the per capita farm/nonfarm income gap in Taiwan.

From the four projected per capita farm incomes consequent upon four alternative policy measures, it is concluded that policy alternatives I and II do not achieve the stated objective of closing income gaps between the two sectors of Taiwan's population. Policy alternative III projects rapid narrowing of the said income gap. But whether consumers of farm products will accept the proposed level of price support for selected agricultural products is subject to further consideration by policy makers. Projection results from alternative IV promise to raise agricultural productions and agricultural incomes in a more moderate pace than alternative III. Yet, policy alternative IV projects the narrowing of income gap between farm and nonfarm population in Taiwan during the period of projection. The study results suggest that the perennial problems of inability to consolidate/mechanize farms in Taiwan may "resolve themselves" in time as a by product of implementing policy alternatives III or IV. This study also points out the need for more detailed farm input data for future studies.

NARROWING TAIWAN'S PER CAPITA FARM/NONFARM INCOME GAP VIA INCREASED AGRICULTURAL PRODUCTION AND GUARANTEED PRICES: PROJECTIONS AND ANALYSIS, 1973-1984

By

Raphael Shen

A DISSERTATION

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

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1975

To the Society of Jesus

ACKNOWLEGMENTS

To Professor Glenn L. Johnson, my major professor and thesis supervisor, my lasting gratitude and appreciation. His intellectual acumen, patient prodding, kind encouragement and insightful comments have constructively guided me throughout my graduate program at Michigan State University. May my future adequately reflect his influence on me during the past. I also wish to thank Professors Lester V. Manderscheid, Vernon L. Sorenson and J. Allan Beegle for having served both on my guidance and thesis committee. Their wise guidance and helpful suggestions are deeply appreciated. Gratitude is also due to Victor E. Smith, Professor and Chairman of the Economics Department, for having served on my guidance committee.

To Enid Maitland, who patiently typed the draft of my thesis, and to Laura Flanders who kindly handled the computer work for me, my sincere thanks.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Taiwan: Land, Population and Agriculture

Taiwan is the smallest province in China with an area of 35,981 square miles. It lies east of Taiwan Straits that separates Taiwan and Fukien Province of China mainland. Nearly two-thirds of the island province is capped with mountains and mountainous terrains. Only 25.1 percent of the island province's land is cultivable. Land is in short supply. Despite reclamation projects and the use of marginal lands, the absolute number of hectares farmed has seen a steady decline in more recent years. Each cultivable hectare (one hectare equals 2.47 acres) is burdened with feeding nearly 17 persons.

The population in Taiwan increased from 3,123,302 in 1930 and 6,090,000 in 1946 to more than 15,441,000 in 1973. Of Taiwan's current population, approximately 38 percent are categorized as agricultural. In 1971 the population density in Taiwan was 412 persons per square kilometer.[1]

Despite physical constraints imposed by nature, among other achievements, real national income increased by 348.1 percent from 1952 to 1971, industrial production by 1,249.7 percent and exports by 1,686.7 percent. The current economic growth and industrialization in Taiwan

---

[1] It was 2, 22, 228 and 323 persons per square kilometer in Canada, the U.S., U.K. and the Netherlands, respectively.

stems from the root of an economy that only two decades ago was predominantly agricultural. Taiwan's agricultural productivity is in turn related to the successful implementation of the Land Reform Act.

Land reform in Taiwan was initiated in 1953, and was carried to successful completion in 1963. It was based on the triple policies of: 1) release of publicly owned agricultural land; 2) imposition of a .375 rental ceiling; and 3) land to the tiller. The land operated by the Japanese prior to the end of World War II was made public, and was open for sale or for lease to prospective tillers. The objective was to enable tillers to achieve land ownership. The value of the publicly released land was set at two and a half times the value of the major crops harvested, payable in twenty installments within a ten-year period. A ceiling on rentals which an existing landlord could collect from his leasee(s) was set at 37.5 percent of the main crops harvested. The government was authorized to: 1) purchase any agricultural land from landlords whose land holdings exceeded the allowable hectarage; and, 2) to release the publicly purchased land to tillers under the provisions enumerated above.

The resulting pride of ownership and economic incentives helped to propel the farmers to intensify their productive efforts and to channel savings to investments on land. With the assistance from the Joint Commission on Rural Reconstruction and the provincial government, farm organizations mushroomed, up to date farming techniques disseminated, price information made more readily available, cooperatives were formed, and export markets were aggressively sought. And to overcome the obstacle imposed by limited cultivable land, impetus was given to family

style livestock raising and fish culturing on land, and, on the seas, to the rapid build up of the fishing fleet.

Agriculture and Other Sectors of the Economy

The immediate beneficiaries of land reform were the rural population. Yields increased, multiple cropping indices climbed, production of higher priced agricultural products such as livestock and vegetables expanded, fishery yields multiplied nearly five times in value over the past decade and, most importantly, the per capita disposable income to the farm person increased. The increased purchasing power of the farm person increased. The increased purchasing power of the farm person, in turn, helped industrial producers in the form of expanded markets for industrial products. Throughout the years, the motto has been" "Agriculture nurturing industires, and industries assisting agriculture."

The agricultural sector of Taiwan population has indeed been nurturing industries. Aside from having provided the industrial and service sectors with ready markets for the latters' products, the rural economy has been providing industries with raw materials, imported equipments for industrial production with the foreign exchange earned through the export of agricultural products, and rural Taiwan has been supplying the ever increasing number of "farm bred" industrial workers. The nurtured industries have taken roots and fructified.

Over the past nineteen years, industrial production has been increasing at a steady annual rate of 14.7 percent. In the process of economic development, agriculture fell in relative importance within the economic structure. A succession of four-year economic development plans has been focusing its attention more on the expansion of secondary and

tertiary sectors. Agricultural production over the same past nineteen years saw a meager annual growth rate of 4.8 percent.

It does seem logical that, faced with the urgent problem of population increases on a nonexpandable island, and with the need of economic growth, a structural change in economy from agricultural to industrial was called for. And the transformation has been successful. In the year 1952, agricultural output accounted for 35.7 percent of the GNP while industries contributed only 17.9 percent in the same year. By 1971, the proportion was almost reversed. Agricultural products and their processed goods assumed 95.2 percent of total export values in 1952. In 1971, the figures slipped to a meager 19.6 percent. The economy as a whole is indeed budding with life. It nevertheless does not negate the fact that the farm person's share of the national per capita income, though increasing in absolute new Taiwan dollar figures, has fallen steadily.

Problems and Implications

Land tillers witness continued fragmentation of farm lands due to the traditional practice of dividing family wealth--among which is agricultural land--among surviving children, thus causing inefficient use of productive resources. And despite the continued trend of off-farm migration over the past two decades, the area of cultivated land per farm person dwindled from .21 hectare in 1952 to .15 hectare in 1972. Farm mechanization designed to raise yields ran into snags due to uneconomic sizes of farms. The hidden tax on farmers in the form of mandatory crop-fertilizer barter system, where agricultural products are deliberately

kept at depressed prices, added an additional burden. And farm investment incentives declined as capital and savings generated on farm could be more profitably invested in industries or in the service sector. The litany of woes may be continued at considerable length.

The root of many problems facing the agricultural producers seems to be the fact that, in the process of economic development, agricultural producers have borne more of the burden and have shared less of the fruits than producers of the industrial and service sectors. And the problem is magnified by the fact that 38 percent of Taiwan's population is agricultural.

The increasingly unfavorable income differential between farm and nonfarm people not only limits the purchasing power by farm persons of industrial products, it also curtails the reinvestment ability of persons on farms. Low investment returns from farming activities relative to industries discourages the flow of capital from the nonfarm to the farm sector. And savings generated from farm people could well seep out of the farm and flow into more lucrative investment opportunities in industries. Low investment on farms means slow increases in agricultural production and low per capita farm income from farming activities. In the long run it is to depress the purchasing power of farm population for industrial products, and therefore is undesirable both for the farm and nonfarm economies.

With rapid industrialization and increases in per capita income in Taiwan, farmers still experience depressed agricultural prices relative to the prices of inputs, thus curtailing agricultural investment incentives and further widening the already relatively inequitable income gap between farm and nonfarm population in Taiwan.

The social implication of low productivities on farm in general cannot be overlooked. With 38 percent of its population still residing on farm lands, policy makers may not rest with assurance that social problems of significant consequences will not emerge.

Also, an increase in the absolute number of persons on the already highly congested farm lands will lead to further lowered labor productivity, directly affecting agricultural production, and indirectly adversely affecting farm income.[2]

Need of Favorable Agricultural Policy Measures

The need is present to improve the current agricultural scene. The government in Taiwan holds tight and effective control over economic policies.[3] Farm persons are economic beings responsive to economic incentives. Therefore, it is important for the policy makers to be presented with alternative approaches to improve the lot of 38 percent of Taiwan's population.

---

[2]This is a well known and accepted fact among economic planning agencies in Taiwan. Four Year Economic Development Plans and publications from Joint Commission on Rural Reconstruction abound with references to this. One of the empirical studies showed the following results from small farms in Taiwan:

$$\log Y = 1.8431 + \underset{(.1785)}{.4825} \log X_1 - \underset{(.1254)}{.1099} \log X_2 + \underset{(.1454)}{.5193} \log X_3$$

where: X_1 = land (.01 hectare)
X_2 = labor (labor day)
X_3 = capital (NT$) and,
Y = yield per .01 hectare (kgs.)

Source: The Quarterly Journal of Land Credit, Vol. IV, No. 4, (September, 1967) (Taiwan: Research Department of Land Bank of Taiwan).

[3]For instance, the recently abolished crop-fertilizer barter system; the quasi-voluntary lowering of all tourist hotel prices by 10 percent to attract foreign visitors, etc.

There is the need to use policy measures: 1) to revitalize and to stimulate the sagging agricultural sector; 2) to increase agricultural yields to meet increasing demand for farm products from domestic consumers and for export purposes; 3) to narrow the per capita income gap between the farm and nonfarm sectors of Taiwan's population so as to achieve a more equitable distribution of the fruits of economic progress and to maintain social orderliness; 4) to enhance the purchasing power of farm population for nonfarm products; 5) to induce farm persons to reinvest their earnings and savings in agriculturally related activities; and, 6) to speed up off farm migration both in order to supply the ever increasing demand for nonfarm labor, and to remove high man-land ratio pressure on scarce cultivable land. This study attempts to provide the decision makers with information about some alternative courses of action to satisfy the above needs.

General Background for Rice, Sugarcane and Livestock Production in Taiwan

In this study, the consequences of raising prices of rice, sugarcane and livestock products will be raised to different support levels will be studied to ascertain consequences for agricultural production and the per capita income to the farm person. General background for rice, sugarcane and livestock production is therefore given.

Rice is the staple crop in Taiwan and its cultivation is found in all counties of Taiwan. Except in isolated areas, rice can be planted twice annually in all rice regions. The total hectarage cropped during the past have seen a slight decline from 789,075 in 1951 to 776,139 hectares in 1970 while the total rice production has increased from

1,484,792 to 2,462,643 metric tons for the corresponding period. In 1959, the value product from rice was fifty percent of total value products from all crops; by 1973 it fell to 44.8 percent. It however has not failed to reveal the importance of rice in Taiwan. Some studies have suggested a possible rice shortage in Taiwan in the future.[4] But this need not occur if policy alternatives III and IV as suggested in this study be considered for adoption. One of the main reasons for the relative slow growth of per hectare yield of rice is reluctance of farmers to invest more heavily in crop production, and the other major obstacle is the inability to mechanize the fragmented farm lands. Given the price support program for rice, the per hectare cash expenditure on rice production, and correspondingly per hectare rice yield can be expected to increase significantly.[5]

In terms of export values sugarcane plantation is the most important crop in Taiwan. Aside from the fact that a very large percentage of Taiwan farmers engage in sugarcane production (hence the possibility of more equitable distribution of the benefits from price support program)

---

[4]Chen, Cheng-Sang, An Economic and Social Geography, Taipei: Fu Min Geographic Institute of Economic Development, 1963, p. 292; and Chang, Te Tsue, Long Term Projections of Supply, Demand and Trade for Selected Agricultural Products in Taiwan, Taipei: The Research Institute of Agricultural Economics, National Taiwan University, 1970, p. 84. The latter study suggested that there would be very little surplus rice left for export purposes by 1980, while the former suggested a down right rice shortage, even for domestic consumption by 1968. The feared rice shortage did not occur in 1968. But as for 1980, with the hectares of rice plantation decreasing far more rapidly than projected by the second study above (1970-1973 period) a rice shortage could occur. This present study suggested that, if the production relationships hold, and if either policy alternatives III or IV be adopted, no such rice shortage need occur.

[5]See subsection on "per hectare yield" possibility in this chapter.

sugar export has traditionally found more ready, international markets than other crops. Since 1949, more than 80 percent of Taiwan's sugar production has been sold directly on the international market. Domestic consumption accounted for only 10 percent of the total sugar produced, while the remaining portion of approximately 10 percent is sold to local canning industries, most of whose products also find their way to foreign markets. With most of its exports going to Southeast Asia, Far East, Middle and Near East regions and countries, increased production of sugarcane resulting from price support programs in Taiwan is not likely to suffer from shortage of international markets.

Livestock products are the third agricultural item suggested for price support. Unlike some livestock producers in some economically more developed countries, most Taiwan's livestock producers are farmers operating on very small scale, utilizing otherwise unproductive labor such as the aged, the children and some women. Backyards of rural dwellings are the breeding ground of hogs, whose value product in 1973 made up 96.0 percent of the value of all livestock slaughtered. The large quantity of livestock supplied in Taiwan is attributable solely to the widespread hog raising practice on farms. With each farm family setting off a corner of the backyard, hogs scrounge and mire in the mud for anything digestable in sight thus converting unusable "resources" into valuable meat products. Sweet potato is the principal feed supplement to residual "resources." Sweet potato production therefore also needs to increase to expand livestock production and, as Tables 5.5, 6.4, 7.4, and 8.4, respectively show, do so with the price support program for rice and sugarcane production.

Study Objectives

The objectives of this study are:

1) To construct the hitherto unavailable time series data on per hectare cash expenditure for the production of nine major crops in Taiwan, 1959-1972.

2) To establish projective relationships for yields of the nine major crops. Then, to predict the consequences of alternative production possibilities for the years 1973-1984.

3) To project through time four alternative per capita farm income streams and four resulting farm/nonfarm income ratios for the years 1973-1984.

4) And help make recommendations concerning ways of closing the income gap between the farm and nonfarm populace through price support programs for farm producers, thus encouraging "plow back" investments by farmers for agricultural production.

Scope of Study

With given data, resources and time, this is a one man effort to produce a general picture of future agricultural production possibilities in Taiwan under alternative pricing and investment policies and programs. It does not purport to be an exhaustive or intricate study of Taiwan's agriculture.

The main concerns of this study are: 1) projections of agricultural yields and farm income streams through time; and, 2) the analysis of projected results. Structural meanings are derived mainly from structural identities and accounting components. Little claim is made for the structural meanings in the interpretation of the regression equations set forth in this study.

Focus is on the predictive power of the entire system of regression equations, integrated with structural identities and accounting components, culminating in the recursive generation of criterion variables and yielding projected alternative income streams for the farm population. In the predictive equations, consideration is given to the multiple correlation coefficients and statistical tests for equations, but no special attention will be given to testing the parameters of estimated coefficients from the independent variables, whose parameters being of questionable structural significance.

Emphasis is on projecting how some of the more important performance variables--such as low yields on farm and widening per capita income gap between farm and nonfarm populations--will vary with alternative commodity price policies and programs.

Justifications and Constraints

The reasons for this particular study are multiple. They include the following:

1) Social stability is one of the major concerns of the government in Taiwan. Population growth continues. Land is limited. The man-land ratio has steadily been increasing. There is the need to raise agricultural production to meet the increasing demand. There is the need to guarantee the 38 percent of Taiwan's population on farm that increased production will mean an increased income stream and that increased farm production and income stream will give them a more equitable share in the fruits of economic successes than before.

There is the need to recapture the incentives and pride which the

farm persons entertained after the land reform. This study intends to explore the alternative ways of meeting the above needs.

2) Government publications have frequently indicated a widening of the per capita income gap between the farm and nonfarm sectors of the population. However, to date only intermittent surveys on the subject have been made, and there is an absence of contiguous time series data. This study will construct the needed data to estimate the per capita farm and nonfarm income which both approximate the survey data and run contiguously through time for more meaningful comparison.

3) Goals have been set by the government for increased agricultural productivity on a yearly basis. No analytical explanations are given as to how one factor of production may affect--positively or otherwise, and to what extent--the yield of a given crop or farm product. This study, therefore, intends to give the above topics some substance for more meaningful discussions. And,

4) The policy makers, intent upon raising farm productivity and closing the farm-nonfarm per capita income gap, can make use of study results that: i) point to the alternative consequences of various agricultural commodity price policy options; ii) analyze their feasibility; and, iii) explain their reasonableness.

Limitations on this study which make it far from being ideal are numerous. To name a few:

1) Unavailability of detailed, consistent and comprehensive input data on subsectors of agriculture in Taiwan.

2) The quite limited number of observations from available data for a time series study.[6]

---

[6]Fourteen to fifteen observations, depending on the variables in question.

3) Absence of detailed well established policy measures with respect to agricultural development in the future.

Given the above constraints, this study attempts to make use of existing information to offer some information of value in choosing among four future alternatives.

Order of Presentation

Chapter II will first detail the general methodological approach taken in this study, the quantitative techniques used, the importance of descriptive and projective information, and how government policy pronouncements are to be incorporated in the study.

A discussion on the compilation of existing data, their sources, categories, and the approximation of needed yet unavailable data, especially time series data on the per hectare cash expenditure for the production of major crops, will be detailed in Chapter III.

Chapter IV presents results from regression equations and structural identities. Predicted consequences for the four alternative policy measures are given in Chapters V through VIII. An analysis of policy consequences and implications is presented in Chapter IX.

Appendices containing hitherto unpresented tables are included.

CHAPTER II

GENERAL APPROACH AND METHODOLOGICAL ISSUES

Chapter I outlined 1) Taiwan's agricultural background; 2) the problems facing agricultural production; 3) objectives, scope, constraints and justification of this study. In this chapter, the following sub-topics will be discussed: 1) the general approach to this study; 2) projective equations; 3) structural identities and accounting components; 4) recursive generation of criterion variables; 5) policy values from government directives; 6) tests of objectivity in this study; and, 8) arrival at recommendations and conclusions.

General Approach to this Study

The general approach taken in this study is that of a problem solving process. This study concerns itself only with the initial steps of the process while leaving the latter ones to decision makers. More specifically, this study: 1) defines the problem; 2) observes facts; 3) analyzes study results; and, 4) examines alternatives and makes recommendations, while leaving to policy makers the remaining steps of: 5) actually deciding on the objectives to be achieved; 6) effectuating actions to be taken; and, assuming responsibility for the actions decided upon.

The general approach taken by this study is explained by the following figure.

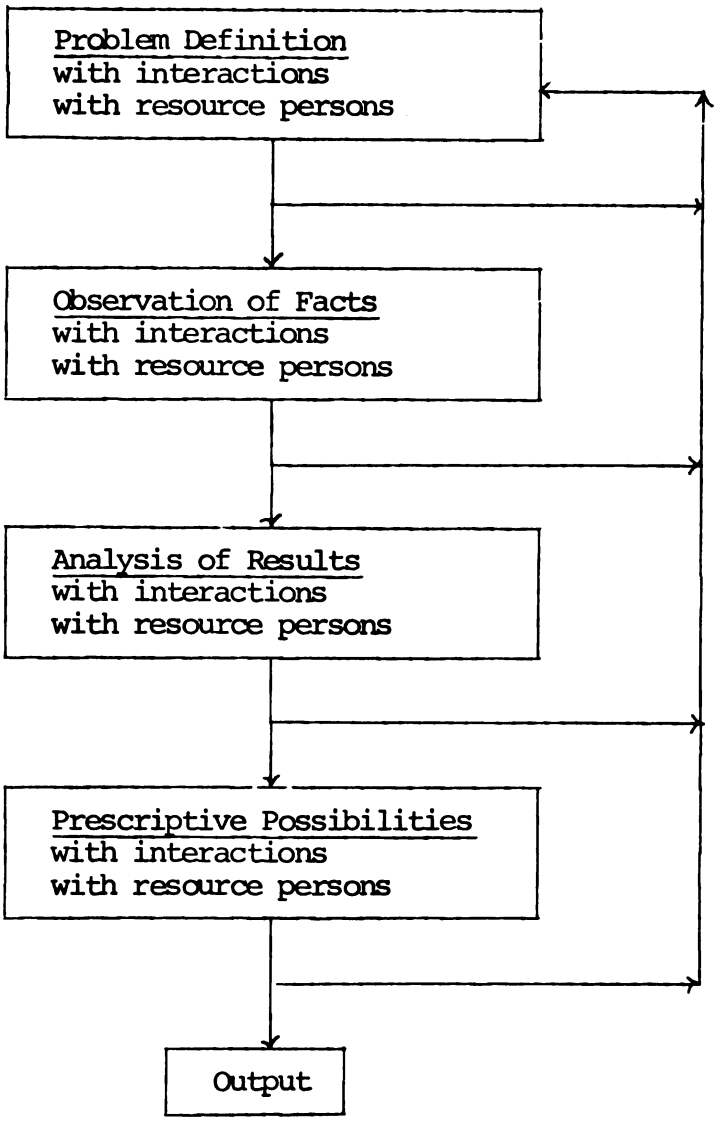

Figure 2.1. General approach to the study.

Attending to steps one through four, interaction takes place between the investigator and the resource persons rather than between the former and the decision makers. This does not exclude the future possibility or need to interaction with decision makers for refinement of the study and for possible adaptation or adoption of the study recommendations.

Knowledge gained through interactions will be incorporated into the model building and refining processes as well as into the interpretation of study results. From inception of the study to its completion, continuous reformulation of concepts with respect to the problem and with respect to observation of facts and analysis of results will be based on the new information and new knowledge gained through interactions. Interactive process of conducting this study is exemplified in the figure, where each step within the process is subject to interactions and feedbacks until the result satisfactorily achieves objectives of this study.

The problem is defined in Chapter I. Observation of facts takes the form of studying and assembling available information/data for the purpose of modeling predictive equations. This step is discussed in Chapter III. The third step--analysis of results--includes: 1) discussing results from regression equations and accounting identities for predictive purposes; and, 2) analyzing projected results from alternative policy measures. Chapter IV is concerned with the former, while Chapters V through IX present the latter.

Data Categories

The data to be used in the projective equations and structural identities can be grouped under four general categories: state, intermediate, policy and performance. State variables are variables whose values, under given conditions, do not change "eratically" over time. In other words, changes observed in a time series study of a state variable are "stable." They follow a determinable pattern under normal conditions. For instance, the total area of agricultural planting is stable over time;

its variation from one year to another is either negligible, or in general predictable as a function of time.

Policy variables are variables whose values change over time in accordance with actions taken by policy makers. For instance, the level of price support for a given crop is a policy determined variable. Its value might vary from one year to another, and is determined on the basis of policy objectives.

The third category of variables includes the intermediate variables whose values are generated within the system from relevant state and/or policy variables, and whose values are in turn employed to project performance variables. For example, the per hectare yield of rice in time period "t" is a function of per hectare cash expenditure on rice in "t", which is in turn a function of the policy determined price of rice in "t-1". Per hectare rice yield as an intermediate variable is then used, together with rice hectarage cropped, to compute the rice production for time period "t". In conjunction with price of rice, rice production is again used as an intermediate variable to compute total value product of rice in "t". Total value product of rice production is eventually used to compute the contribution of rice to total farm income which is a performance variable.

A performance variable is, therefore, a dependent variable generated for a given time period within the system from the intermediate, state and policy variables. Performance variables measure the conditions, situations or things to which goodness or badness are attached; as such they are normative.

Projective Equations

This study projects the per capita income consequences of four policy alternatives for the farm people in Taiwan. These alternative income consequences are the result of: 1) alternative price policy measures for selected crops; 2) alternative per hectare cash expenditures by farmers; and, 3) alternative crop production possibilities.

Income sources to the farm person from farming activities consist of; 1) income from crop production; and 2) income from livestock production. We need first to determine the crop production possibilities. The basic projective equation for crop production is:

$$Y_{i_t} = f(X_{i_t}) \text{ for } i = 1,\ldots,9 \text{ and } t = 1959,\ldots,1984$$

where:

Y = the per hectare yield of $crop_i$,

X = the per hectare cash expenditure for the production of $crop_i$.

There could be as many possible levels of per hectare yield of a given crop as there are levels of per hectare cash expenditure. The latter is a function of its per hectare value product in t - 1. In other words, it is a function of the per hectare yield in t - 1, and of crop price in t - 1.

In an ideal study of this nature, the system would be composed of structural equations which would then be transformed into reduced form for estimation. After transformation of these estimates back into the parameters of the structural equations, the projected values of dependent variables would then be incorporated into structural identities.

In this study, however, the projective equations set forth are

not structural. The reasons for not developing these projective equations in the structural form are: 1) the many variables and relationships among them needed to write structural equations are not well known; and, 2) even if all the variables and relationships needed to write the equations structurally were known, much of the data needed to estimate their coefficients is unavailable. A simple example is that the per hectare labor input for the production of a given crop has never been recorded.

We could make believe the needed variables for these structural projective equations are known, and that the data needed for the estimation of their coefficients could be approximated. However, such estimated results would be misleading. It is better, therefore, to recognize and accept the shortcomings enumerated and to make the projections with available information rather than to conduct a research that ends in misleading results.

In this study, therefore, no claim is made that the projective equations set forth are structural. Due to the lack of detailed knowledge and data needed to construct structural equations, the projective equations set forth in this study do not weave into a system of "n" equations with "n" unknowns which can be reduced. Rather, the projective equations set forth in this study are probably partially reduced forms of unspecified and unknown structural equations. Each of these equations is distinct, and the endogenous variables are expressed as functions of exogenous, lagged endogenous or policy variables. Their strength is not so much in their individually estimated parameter as in their nonmonetary parameter and in having the estimated results fed into structural

identities in a later stage. The projective equations and structural identities employed in this study did project variables satisfactorily.[1]

Thus, we proceed with the discussion and presentation of the predictive equations used in this study. The first equations to be determined for projective purposes are those for the per hectare yield of major crops. Instead of a lump sum calculation and projection of total agricultural value product, the per hectare physical yield of each individual crop is estimated from logarithmic regression equations. Thereafter, for each given year, the per hectare yield of an individual crop, together with its unit price and harvest hectarage will provide the total value product of that particular crop.[2]

The summation of all such individually estimated crop yields, together with their respective unit prices and harvested areas, gives a total value product of cropping activities for that year. This summed total value of agricultural products were estimated directly. This is so because the errors in individual estimates will probably cancel out each other's effect and produce a relatively smaller error on the aggregate final value product. This procedure also allows the inclusion, use

---

[1] Frederick V. Waugh, when contrasting the practical usefulness of OLS technique and the more complicated models for projective purposes has the following to say: ". . .least square estimates are unbiased, and that the basic structural true equations give biased estimates of the expected value of the dependent variable." (Frederick V. Waugh, Econometrica, Vol. XXIX, No. 3, (July 1961), p. 386.) Trygve Haavelmo showed that ". . .if one wants the expected value of Y_1 given X, it is the structural equations that is biased, and the least squares equation that is unbiased." Ibid., p. 388.

[2] I.e., $\text{Value product}_{i_t} = \text{Yield}_{i_t} \cdot \text{price}_{i_t} \cdot \text{Hectares cropped}_{i_t}$ for $i = 1,\ldots,9$ and $t = 1959,\ldots,1984$. See subsection on structural identities in this chapter. Prices are policy determined whereas the hectares cropped are a function of time.

and analysis of more information than if estimation of the total value product of farming were done directly.

The predictive equations set forth in this study embrace two sub-sectors of agriculture: crops and livestock production. The basic equations fitted for predictive purposes are:

a) Crops:[3] $\log Y_{i_t} = \log a_i + b_i \log X_{i_t}$ for $i = 1,\ldots,9$ and $t = 1959,\ldots,1984$

where:

Y = per hectare yield of crop, and,

X = per hectare cash expenditure.

Under policy alternative I, the per hectare cash expenditure is a function of time. Under policy alternatives II through IV, the per hectare cash expenditure is estimated by the following equation (see tables in Appendices C, D, and E):

$$Z_{i_t} = X_{i_t} \frac{P_{i_t} / P_{a_t}}{P_{i_{t-1}} / P_{a_{t-1}}} [\alpha + \beta (VP_{a_{t-1}})]$$

where:

Z_{i_t} = unadjusted per hectare cash expenditure for crop i,

$X_{i_t} = Y_{i_{t-1}} / Y_{a_{t-1}}$, where: X_{i_t} is a ratio, and, $Y_{a_{t-1}}$ = average per hectare cash expenditure in t - 1 (NT$/hectare)

Y_{a_t} = calculated from the following equation:

---

[3] Combinations of many other possible predictive variables have been tested for the variations in the dependent variables. Due to one reason or another, the above listed format appears to be most satisfactory. For test results, see Chapter IV. Chapters III, V, VI, VII and VIII explain more fully how the per hectare cash expenditures are estimated under the four policy alternatives.

$$Y_{a_t} = \frac{\sum_{k=1}^{9} \sum_{j=1}^{9} \sum_{i=1}^{9} P_{i_t} \cdot Q_{j_t} \cdot H_{k_t}}{\sum_{k=1}^{9} H_{k_t}}$$

for i, j and k = 1,. . .,9 respectively and t = 1959. . .,1984

where: P_{i_t} = price of crop i (NT$/1,000 kgs.)

Q_{j_t} = per hectare yield of crop j (1,000 kgs./hectare) and,

H_{k_t} = number of hectares cropped for crop k, where H_k is a function of time.

P_{i_t} = price of crop i in time period t (NT$/1,000 kgs.)

P_{a_t} = average price of all crops in t (NT$/1,000 kgs.)

α and β = the constant term and the estimated coefficient from the equation $y_t = f(VP_{a_{t-1}})$

where: y_{a_t} = the average per hectare cash expenditure in time period t (NT$/hectare), and

VP = the average per hectare value product in time period t - 1 (NT$/hectare)

P_{i_t} from 1959 to 1973 is from recorded data whereas from 1974 through 1984 is policy determined.

P_{a_t} is computed via the following equation:

$$P_{a_t} = \frac{\sum_{j=1}^{9} \sum_{i=1}^{9} P_{i_t} \cdot Q_{j_t}}{\sum_{j=1}^{9} Q_{j_t}}$$

for i and j = 1,. . .,9, respectively, and
t = 1959,. . .,1984

where: Q_j = the quantity of crop j (1,000 kgs.)

P_i = the price of crop i (NT$/1,000 kgs.)

The above equations yield the unadjusted per hectare cash expenditure for a crop (see, e.g., Table C.2 in Appendix C). To reach the adjusted per hectare cash expenditure, the following process is carried out:

$$X_{i_t} = \frac{\dfrac{Z_{i_t} \cdot H_{j_t}}{\sum_{j=1}^{9} \sum_{i=1}^{9} Z_{i_t}} \cdot H_{j_t} \cdot Y_{a_t} \cdot H_t}{H_{i_t}}$$

for i and j = 1,. . .,9 and t = 1959,. . .,1984

where:

X_{i_t} = adjusted per hectare cash expenditure for crop i (NT$/hectare),

Z_{i_t} = unadjusted per hectare cash expenditure for crop i (NT$/hectare),

H_{j_t} = hectares cropped for crop j (Hectare)

Y_a = average per hectare cash expenditure (NT$/hectare),

And this average per hectare cash expenditure is in turn obtained via:

$$Y_{a_t} = [(\alpha + \beta (VP_{a_{t-1}})] \quad \text{for } t = 1959,. . .,1984$$

where: Y_{a_t} = average per hectare cash expenditure in t (NT$/hectare)

$VP_{a_{t-1}}$ = the average per hectare value product in t. (NT$/hectare)

b) Livestock:

(i) $\log Y = \log a + b \log X_{t-1}$ for t = 1959,. . .,1984

where: Y = livestock slaughtered (head) and,

X = national per capita income t-1 (NT$)

(ii) $\log Y_t = \log a + b_1 \log X_{1_t} + b_2 \log X_{2_t}$

for t = 1959,. . .,1984

where: Y = production of poultry fowls (heads)

X_1 = price of poultry (NT$) and,

X_2 = total population (persons)

(iii) $\log Y = \log a = b \log X_{t-1}$

for t = 1959,. . .,1984

where: Y = production of milk (tons), and,

X = national per capita income

(iv) $\log Y = \log a + b \log X_{t-1}$ for t = 1959,. . .,1984

where: Y = egg production (1,000s) and,

X = number of fowl.

Structural Identities and Accounting Components

Having detailed the nature of the projective equations used in this study, and having outlined the projective equations for crop and livestock subsectors, we may now discuss in greater detail the operation and role of structural identities and accounting components. The identities and accounting components, and their relationships are presented below:

$$TVP_1 \equiv \sum_{i=1}^{9} P_{i_t} \cdot Q_{i_t} \cdot H_{i_t} \quad \text{for } i = 1,. . .,9 \text{ and } t = 1959,. . .,1984$$

where:

TVP_1 = total value product of nine major crops (NT$)

P = policy determined price for crop i (NT$)

Q = quantity of per hectare yield (kgs.) and,

H = hectares cropped.[4]

$$TVP_2 \equiv TVP_{i_t} + TVP_{j_t} \quad \text{for } i = 1,. . .,9 \text{ and } t = 1959,. . .,1984$$
$$j = 1,. . .,n$$

---

[4] Long Term Projections of Supply, Demand and Trade for Selected Agricultural Products in Taiwan uses a trend approach in determining future hectarages of individual crops, with minor adjustments. In this study, the trend approach is adopted for hectarages cropped in the future, with minor adjustments made if appropriate. That is, hecatres cropped per major crop is a function of time.

where:

TVP_2 = total value product of all crops (NT$)

TVP_i = TVPs of the nine major crops, and

TVP_j = TVPs of all minor crops (NT$)

$$TVP_3 \equiv \sum_{i=1}^{4} P_{i_t} \cdot Q_{i_t} \quad \text{for } i = 1,\ldots,4 \text{ and } t = 1959,\ldots,1984$$

where:

TVP_3 = TVP of livestock products,

P = price of livestock item (livestock slaughter, milk, eggs, poultry) (NT$) and,

Q = quantity of livestock produced.

$$TVP_{4_t} \equiv \sum_{k=1}^{2} TVP_{k_t} \quad \text{for } k = 1 \text{ and } 2 \text{ (crops and livestock and, } t = 1959,\ldots,1984$$

where:

TVP_4 = total value product from agriculture (NT$)

$$Y_{f_t} \equiv \frac{TVP_{ag_t} - TC_t}{P_t} \quad \text{for } t = 1959,\ldots,1984$$

where:

Y_f = per capita farm income from farming activities in NT$/year

P_t = farm population t,

TVP_{ag} = total value product from farming and livestock production (NT$) and,

TC = total cost of agricultural production.

$$Y_{tf_t} \equiv Y_{f_t} + Y_{nf_t} \quad \text{for } t = 1959,\ldots,1984$$

where:

Y_{t_f} = total per capita income for a farm person in NT$/year,

Y_{f_t} = per captia farm income from agricultural production in NT$/year; and,

Y_{nf_t} = per captia income to the farm person from nonfarming activities (NT$)

$$Y_{n_t} \equiv \frac{(Y_t - Y_{tf_t}) \cdot P_{f_t}}{P_{nf_t}} + Y_t \quad \text{for } t = 1959,\ldots,1984$$

where:

Y_{nt} = per capita income of a nonfarm person in NT$/year,

Y_t = national per capita income (NT$)

Y_{tf_t} = per capita income of a farm person in NT$/year and,

P_{f_t}, P_{nf_t} = total farm and nonfarm population, respectively.

And finally,

$$Y_{d_t} \equiv Y_{n_t} - Y_{tf_t} \quad \text{for } t = 1959,\ldots,1984$$

where:

Y_d = per capita income difference between farm and nonfarm person in NT$/year,

Y_{n_t} = per capita income of a nonfarm person (NT$) and,

Y_{tf_t} = per capita income of a farm person.[5]

In view of the above identities and accounting components, due to the various policy determined farm commodity prices and correspondingly

---

[5]Besides the differences in terms of absolute NT$, the per capita farm income as a percentage of that of a nonfarm person's will be given for comparative purposes.

their alternative yield/production responses, there will be correspondingly many alternative total value products.

Thus, via projection equations, structural identities and accounting components, the possible trends in per capita income streams to the farm and nonfarm persons in Taiwan and the differences in their income streams may be projected through time. Comparisons will be made and analyzed. Conclusions and recommendations will be developed and presented in Chapter IX.

Recursive Generation of Criterion Variables

The projective equations set forth in this study run recursively by virtue of: 1) recursivity in the equations; and 2) exogenously determined policy variables. Both of these points are demonstrated in the computational process and is described in Chapter III and Chapters V through VIII. the nature of recursivity in this study may first be explained in the following manner.

In Chapter VI through VIII of this study, the per hectare yield of rice, for instance, is a function of its per hectare cash expenditure. The endogenous variable--per hectare yield of rice--is determined one crop at a time, year by year. The per hectare yield of rice in time period I is determined from the value of its per hectare cash expenditure in the corresponding period, independent of the other endogenous variables. Its solution "then appears in the second endogenous variable" by virtue of the following link:

For instance, under price policy alternative III, 1974's per hectare yield of rice is a function of 1974's per hectare cash expenditure on rice production. However, 1974's per hectare cash expenditure

on rice production is a function of the following three factors:

1) The change in the unit price of rice from t-1 to t (i.e. 1973 to 1974) relative to the province's average change in price for all crops for that corresponding time period. That ratio as computed is 1.005. That means, relative to the changes in the prices of other crops from 1973 to 1974, the price of rice had a more rapid increase. This more rapid increase positively affects 1974's per hectare cash expenditure on rice production. This is made clear in conjunction with the following factor.

2) The second factor affecting the per hectare cash expenditure on rice production in 1974 is the ratio of per hectare cash expenditure for the production of rice to the province's average per hectare cash expenditure for all crops in 1973. In 1973, that ratio was .792. That means, given 1973-1974's relatively more rapid increase in the price of rice (1.005) than that of other crops, and given the existing ratio of per hectare cash expenditure on rice production to that of the province's average in 1973 (.792), the ratio of per hectare cash expenditure on rice to that of the province's average in 1974 will relatively increase. The product of 1.005 x .792 is .796. Which means, due to the price changes from 1973 to 1974, and due to the existing ratio of per hectare cash expenditure on rice to that of the province's average in 1973, that ratio in 1974 is increased from .792 to .796.

3) The third factor affecting 1974's per hectare cash expenditure on rice production is the province's average per hectare value product in 1973. That means, if the per hectare value product in t - 1 (1973) was high, then the producer would have a greater incentive to invest more

heavily in t (1974). Conversely, if the value product in t-1 (1973) was low, the farmer would be less prepared and less capable of investing heavily in farm production. In our example of rice production, given the average per hectare value product in t-1 (1973), the 1974's per hectare expenditure is NT$ 9,926, a net increase of NT$ 2,342 over 1973. This is so because the average per hectare value product in 1973 witnessed a significant increase. This NT$ 9,926--(the 1974's average per hectare cash expenditure)--is then multiplied by the ratio of .796 mentioned above (the ratio of per hectare cash expenditure on rice production to that of the province's average) which yields a NT$ 7,901. That means, 1974's per hectare cash expenditure on rice production is also a function of 1973's average per hectare value product.

To summarize, time period t's per hectare cash expenditure on a given crop is a function of: 1) the change in the unit price of crop from t-1 to t relative to the province's average change in price for all crops for that corresponding period; 2) the ratio of per hectare cash expenditure for the production of crop to the province's average per hectare cash expenditure for all crops in t-1; and, 3) the province's average per hectare value product in t-1.

Instead of having all equations in a statistically recursive fashion, we employ structural identities resulting in lookup tables, where values of dependent variables--per hectare yield of $crop_i$--in "t" depend on values of independent variables in "t-1", where the policy determined alternative price levels of agricultural commodities set the recursive process in motion. The function is not so much in statistical regression form as in a mathematical, computational form.

Policy Variables from Government Directives

Under the subsection "Data Categories" in Chapter II, it was pointed out that among the variables used in this study are policy variables whose quantitative "values" through time are determined on the basis of actions taken by decision makers. An example of a policy variable is the level of price support, whose quantitative "value" is set by the policy makers. The decision to support the prices of certain major crops, for instance, is based on the following: 1) value concepts in the ethical or normative sense; 2) positive concepts; and, 3) a decision rule. These points are briefly discussed in the following paragraphs.

In the early 1970's, for instance, the policy makers in Taiwan became more and more aware of the widening per capita income gap between the farm and nonfarm sectors of Taiwan's population. Though the per capita nonfarm income was increasing rapidly, the per capita farm income was lagging farther and farther behind. Considering the fact that 40 percent of Taiwan's population was then agricultural, such unequitable distribution of national income was considered wrong and bad. As a result, the policy makers initiated measures to correct this undesirable situation. A price support program for major crops was introduced. This measure is not reflected in a statistical analysis of past data and therefore such information needs be incorporated into a study to make future projections of per capita farm income more accurate.

However, to know that a price support program for agricultural commodities has been initiated is not sufficient information. We must also know the extent of government price support so that the quantitative

"value" of policy determined variables may be ascertained and incorporated into the projective equations. It is the policy makers' role to determine the levels of price support. And the policy makers need to resort to both positive and normative concepts; for the future is built on the present and the past. What has been and what is must be considered when endeavoring to guide the economy to what "should be."

Having envisioned positively and normatively what has been and what is, the policy makers must agree on a decision rule to arrive at a specific quantitative "value" for a given policy variable. A common denominator for reaching a specific decision is to avoid bad and achieve good. This study does not purport to scrutinize how the policy makers arrived at a specific decision but what has been decided upon. More specifically, this study uses the alternative quantitative "value" of policy determined variables--i.e., price support levels for major crops--to project the resulting production and income consequences to the farm population.

Because of the "nontrend" consequences to future farm production and future per capita farm income as a result of policy determined agricultural price support measures, information on policy determined quantitative "values" of policy variables must accordingly be incorporated in the projective process to make projections more approximately reflect future reality.

Tests of Objectivity

If a study is to make any contribution to the field of inquiry, both the investigator and the knowledge generated thereby need pass the

test of objectivity. One definition of objectivity is as follows:

> Applied to an investigator, the ideal of an investigator being unbiased, fair, impartial and accurate in the sense that he is willing to subject his concepts, both normative and nonnormative, to tests as to their objectivity. Applied to a concept, a concept is regarded as objective if it has thus far passed the tests of (1) logical consistence with previously accepted concepts and with other new concepts based on experience, (2) clarity, and (3) workability.[6]

The key to the investigator's being objective in his approach is his willingness to submit his conceptual framework to impartial testing. He is willing to reject or to revise a concept that does not measure up to the above definition of objectivity. His general philosophy towards investigation is: attachment, but detachable. He is detachable in the sense that evidence supersedes personal feelings and preconviction.[7]

It is within the framework of the above definition and description that this inquiry attempts to maintain objectivity. The use of statistical and econometric tools and accounting indentities on the basis of existing data and accepted economic thinking--within the confine of feasibility due to constraints mentioned in Chapter I--is impersonal enough to keep subjectivity from entering into the picture. Subjection of initial study results to statistical analysis and to revision, or possible rejection, are part of the procedure in this study. No future reality is available to test the accuracy of predictions about the future

---

[6]Korean Agricultural Sector Analysis and Recommended Development Strategies, 1971-1985. Korean Agricultural Sector Study Team, 1972. (East Lansing, Michigan: Michigan State University), pp. 34-35.

[7]Johnson, Glenn L. and Lewis K. Zerby, What Economists Do About Values. (East Lansing, Michigan: Michigan State University), pp. 222-227.

by following alternative policies and programs. But verification or the establishment of credibility for estimates may be made in light of the following passage:

> First, the nature of the projections and simulation must be clearly understandable to potential users or they will not be accepted; and second, competent men experienced in the field . . .must be convinced that the design, policy, or program being simulated will actually work more or less according to the model used.[8]

These tests will be embodied in the following chapters when evaluating the prediction equations and identities to be constructed, when analyzing and evaluating prediction results, and when formulating recommendations and drawing conclusions. Steps will be taken to insure that: 1) the nature of the predictions is understandable to potential users, and 2) that knowledgable persons agree to the workability of prescriptions which might be based on them.

Arrival at Recommendations and Conclusions

The projected results will be used in the following manner in order to reach recommendations and conclusions. Several alternative policy strategies will be investigated.

There are four alternative crop price policy measures resulting in four sets of possible yields and revenues. The resulting per capita income differences between the farm and nonfarm sectors of the population in Taiwan will then be compared. Since the per capita farm income was only 28.2 percent that of a nonfarmer in 1972, we may immediately determine whether any of the price policies perpetuates the widening per capita

---

[8]Johnson and Zerby, Ibid., p. 226.

income gap between these two sectors of Taiwan's population. If so, it can immediately be considered undesirable (wrong), and a recommendation made that that price policy not be accepted.

If one of the possible per capita farm income streams only maintains the status quo of income distribution (i.e. around 28.2 percent for the farm person as in 1972) then that crop price policy measure is likewise to be considered undesirable.

If an income stream promises to narrow the income gap, then the time needed to close the income gap can be estimated. If the rate is too slow, then this crop price policy alternative will likewise be considered undesirable. Attempts will then be made to arrive eventually at a possible per capita farm income stream that is: 1) feasible; 2) reasonable; 3) realizable within a short period of time; and, 4) capable of narrowing the gap of per capita income streams between the farm and the nonfarm population in Taiwan.

When considering one or several acceptable alternatives to enhance the income streams of farm population in Taiwan, feasibility and reasonableness will be taken into due consideration. However, since the past policies had deliberately kept the farm prices at very low levels for too long and since the national per capita income as a whole is rising at a rapid rate, to increase farm person's income at a faster rate relative to that of the nonfarm person cannot be deemed unreasonable, provided the per capita income increment to the farm person in NT$ terms does not outstrip that of the nonfarm person.

The consideration of feasibility, in general, will be weighed primarily within the framework of government's plans. And recent programs

will also be studied to determine the feasibility of a given level of price support for selected farm products.

By comparing predicted per capita farm income streams with projected national per capita income streams, the feasibility and reasonableness of proposed measures can be examined. And in light of feasibility and reasonableness, conclusions and recommendations may be arrived at.

Having so far outlined the general methodological issues, and the quantitative techniques to be used in this study, and having discussed how the study results will be used to reach recommendations and conclusions, we may now proceed to discuss in the following chapter how the needed yet unavailable data were constructed.

CHAPTER III

DATA DISAGGREGATION AND ASSEMBLAGE

In Chapter II, the general approach to this study and the quantitative techniques to be used were outlined. In this chapter, data sources are described. The sections which follow explain how the time series data on per hectare cash expenditures for the production of major crops were constructed and how data for other projective variables were determined.

Data Sources

The observation period is 1959 through 1973. Government publications and studies commissioned by government agencies comprise the major sources of information used in this study.[1] Three publications deserve brief mention. They are: 1) Taiwan Agricultural Yearbooks; 2) Report from Farm Record Keeping Families; and, 3) Report on Taiwan's Agricultural Input-Output Survey, 1970.[2]

---

[1] Under this section, only a few of the much used sources are briefly reviewed. How data contained therein are used will be detailed under the subsections "Allocation of Cash Expenditure to Major Crops, 1970" and "Construction of Time Series Data". Brief discussion on other data sources will be given when appropriate.

[2] Taiwan Agricultural Yearbook, Vols. 1959-1974. (Taiwan: Department of Agriculture and Forestry, Taiwan Provincial Government). Report from Farm Record Keeping Families in Taiwan, (Taiwan: Department of Agriculture and Forestry, Taiwan Provincial Government). Report on Taiwan's Agricultural Input-Output Survey, 1970. (Taiwan: Department of Agriculture, Taiwan Provincial Government, 1971).

Taiwan Agricultural Yearbooks, 1959 through 1974, provide annual yields, cropped hectarages and prices of individual crops as well as production data on fishery, forestry and livestock subsectors and their respective prices.

Report from Farm Record Keeping Families in Taiwan is a series of edited reports by the government on farmers who have kept detailed records of their activities over the years.[3]

And, Report on Taiwan's Agricultural Input-Output Survey, 1970 is a survey done mainly for the purpose of providing decision makers with information to determine price support programs for some of the surveyed crops. The major items surveyed include: crop prices, expenditures on seedlings, fertilizer, insecticides, water, feeds, etc.[4] The data on input ratios contained in this report enable us to derive the annual per

---

[3]It originated in 1953 when only a handful of willing and able Taiwanese farmers who, under the supervision of knowledgable personnel from their respective districts, kept statistics of their activities in a uniform format. Though the number of farm families which keep records has been increasing over the past years, 1972's report includes only 480 farm families' statistics. Despite the fact that the number of farm record keeping families represent approximately 1/2,000th of the total farm families in Taiwan, many of the agricultural research projects in Taiwan have based their studies on the data of this report. Since it is a detailed statistical report of those families' activities, and since many official research projects are based on these data, it provides this study with a "resource pool" in cases where more detailed yet unavailable data were needed.

[4]No explanation was given to the sampling technique or sample size. The Report is otherwise detailed. Unlike revenue figures in Taiwan Agricultural Yearbooks, where crop prices were quoted in terms of what the farm producers actually received, revenue figures and input prices given in this Report were based on market prices for farm products. For meaningful utilization of data from all available sources, therefore, synchronization of these sets of data will be in order.

hectare cash expenditure through time. We now proceed to the presentation of the main concern of this chapter--construction of unavailable time series data for fitting projective equations.

Use of Aggregate Data and Data Disaggregation

Recorded data on the annual hectarage of a planted crop, crop prices and yields per hectare are specific and detailed in the above mentioned publications. However, cash expenditure for the production of various crops is a derived lump sum figure which does not specify the allocation to each crop. We now proceed to explain how available data are utilized and how aggregate data are disaggregated for use in this study.

The major crops whose production is to be projected through 1984 are: rice, sweet potato, corn, soybean and other beans, tea, sugarcane, peanuts, fruits and vegetables.[5] Needed for fitting the projective equations are the per hectare cash expenditures for the major crops.[6]

For the purpose of explication, take the year 1970 as an example. (See Table 3.1 on the following page).

1) From Report from Farm Record Keeping Families in Taiwan, 1970, the cash expenditure per cropped hectare is NT$ 22,326, of which NT$ 8,137

---

[5] Initially, mushroom production was also included among the projective equations. But because the R^2 of its regression equation was zero, and because its value product accounts for approximately only two percent of the total value products from crops, it is dropped from the set of projective equations.

[6] Numerous other potential exogenous variables had been used to test their projective power on the variation in the dependent variables. But because of unsatisfactory results or due to undesirable features resulting from these tested projection equations, per hectare/per crop cash expenditure alone was eventually adopted as the lone independent variable for the projection of these major crops' production.

Table 3.1. Derived Data for Annual Average Per Hectare Cash Expenditure in Taiwan, 1959-1972

Year	Per Hectare Cash Expenditure (Minus Hired Labor) (1)	Livestock Purchase and Feeds (2)	Per Hectare Expenditure for Crop Raising (3)	Cropping Index (4)	Per Cropped Hectare Cash Expenditure (5)	Revenue From Per Hectare Cropped (6)	Input-Output Ratios (7)	Total Revenue From the Major Crops (8)	Total Cost for the Production of the Major Crops (9)	Hectares Cropped for the Major Crops (10)	Provincial Average of Cash Expenditure for per Hectare Cropped (11)
	NT $			Percent	NT $			Million NT $		Hectares	NT $
1959	14,304	4,798	9,506	181.5	5,327	13,415	.397	14,049	5,577	1,473,533	3,785
1960	15,295	5,554	9,741	183.6	5,306	16,511	.321	16,183	5,195	1,475,703	3,520
1961	15,881	5,619	10,262	185.5	5,523	16,783	.329	17,795	5,856	1,499,609	3,904
1962	14,834	4,985	9,849	185.3	5,315	16,593	.329	17,658	5,650	1,492,116	3,787
1963	16,542	5,608	10,934	184.7	5,920	18,501	.320	18,336	5,868	1,449,181	4,049
1964	15,629	5,589	10,040	188.0	5,340	17,576	.304	22,102	6,719	1,488,423	4,514
1965	17,018	6,305	10,713	189.4	5,656	18,675	.303	22,698	6,877	1,520,551	4,523
1966	18,675	7,313	11,362	190.0	5,980	18,918	.316	24,027	7,593	1,545,738	4,912
1967	20,496	7,821	12,675	187.4	6,764	21,247	.318	24,697	7,854	1,544,805	5,084
1968	21,915	8,404	13,511	188.2	7,179	22,077	.325	27,762	9,023	1,557,572	5.793
1969	21,893	8,474	13,419	184.3	7.281	19,165	.380	26,621	10,116	1,544,537	6,550
1970	22,326	8,137	14,189	182.6	7,771	21,932	.354	28,775	10,186	1,528,120	6,666
1971	24,406	9,923	14,483	179.3	8,078	22,026	.367	28,574	10,487	1,500,157	6,990
1972	26,219	11,929	14,290	175.5	8,142	23,893	.341	31,223	10,647	1,457,939	7,303

Sources of Information:
Column 1 - Report from Farm Record Keeping Families, Vols. 1959-1972.
Column 2 - Ibid
Column 3 - Equals Column 1 ÷ Column 2
Column 4 - Taiwan Agricultural Yearbooks vols. 1959-1972.
Column 5 - Equals Column 3 ÷ Column 4.
Column 6 - Report from Farm Record Keeping Families, Vols. 1959-1972.
Column 7 - Equals Column 5 ÷ Column 6.
Column 8 - Taiwan Agricultural Yearbook, Vols. 1959-1972.
Column 9 - Column 7 x Column 8
Column 10 Taiwan Agricultural Yearbook, Vols. 1959-1972.
Column 11 Equals Column 9 ÷ Column 10.

is spent for livestock and feeds. That leaves NT$ 14,189 as operating expenses for each hectare.

2) Cropping index for 1972 being 1.826, then NT$ 14,189 ÷ 1.826 = NT$ 7,771 which is the operating expenditure per cropped hectare for 1970.[7]

3) The year's revenue per cropped hectare--excluding revenue from other sources, such as livestock raising--being NT$ 21,932, then the input-output ratio for crop raising is NT$ 7,771 ÷ 21,932 = .354.

4) From Taiwan Agricultural Yearbook, 1971, the summed total value products of these major crops for 1970 is NT$ 28,774,981,000.

5) Since the input-output ratio for 1970 as calculated is .354, then .354 x 28,774,981,000 = NT$ 10,186,343,274 which is the total operating expenses for the major crops in Taiwan, for the year 1970.

6) Again, from Taiwan Agricultural Yearbook, 1971 we sum up the total hectares for these crops for 1970 which is 1,528,120. And divide the latter into NT$ 10,186,343,274, we obtain NT$ 6,666. That means the average per hectare cash expenditure for the major crops in Taiwan, for the year 1970, is NT$ 6,666. The next step in the process is to approximate what proportion of that NT$ 6,666 is spent for the production of each of the crops for 1970.

---

[7]Cropping index refers to the number of times a hectare of land is cropped each year. The figure 1.826 in the text means that, for Taiwan province as a whole, each cultivated hectare of land was cropped 1.826 times in the year 1972.

Allocation of Cash Expenditure to Major Crops: 1970

A province wide survey was made for the input-output relationship for major crops in Taiwan in 1970 which produced data on per hectare operating expenditures for the major crops.[8]

In Table 3.2, per hectare cash expenditures for crop (column 1) is multiplied by the number of hectares of that crop for the year (column 2). Total cash expenditures for these major crops are found in column 3. The sum total of cost for raising these crops (bottom of column 3) is then divided by the sum of total hectares cropped (bottom of column 2) to arrive at the province's average per hectare cash expenditure, i.e., $\frac{\text{NT\$ 24,065 million}}{\text{1,528 thousand hectares}}$ = NT$ 15,750/hectare.

Having arrived at the above figure for the province average per hectare cash expenditure for 1970,[9] the per hectare cash expenditure per respective crop is divided by that average to arrive at a series of ratios as follows:

Rice: NT$ 11,532/15,750 = .731

Sweet Potato: NT$ 12,976/15,750 = .823

.

.

.

---

[8]See Table 3.2 on the following page. Note, the cash expenditure figures from this survey report does not square with those computed from Table 3.1. Synchronization of these data will be discussed shortly.

[9]According to data from Report on Taiwan's Agricultural Input-Output Survey, 1970, all items are priced according to market values. It is different from figures from Taiwan Agricultural Yearbook where all figures are based on farm level prices. Synchronization of the two will be made.

Table 3.2. Adjusted per Hectare Cash Expenditure for the Production of Major Crops in Taiwan, 1970

Crop	Unadjusted Per Hectare Cash Expenditure	Hectares Cropped	Columns 1 x 2	Ratio of Per Hectare$_i$ Expenditure to the Province's Average Per Hectare Cash Expenditure	Adjusted Per Hectare$_i$ Cash Expenditure
	(1)	(2)	(3)	(4)	(5)
	NT $	Hectare	NT$ Mill.		NT $
Rice	11,532	776,139	8,950	.731	4,873
Sweet Potato	12,976	228,713	2,968	.823	5,486
Corn	9,666	22,641	219	.613	4,086
Soybean and Other Beans	6,139	57,991	356	.389	2,593
Tea	4,951	33,253	165	.314	2,093
Sugarcane	22,789	86,247	1,965	1.446	9,639
Peanut	8,226	87,477	710	.522	3,480
Fruits	42,425	94,042	3,990	2.691	17,938
Vegetables	33,313	141,540	4,690	2.113	14,085
Mushroom	555,529	77	43	35.238	234,897
		1,528,120	24,065		

Sources of Information: Column 1 - Taiwan Agricultural Input-Output Survey Report, 1971.
Column 2 - Taiwan Agricultural Yearbook, 1971.
Column 3 - Column 1 x column 2
Column 4 - 24,064,931,737 : 1,527,381 = 15,765
Then, column 1 : 15,765 = ratios in column 4.
Column 5 - Column 4 x 6,666, where NT$ 6,666 is from Table 3.1, column 11, for the year 1970.

These ratios appear in column 4 of Table 3.2. These ratios represent the $crop_i$'s per hectare cash expenditure relative to that of the province's average per hectare expenditure.

For our study, this province average figure of NT$ 15,750 per hectare's cash expenditure may not be used. The reason: all inputs have been priced at market values rather than what the farmers actually paid in cash and in kind, or what the farmers actually received by selling crops on farm level prices.[10] If one were to accept this NT$ 15,750 per hectare cash expenditure figure as actually paid by the farmers, then the province's sum total of operating costs (in the form of fertilizer, seeds, pesticides, water etc.) for farming in 1970, even though self supplied labor costs are excluded, would have exceeded the total farm value product given by Taiwan Agricultural Yearbook, 1970 whose data are more detailed, reliable and authoritative.[11]

The ratios as listed in column 4 of Table 3.2, however, should accurately reflect the $crop_i$'s per hectare cash expenditure relative to the province's average per hectare cash expenditure, and hence this set of ratios may be usefully employed to compute the "actual" per hectare cash expenditure for 1970.

---

[10] The possible explanation for this wide divergence between NT$ 15,750 and NT$ 6,666 (Table 3.1, column 11) as the province average per hectare cash expenditure might reside with the fixed asset theory. Due to $Price_{acquisition} > MVP > Price_{salvage}$ on the farm level, when both cost and revenue are calculated on the farm level, both figures would be considerably smaller than if calculated on market price level.

[11] The total revenue from all crops for 1970 is NT$ 30,405 million. (Taiwan Agricultural Yearbook, 1972, p. 24). Note, the NT$ 24,065 million in Table 3.2, the supposed cash expenditure for the production of major crops for 1970, does not include cash expenditure on the production of minor crops and does not include hired labor costs.

Consequently, by multiplying the ratios in column 4 of Table 3.2 with the "provincial average of cash expenditure for per hectare cropped" in column 11 of Table 3.1, we obtain the "adjusted per hectare cash expenditure" in column 5 of Table 3.2.

The method of deriving per hectare cash expenditure for each of the major crops for the year 1970 has now been presented. Two more points need detailed explanation: 1) how per crop/per hectare cash expenditure figures for years after 1970, and 2) how figures of cash expenditure per crop/per hectare for years prior to 1970 are obtained.

Cash Expenditures for the Major Crops, 1971 and 1972

Cash expenditure for the major crops for the year 1971 may be explained by Tables 3.3 through 3.5. Table 3.3 presents the prices of the major crops.

Given the prices of individual commodities, average prices listed on the last row of Table 3.3 are obtained from the equation:

$$P_{a_t} = \frac{\sum_{i=1}^{10} TVP_{i_t}}{\sum_{i=1}^{10} Q_{j_t}} \qquad \text{for } i \text{ and } j = 1,\ldots,10 \text{ and } t = 1958,\ldots,1973$$

Thus, for 1970, the equally weighted price per 1.000 kgs. for all crops is NT$ 1,899 whereas for 1971 it is NT$ 1,679 per 1.000 kgs.

We wish to know the price changes for individual crops relative to the movements for changes in average prices for these major crops. For, we believe that relative changes in prices for this year's crop affect the next year's relative adjustments in cash expenditures for crop$_i$'s

production. The change in relative price is measured by:

$$\frac{P_{i_t}/P_{a_t}}{P_{i_{t-1}}/P_{a_{t-1}}} \quad \text{for } i = 1,\ldots,10 \text{ and } t = 1959,\ldots,1973$$

where:

P_i = the unit price of $crop_i$ (NT$/1,000 kgs.) and,

P_{a_t} = the average price of all the crops.[12]

Table 3.4 presents the relative changes in price ratios of these major crops.[13]

Up to this point, several sets of information have been constructed for use: 1) the 1970's relative ratios of cash expenditure for each crop (Table 3.2, column 4); 2) the ratios of commodity price changes relative to the average (Table 3.4); 3) the province wide average cash expenditure for year 1959 to 1972 (Table 3.1, column 11); 4) the hectares cropped per each of the major crops (Taiwan Agricultural Yearbook, 1959 through 1973); and, 5) the percentages of total cash expenditure to total revenue for major crops from 1959 through 1972 (Table 3.1, column 7).

---

[12]The price change of rice, for instance, relative to all the other major crops from 1970 to 1971 is:

$\frac{\text{NT\$ } 5,555/1,899}{\text{NT\$ } 5,573/1,679} = 1.135$ which appears in Table 3.4, column 1970-71.

[13]For the year 1971, for instance, 1.135 is obtained as mentioned in footnote above. Comparison of relative price changes should be made not from year to year (as for rice, for example, the ratio in 1970 is .895 whereas in 1971 is 1.135. It does not represent a significant increase in the price of rice. In fact the increase is almost nil--from 1970's NT$ 5,555 to 1971 NT$ 5,573) but rather within the year among crops. Thus, considering the decline in average prices from 1970's NT$ 1,899 to 1971's NT$ 1,679 as stated in Table 3.1 the relative change in price for rice from 1970 to 1971 is "more favorable" than that of some other crops mainly because the price of rice from 1970 to 1971 did not decline as some other crops' prices did.

Table 3.3. Crop Price$_{it}$ and Weighted Average Crop Price$_t$ in Taiwan, 1958-1973

Crop \ Year	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
	NT$/1,000 Kgs															
Rice	2,999	3,244	4,913	5,098	4,726	4,913	5,014	5,045	5,240	5,499	5,601	5,420	5,555	5,573	5,952	8,349
Sweet Potato	423	450	615	621	646	732	743	728	752	821	839	876	833	837	973	1,212
Corn	2,022	2,462	2,911	3,038	3,141	3,240	3,582	3,815	3,584	3,513	3,569	3,269	3,629	3,324	3,576	4,843
Soybean and Other Beans	4,974	5,674	6,243	5,859	5,715	5,558	6,142	6,490	6,252	6,568	6,601	6,137	5,851	6,236	6,463	10,632
Tea	13,065	13,569	14,290	16,218	17,320	17,534	16,448	15,948	17,785	18,389	20,508	26,831	28,645	21,417	22,188	33,632
Sugarcane	144	170	169	182	219	249	482	217	212	222	206	226	234	270	317	309
Peanut	4,667	5,154	6,460	6,524	6,476	6,744	7,419	6,364	6,967	7,475	7,542	7,250	7,376	7,634	8,485	10,295
Fruits	1,394	1,667	1,779	1,776	1,958	2,479	2,694	2,925	2,796	2,623	2,701	2,666	2,880	2,821	3,309	3,333
Vegetables	945	1,025	1,159	1,209	1,306	1,217	1,222	1,606	1,841	1,830	2,219	2,244	2,585	2,366	2,657	3,284
Mushroom	---	---	---	---	---	12,208	12,100	12,543	12,378	13,037	13,227	13,299	13,079	12,965	13,620	13,880
Average	746	791	1,095	1,159	1,307	1,432	1,548	1,323	1,406	1,673	1,624	1,658	1,899	1,679	1,980	2,410

Source: Taiwan Agricultural Yearbook, 1958-1973.

Table 3.4. Ratios of Annual Crop Price Change$_{i_t}$ Relative to Weighted Average Crop Price$_t$ in Taiwan, 1958-1973*

Crop \ Years	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73
Rice	1.020	1.094	.980	.822	.949	.944	1.177	.977	.882	1.049	.948	.895	1.135	.906	1.152
Sweet Potato	1.004	.988	.954	.922	1.034	.939	1.146	.973	.918	1.053	1.021	.831	1.137	.984	1.024
Corn	1.149	.854	.986	.917	.942	1.023	1.246	.884	1.016	1.047	.897	.969	1.036	.912	1.113
Soybean and Other Beans	1.076	.795	.887	.865	1.887	1.022	1.236	.906	.883	1.035	.894	.832	1.305	.879	1.352
Tea	.980	.761	1.072	.947	.924	.868	1.134	1.049	.869	1.149	1.282	.932	.846	.878	1.245
Sugarcane	1.114	.716	1.019	1.070	1.036	1.787	.527	.921	.881	1.995	1.071	.904	1.309	.994	.800
Peanuts	1.042	.905	.954	.880	.950	1.018	1.004	1.030	.902	1.039	.942	.888	1.171	.942	.997
Fruits	1.127	.771	.943	.978	1.156	1.005	1.293	.884	.788	1.061	.967	.943	1.107	.995	.828
Vegetables	1.023	.816	.986	.958	.851	.928	1.539	1.078	.836	1.184	.990	1.006	1.035	.952	1.016
Mushroom	—	---	---	---	---	.917	1.213	.929	.885	1.045	.985	.859	1.121	.891	.832

*Obtained by the following equation:

$$\frac{P_{i_t}/P_{a_t}}{P_{i_{t-1}}/P_{a_{t-1}}}$$

where:

P_i = price of crop$_i$, and

P_a = average price of all crops.

Given the above information, Table 3.5 is constructed to arrive at cash expenditure for individual crops for the year 1971.

Given the relative ratios of per crop operating expenditure (Table 3.2 column 4), and given the relative commodity price changes from 1970 to 1971 (Table 3.4, column 1970-71), column 3 in Table 3.5 is the product of the two and says: since the per hectare operating expenditure on rice, for instance, for 1970 is .731 of the province's average per hectare cash expenditure, and since the price change of rice from 1970 to 1971, relative to price changes in other crops, is 1.135, then the relative operating expenditure on rice for the year 1971 should vary accordingly.

Note, normally one would use the ratios of price changes from 1969 to 1970 in order to determine the cash to be expended for 1971. However, due to the crop-fertilizer barter system in Taiwan, which predetermines that X quantity of this coming year's yield is needed to barter for Y amount of the government-controlled fertilizer, the farmers, before planting, already know the relative prices—and hence relative price changes—of crops for the coming year. For instance, if 100 kgs. of rice in 1970 was needed to barter for X quantity of fertilizer, while it would take 105 kgs. of rice in 1971 to barter for the same X quantity of fertilizer, then, before planting for the 1971's first crop, the farmer in 1970 already knows that the fertilizer "price" has increased while the 1971's price of rice relative to other crops in 1970 has declined. Consequently, in 1970 the farmer already knows the predetermined price of crops for 1971 via this crop-fertilizer barter system and hence, in 1970, when planting for the 1971 crops, the farmer already knows the crops' price changes relative to fertilizer and adjusts the operating expenses on various crops accordingly.

Table 3.5. Adjusted per Crop/per Hectare Cash Expenditure in Taiwan, 1971

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1970	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1970-71	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Ratio of Crop$_i$'s Cash Expenditure to Total Cash Expenditure for the Major Crops	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				NT $	NT$ Mill.		NT$ Mill.	NT $	
Rice	.731	1.135	.830	5,802	4,372	.368	3,859	5,122	.733
Sweet Potato	.823	1.137	.936	6,543	1,474	.124	1,300	5,772	.826
Corn	.613	1.036	.635	4,439	99	.008	84	3,766	.539
Soybean and Other Beans	.389	1.205	.469	3,278	176	.015	157	2,931	.419
Tea	.314	.846	.266	1,859	61	.005	52	1,591	.228
Sugarcane	1.446	1.309	1.893	13,232	1,175	.099	1,038	11,696	1.673
Peanut	.522	1.171	.611	4,271	369	.031	325	3,764	.538
Fruits	2.691	1.107	2.979	20,823	1,886	.158	1,667	18,413	2.634
Vegetables	2.113	1.035	2.187	15,287	2,243	.189	1,981	13,510	1.933
Mushroom	35.238	1.121	39.502	276,119	30	.003	31	287,273	41.098
					11,884	1.001			

Sources of Information:
Column 1 - Table 3.2, column 4.
Column 2 - Table 3.4, column 1970-71.
Column 4 - Column 3 x 1971's provincial average of cash expenditure per hectare cropped. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1971. Number of hectares cropped, Taiwan Agricultural Yearbook, 1972.
Column 7 - Column 6 x 1971's total cash expenditure for the production of the ten major crops. Table 3.1, column 9
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1971. Number of hectares cropped, Taiwan Agricultural Yearbook, 1972.
Column 9 - Column 8 divided by the provincial average for cash expenditure$_i$ for per hectare cropped. Table 3.1, column 11.

Column 3 in Table 3.5 is multiplied by NT$ 6,990 (from Table 3.1, column 11) which is the average per hectare operating expenses for 1971 and the result appears in column 4.

Column 5 is the product of column 4 and their respective hectares cropped for the year (see column 2 of Table 3.2). At the bottom row of Table 3.5, NT$ 11,884 million represents the total cash supposedly expended for the major crops for 1971. However, given the year's total revenue--NT$ 28,775 million from column 8 of Table 3.1--the supposedly NT$ 11,884 million represents a .413 ratio of input to output, which does not square with Table 3.1, column 7's .354 as obtained from data of Report from Farm Record Keeping Families in Taiwan, 1970. There is the need to synchronize the two ratios.

Consequently, each row in column 5 of Table 3.5 is divided by NT$ 11,884 million (sum of column 5) to obtain the ratios of $crop_i$'s to total operating expenses of the major crops, 1971.

The result is a set of ratios which appear in column 6 of Table 3.5.[14]

Data from Report from Farm Record Keeping Families in Taiwan, 1971 (column 9 of Table 3.1) indicate that 1971's total cash expenditure for these major crops is NT$ 10,486 million. Then, multiplying ratios in column 6 of Table 5 with NT$ 10,487 million gives the total cash expended for each of the major crops in column 7.

Finally, to obtain the per hectare cash expenditure for $crop_i$ for 1971, the values in column 7 are divided by the crops respective hectares cropped for that year.

---

[14]The sum of column 6 being 1.001 is due to rounding.

Pooling information from various sources and tracing through a series of calculations based on reasoning and common sense results in the desired information in column 8 of the above table. And it is figures such as contained in column 8 that will eventually enter as derived data into the prediction equations for the production of major crops.[15]

While Table 3.5 on previous pages represents calculations for the year 1971, Table 3.4 on the following two pages outlines calculations done for the year 1972's per hectare$_i$ cash expenditure. The reasoning behind Table 3.6 is similar to that of Table 3.5.

Having presented how data on crop$_i$'s cash expenditure for 1971 were obtained, and how from 1971's data (column 9) we proceeded to derive 1972's corresponding data, we now need to explain how the corresponding data for years prior to 1970 were derived.

Obtaining Information on Operating Expenditures for the Major Crops Prior to 1970

From Report on Taiwan's Agricultural Input-Output Survey, 1970, the relative ratios of cash expenditure for the major crops for 1970 are known (Table 3.2, column 4). And, given 1970's known ratios, 1971's per crop cash expenditure and cash expenditure ratios are derived (Table 3.5). For operating cash expenditures on individual crops, 1959 to 1969, the same reasoning as applied to the construction of Table 3.5 is applied, with the one exception of column 3 in Table 3.7.

---

[15] Note that the ratios listed in column 9 of Table 3.5 are calculated as follows: e.g. NT$ 5,122/6,990 = .733, where NT$ 5,122 is the constructed per hectare cash expenditure for rice production in 1971, whereas NT$ 6,990 is the province's average per hectare operating cash expenditure for the same year (Table 3.1, column 11). This .733 for 1971 is parallel in meaning to 1970's .731 as in column 4 of Table 3.2 and column 1 of Table 3.5.

Table 3.6. Adjusted Per Crop/Per Hectare Cash Expenditure in Taiwan, 1972

Crop	Ratio of Per Hectare Cash Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1971 (1)	Crop Price Change$_{i,t}$ Relative to Average Crop Price$_t$ 1971-72 (2)	Columns 1 x 2 (3)	Unadjusted Per Hectare Cash Expenditure$_i$ (4)	Unadjusted Total Cash Expenditure for Crop$_i$ (5)	Ratio of Crop$_i$'s Cash Expenditure to Total Cash Expenditure for the Major Crops (6)	Adjusted Total Cash Expenditure for Crop$_i$ (7)	Adjusted Per Hectare Cash Expenditure$_i$ (8)	Ratio of Per Hectare Expenditure to the Province's Average per Hectare Cash Expenditure (9)
				NT $	NT$ Mill.		NT$ Mill.	NT $	
Rice	.733	.906	.664	4,849	3,596	.354	3,769	5,083	.696
Sweet Potato	.826	.984	.813	5,937	1,250	.123	1,309	6,218	.851
Corn	.539	.912	.492	3,593	93	.009	96	3,722	.510
Soybean and Other Beans	.419	.879	.368	2,688	123	.012	128	2,797	.383
Tea	.228	.878	.200	1,461	48	.005	53	1,637	.224
Sugarcane	1.673	.994	1.663	12,145	1,097	.108	1,150	12,730	1.743
Peanut	.538	.942	.507	3,703	282	.028	298	3,909	.535
Fruits	2.634	.995	2.621	19,141	1,657	.163	1,735	20,051	2.746
Vegetables	1.933	.952	1.840	13,438	1,996	.196	2,087	14,047	1.923
Mushroom	41.098	.891	36.618	267,421	25	.002	21	225,806	30.920
					10,167	1.000			

Sources of Information: Column 1 - Table 3.2, column 4.
Column 2 - Table 3.4, column 1971-72.
Column 4 - Column 3 x 1972's provincial average of cash expenditure per hectare cropped. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1972. Number of hectares cropped, Taiwan Agricultural Yearbook, 1973.
Column 7 - Column 6 x 1972's total cash expenditure for the production of the ten major crops. Table 3.1, column 9.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1972. Number of hectares cropped, Taiwan Agricultural Yearbook, 1973.
Column 9 - Column 8 divided by the provincial average for cash expenditure$_i$ for per hectare cropped. Table 3.1, column 11.

While column 3 in Table 3.5 is the product of columns 1 and 2, column 3 in Table 3.7 on the following page is obtained by division: column 1/column 2. And the rationale is as follows.

In Table 3.5--for year 1971--we asked: given 1970's ratios of per hectare cash expenditure relative to that of the average (Table 3.5, column 1), and given the relative changes in the crops' respective prices from 1970 to 1971 (Table 3.4, column 1970-71), what should be the relative changes in ratios for cash expenditure for the production of crops in 1971.

In Table 3.7--for 1969, for example--we ask: Given the relative price change ratios in Table 3.4, column 1969-70, what cash expenditure ratios of $crop_i$ in 1969 for the production of 1970 crops would be such that the corresponding ratios for 1970 were as given by the Report on Taiwan's Agricultural Input-Output Survey, 1970 (Table 3.2, column 4).

Consequently, instead of multiplying columns 1 and 2 as in Table 3.5 which "rationalizes forward" to 1971's ratios, we divide column 1 by column 2 in Table 3.7 to "reason back" to 1969's ratios.

The reasoning for columns 4 through 9 of Table 3.7 is identical with that of Tables 3.5 and 3.6.[16]

The above constructed time series data in columns 8 of Table 3.5 through 3.7 are values used to explain the variations in the dependent variables: namely, per hectare yield for the major crops.

---

[16]For years from 1959 through 1968, ten corresponding tables are constructed. The values in column 8 of each of the tables are constructed data for $crop_i$'s per hectare cash expenditure in the projection equations. See Appendix A for Tables for years 1959 through 1968.

Table 3.7. Adjusted Per Crop$_i$/Per Hectare Cash Expenditure in Taiwan, 1969

Crop	Ratio of Per Hectare Cash Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1970	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1968-69	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Ratio of Crop$_i$'s Expenditure to Total Cash Expenditure for all Major Crops	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				NT $	NT$ Mill.		NT$ Mill.	NT $	
Rice	.731	.895	.817	5,351	3,596	.354	3,769	5,083	.756
Sweet Potato	.823	.831	.990	6,485	1,250	.123	1,310	6,208	.916
Corn	.613	.969	.633	4,146	93	.009	93	3,722	.568
Soybean and Other Beans	.389	.832	.468	3,065	123	.012	128	2,797	.427
Tea	.314	.932	.337	2,207	48	.005	53	1,637	.321
Sugarcane	1.446	.904	1.600	10,480	1,097	.108	1,150	12,730	1.489
Peanut	.522	.888	.588	3,851	282	.028	298	3,909	.541
Fruits	2.691	.943	2.854	18,694	1,657	.163	1,735	20,051	2.637
Vegetables	2.113	1.006	2.100	13,755	1,996	.196	2,087	14,047	1.942
Mushroom	35.238	.859	41.022	268,694	25	.002	21	225,806	41.555
					10,167	1.000			

Sources of Information:
Column 1 - Table 3.2, column 4.
Column 2 - Table 3.4, column 1968-69.
Column 4 - Column 3 x 1969's provincial average of cash expenditure per acre hectare cropped. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1969. Number of hectares cropped, Taiwan Agricultural Yearbook, 1970.
Column 6 - Column 5 divided by the sum of column 5.
Column 7 - Column 6 x 1969's total cash expenditure for the production of the ten major crops. Table 3.1, column 9.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1969. Number of hectares cropped, Taiwan Agricultural Yearbook, 1970.
Column 9 - Column 8 divided by the provincial average for cash expenditure$_i$ for per hectare cropped. Table 3.1, column 11.

In this chapter, we have presented the data sources, use of available macro data for disaggregation purposes, and we have constructed hitherto unavailable time series data in the form of per hectare cash expenditure for predicting the per hectare yield of the major crops.

Given the information contained in this chapter, and given the projection equations, identities and accounting components in Chapter II, we may now proceed to present the results of prediction equations in the following chapter.

CHAPTER IV

REGRESSION RESULTS, COMPARISON OF HISTORICAL DATA WITH RESULTS FROM REGRESSION ANALYSIS, IDENTITIES AND ACCOUNTING COMPONENTS

Agriculture in Taiwan can be divided into four subsectors: crops, livestock, fishery and forestry. In this chapter, results will be presented for each of the projective equations grouped under crops and livestock subsectors.[1] Estimated results are compared with historical data, both on commodity and aggregate levels to establish the projective ability of the adopted regression equations, identities and accounting components. This chapter is confined to the presentation of regression results only.

Estimated Coefficients, R^2, s, F and t Test Values

Crop Subsector

The general equation for crop production used in this study is:

$$\log Y_{i_t} = \log a_i + b_i \log X_{i_t} \quad \text{for } i = 1,\ldots,9 \text{ and } t = 1959,\ldots,1972$$

where:

Y_i = yield of crop$_i$ (kg./hectare) and,

X_i = cash expenditure$_i$

---

[1] The farmer's per capita income from farming activities is derived from crop and livestock raising. See Reports from Farm Record Keeping Families in Taiwan. And in Taiwan Agricultural Yearbooks, the fishery population and revenues from fishing industry are given in separate accounts; that means, revenues from fishing industry are not a source of income to the farm person.

Rice

Per hectare rice yield as regressed on its corresponding per hectare cash expenditure yields the following parametric estimates:

$$\log y + 2.407 + .297 \log X$$
$$(.222) \quad (.062)$$

$R^2 = .654^2$ and $S_y = .026$

The coefficient of determination, R^2 is significantly different from zero at < .0005 level from the F test. As for rice production, the t-tests on the estimated coefficient for per hectare cash expenditure and for the constant are significant at the < .0005 levels.

To compare the estimated value product of rice with that of the historical data, the ratio $\hat{VP}/VP$ is used where $\hat{VP}$ is the estimated value product obtained via an identity.[3] The resulting ratios are as follows:

---

[2]The R^2s in the subsector for crop production are generally low compared with those obtained for the livestock subsector. However, the ratios of estimated value products to historical value products as presented in Table 4.3 of this Chapter indicate that, via identities and accounting components, these projective equations are adequate for projective purposes.

[3]The identity is: VP = estimated per hectare $yield_t$ x $price_t$ x $hectares\ cropped_t$. With $price_t$ and $hectares\ cropped_t$ as historically given.

In a computerized simulation study, tracking and sensitivity tests are done: (1) to compare the projected consequences from the estimated or guestimated coefficients with that of the recorded evidence; and (2) by varying the estimated coefficients by one or more standard deviations in either direction, to test how sensitive the projections. However, since this simulation study is not computerized and since all the coefficients are estimated by following statistical procedures, no tracking as such is done.

Some procedure similar to tracking is done in the following manner. The estimated coefficients in each of the equations lead to their estimated per hectare yields (or production of livestock items). When the per hectare yields are multiplied by their corresponding recorded unit prices and by their hectares cropped, we obtain the $\hat{VP}$s. We then calculate the

1959	1960	1961	1962	1963	1964	1965
1.148	1.024	1.020	1.004	.965	.969	.930

1966	1967	1968	1969	1970	1971	1972
.956	.943	.958	1.080	1.000	1.046	.976

Regression results and comparative value-product ratios for the remaining crops and agricultural subsectors will be presented by the same general format as the one immediately above.

Sweet Potato

$$\log Y = 2.384 + .477 \log X$$
$$(.569) \quad (.155)$$

$R^2 = .442$ and $S_y = .044$

R^2 is significant at the .009 level from the F test, and the t-test for the estimated coefficients are significant at .001 and .009 levels, respectively. The $\hat{VP}_t/VP_t$ ratios are:

1959	1960	1961	1962	1963	1964	1965
1.013	.958	.938	.950	1.302	.981	.998

1966	1967	1968	1969	1970	1971	1972
.942	.866	1.038	.967	.980	1.003	1.126

Corn

$$\log Y = .9181 + .698 \log X$$
$$(.615) \quad (.178)$$

$R^2 = .562$ and $S_y = .061$

$\hat{VP}_{i_t}/VP_{i_t}$ ratios to see how close they are to unity. This is first done for individual crops and livestock production, and then aggregatively for each subsector.

With respect to sensitivity test, since coefficients used in this study are statistically estimated, and since this is not a computerized simulation study, it is cost and time prohibitive to test the sensitivity of the estimated coefficients.

The F test is significant at the .002 level for R^2 while t-tests for the estimated coefficients are "significant" at .161 and .002 levels, respectively. The $\hat{VP}_t/VP_t$ ratios for the 14-year period are:

1959	1960	1961	1962	1963	1964	1965
1.287	1.212	1.038	.890	1.079	.975	.905

1966	1967	1968	1969	1970	1971	1972
.969	.754	.910	1.094	1.084	1.018	.936

Soybean and Other Beans

$$\log Y = .7228 + .7034 \log X$$
$$(.228) \quad (.069)$$

$R^2 = .895$ and $S_y = .033$

The F test is significant at the < .0005 level for the coefficient of determination, and the t-tests for the estimated coefficients are both significant at .008 and <.0005 levels, respectively. The $\hat{VP}_t/VP_t$ ratios for the years 1959 through 1972 are:

1959	1960	1961	1962	1963	1964	1965
1.004	.971	1.045	1.018	1.171	1.023	.896

1966	1967	1968	1969	1970	1971	1972
1.015	.898	.946	1.063	.963	1.098	.934

Tea[4]

$$\log Y = -2.09 + 1.140 \log X$$
$$(.801) \quad (.188)$$

$R^2 = .755$ while $S_y = .064$

---

[4]While the independent variables in all other equations estimating the per hectare yields are their respective per hectare cash expenditure$_i$, the independent variable in this equation is the price of tea t-1 because it yields a higher R^2.

The F test for tea production's coefficient of determination is significant at the < .0005 level while the t-tests for the estimated constant and beta terms are significant at the .023 and < .0005 levels, respectively. The $\hat{VP}_t/VP_t$ ratios for tea production are as follows:

1959	1960	1961	1962	1963	1964	1965
1.143	1.161	1.267	1.001	.958	.995	.835

1966	1967	1968	1969	1970	1971	1972
.908	.831	.934	1.161	1.171	.854	.903

Sugarcane

$$\log Y = 4.405 + .124 \log X$$
$$(.263) \quad (.068)$$

$R^2 = .217$ and $S_y = .038$

The F test is not significant at the .05 level for R^2 but is "significant" at the .1 level (.093). The t-tests for the estimated coefficients are "significant" at the < .0005 and .093 levels for $\hat{\alpha}$ and $\hat{\beta}$, respectively. The $\hat{VP}_t/VP_t$ ratios for the years 1959 through 1972 are:

1959	1960	1961	1962	1963	1964	1965
.906	1.074	.959	1.128	1.068	.977	.895

1966	1967	1968	1969	1970	1971	1972
.922	1.040	.919	1.057	1.143	.916	1.046

Peanut

$$\log Y = \log 1.937 + .324 \log X$$
$$(.430) \quad (.125)$$

$R^2 = .360$ while $S_y = .043$

The F test for the regression equation is significant at the .023 level while t-tests for the estimated α and β are significant at the .001 and

.023 levels, respectively. The $\hat{VP}_t/VP_t$ ratios for the years 1959-1972 are as follows:

1959	1960	1961	1962	1963	1964	1965
1.062	1.004	.998	1.064	1.111	.957	.927

1966	1967	1968	1969	1970	1971	1972
.967	.805	1.043	1.111	.872	1.106	1.026

Fruits

$$\log Y = \underset{(.778)}{\log 2.218} + \underset{(.188)}{.454 \log X}$$

$R^2 = .328$ and $S_y = .062$

The F test is significant at the .032 level while the t-tests for the estimated coefficients α and β are significant at the .015 and .032 levels, respectively. The $\hat{VP}_t/VP_t$ ratios for fruit production for the duration studied are:

1959	1960	1961	1962	1963	1964	1965
1.313	1.254	1.339	1.217	1.223	.888	.782

1966	1967	1968	1969	1970	1971	1972
.874	.874	.904	.975	1.066	.951	1.111

These ratios show substantial deviations from one and indicate a pattern of serial correlation. Given Taiwan's limited data basis and our limited knowledge of the basic structural relationships, speculation did not reveal variables to be included which would remove the serial correlation. Durbin-Watson statistic is .5607.[5]

---

[5]Of all the major crops, only fruits and vegetables' per hectare yield projective equations show serial correlation of the error terms at $\alpha = .01$ level of significance. Vegetable production also has observation values serially correlated. However, the differences between the estimated and the historical value product are small.

Reiterating once again the nonstructural nature of the regression equations, and stressing the function of structural identities and accounting components, we choose not to resort to weighted regression results for fruit production. The overall $\hat{VP}_t/VP_t$ for all major crops is .994 while for all agricultural subsectors taken together is .995.[6]

Vegetables

$$\log Y = .936 + .746 \log X$$
$$(.967) \quad (.236)$$

$R^2 = .453$ whereas $S_y = .042$

The coefficient of determination R^2 is significant at the .008 level from the F test. The t-test for estimated α is not significant (.352) while for that of β is significant at the .008 level. The $\hat{VP}_t/VP_t$ ratios, 1959-1972, are:

1959	1960	1961	1962	1963	1964	1965
1.018	1.021	1.064	.997	1.130	1.195	1.036

1966	1967	1968	1969	1970	1971	1972
1.057	1.032	.903	.906	.900	.864	.933

Though the $(Y_t - \hat{Y}_t)$ values do not diverge as significantly as those for fruit production above, there is also serial correlation problems encountered here. The Durbin-Watson statistic for this equation, with 12 degrees of freedom, is .609. But, by the same token as discussed in footnote five and since the average $\hat{VP}_t/VP_t$ is 1.011, the results are allowed to stand as they are.

We now proceed to the presentation of regression results for the remaining livestock subsector.

---

[6]See Table 4.3.

Livestock Subsector

Livestock Slaughter

$$\log Y = \underset{(.160)}{\log 4.123} + \underset{(.042)}{.621 \log X}$$

where:

Y = livestock slaughter (heads), and,

X = national per capita income t-1 (NT$)

$R^2 = .945$ and $S_y = .031$

The coefficient of determination R^2 is significant at the < .0005 level from the F test. And the t-tests for the estimated α and β terms are both significant at the < .0005 level. The $\hat{VP}_t/VP_t$ ratios for the 14-year period are as follows:

1959	1960	1961	1962	1963	1964	1965
.904	.960	1.002	.976	1.016	1.094	1.143

1966	1967	1968	1969	1970	1971	1972
1.051	.973	1.006	1.052	.939	.999	1.040

Poultry Production

$$\log Y = \underset{(1.271)}{-12.5814} - \underset{(.137)}{.486 \log X_1} + \underset{(.206)}{2.905 \log X_2}$$

where

Y = production of poultry meats (heads)

X_1 = price of poultry meat t-1 (NT$/head) and,

X_2 = population t

$R^2 = .978$ and $S_y = .0212$

The F test is significant at the < .0005 level for the coefficient of determination while the t-tests for the estimated coefficients are

significant at the < .0005, .004 and < .0005 levels, respectively. The $\hat{VP}_t/VP_t$ ratios for poultry production, 1959 through 1972, are:

1959	1960	1961	1962	1963	1964	1965
.955	.986	.980	1.016	1.051	1.072	.956

1966	1967	1968	1969	1970	1971	1972
.975	.965	.928	1.018	1.064	1.032	.935

Milk Production

$$\log Y = \underset{(.437)}{\log -1.115} + \underset{(.113)}{1.343} \log X$$

where

Y = milk production (ton) and,

X = national per capita income t-1 (NT$)

$R^2 = .915$ and $S_y = .084$

The F test for the coefficient of determination is significant at the <.0005 level, whereas the t-tests for $\hat{\alpha}$ and $\hat{\beta}$ terms are both significant at the .024 and < .0005 levels respectively. The annual value product ratio $\hat{VP}_t/VP_t$ are as follows:

1959	1960	1961	1962	1963	1964	1965
1.168	.933	1.075	1.406	.930	.764	.774

1966	1967	1968	1969	1970	1971	1972
.810	.913	.971	1.130	1.183	1.244	1.132

Poultry Egg Production

$$\log Y = \underset{(.522)}{-4.312} + \underset{(.072)}{1.394} \log X$$

where

Y = number of poultry eggs (1,000 pieces) and,

X = number of fowls t-1

$R^2 = .967$ and $S_y = .035$

The coefficient of determination R^2 is significant at the <.0005 level from the F test. The t-test results for α and β respectively are both significant at the <.0005 level. The annual value product ratio $\hat{VP}_t/VP_t$ for egg production is as follows:

1959	1960	1961	1962	1963	1964	1965
1.005	1.080	1.109	1.009	.934	.857	.993
1966	**1967**	**1968**	**1969**	**1970**	**1971**	**1972**
1.020	1.077	1.058	.945	.899	1.008	1.116

Having presented the regression results of crop and livestock production in Taiwan, and having indicated the ratios of $\hat{VP}_{i_t}/VP_{i_t}$, we now provide an overall view of comparisons between the estimated and the historical value products by commodity and by subsector.

Regression Results in Comparison with Recorded Aggregate Data

While Table 4.1 on the following pages shows the historical data on value products for agricultural commodities and subsectors, Table 4.2 presents the estimated value products of corresponding commodities and subsectors. To compare the proportional differences between values of the historical data and that of the estimated values, Table 6.3 shows the VP_{i_t}/VP_{i_t} ratios.[7]

---

[7] VP_{i_t} is obtained by: Estimated per hectare $yield_{i_t}$ x price x $hectares\ cropped_{i_t}$ for i = 1,. . .,9 and t = 1959,. . .,1972, where price and hectares cropped being historically given. (Units: yield--kgs. per hectare and price--NT$/kg.) TVP_i and TVP_j for each subsector (for i = 1, . . .,9 for crops and j = 1,. . .,4 for livestock subsector) and TVP for both subsectors are obtained via summation identities.

Some selected $\hat{VP}_t/VP_t$ ratios may indeed cause justifiable concern as to the adequacy of using the regression equations for projections.[8] However, due to the nature of this study, which focuses primarily on the per capita income gap between the farm and the nonfarm sectors of the population, one needs to examine the differences in the subsectors and the agricultural sector as a whole rather than singling out individual instances to determine the projective ability of the estimation equations. Besides, most of the ratios between the estimated and the historical value products are close enough to warrant use of the projective equations.

Thus, when comparing the above ratios on the levels of subsectors, only a few isolated instances show wider divergence between the estimated results and the recorded data on value products.

One further observation needs to be made. Table 4.3's ratios for crop and livestock subsectors, and the ratios for the two subsectors combined (bottom row) indicate that, for the period 1964 through 1968, the estimated value products are generally lower than the recorded value products (i.e. below unity). Similarly, the $\hat{VP}_t/VP_t$ ratios for the 1959 through 1963 period are greater than unity. Attention was then turned to individual projective equations.

When running regression equations at an earlier stage of this study, Durbin-Watson statistics were not requested. Subsequent computer print-out confirmed the existence of serial correlation of the error terms for two (fruits and vegetables) out of thirteen projective equations at .01 level of significance.

---

[8] For instance, the $\hat{VP}_{i_t}/VP_{i_t}$ ratios for 1963's potato is 1.302 and 1.302 and for 1967's corn is .754.

Table 4.1. Historical Value Products of Major Crops and Livestock Products in Taiwan, 1959-1972

Year / Commodity	1959	1960	1961	1962	1963	1964	1965
	NT$ = 1,000						
Rice	6,021,474	9,394,145	10,278,768	9,984,483	10,362,151	11,264,767	11,845,243
Sweet Potato	1,303,530	1,832,001	2,007,576	1,988,575	1,572,770	2,486,926	2,280,421
Corn	42,053	60,297	82,297	113,908	111,855	150,811	156,730
Soybean and Other Beans	370,307	428,720	436,479	400,116	370,142	458,692	520,319
Tea	223,980	248,145	292,965	342,368	370,052	301,105	330,598
Sugarcane	1,373,296	1,135,123	1,445,043	1,343,775	1,619,555	3,260,199	2,055,769
Peanut	500,118	660,018	682,648	618,394	616,683	858,597	800,746
Fruits	578,916	698,788	745,173	922,854	1,114,830	1,856,561	2,746,123
Vegetables	767,892	930,843	984,445	1,098,957	1,108,678	1,189,817	1,555,129
Subtotal for Major Crops Subsector	11,181,566	15,388,080	16,964,394	16,813,430	17,246,716	21,827,475	22,291,078
Livestock Slaughter	3,142,482	3,730,179	4,354,504	4,730,837	4,864,478	5,023,661	5,364,852
Poultry	423,918	489,425	551,331	612,421	648,877	749,216	867,170
Milk	31,953	42,959	53,491	46,920	75,558	106,897	84,730
Eggs	458,612	609,103	559,847	649,359	723,987	876,953	733,071
Subtotal for Livestock Subsector	4,056,965	4,871,660	5,519,173	6,039,537	6,312,900	6,756,727	7,049,823
Sum Total of t	15,238,531	20,259,740	22,483,567	22,852,967	23,559,616	28,584,204	29,340,901

Table 4.1. Continued.

Year / Commodity	1966	1967	1968	1969	1970	1971	1972
	NT$ = 1,000						
Rice	12,469,737	13,273,106	14,104,701	12,582,551	13,680,977	12,894,374	14,524,539
Sweet Potato	2,601,356	3,054,780	2,890,106	3,242,260	2,867,280	2,838,714	2,847,789
Corn	185,086	225,106	183,723	146,373	208,339	188,848	253,207
Soybean and Other Beans	489,947	596,916	600,486	527,120	468,638	442,129	443,549
Tea	382,556	448,757	500,769	704,264	791,970	577,918	581,980
Sugarcane	1,891,086	1,499,905	1,703,300	1,585,997	1,401,791	2,127,880	2,248,118
Peanut	801,154	1,024,109	803,113	730,570	901,375	744,899	797,900
Fruits	2,956,922	3,344,990	3,599,172	3,376,834	3,587,486	3,838,836	3,834,064
Vegetables	1,773,179	1,924,821	2,683,278	3,288,577	4,356,755	4,176,101	4,527,366
Subtotal for Major Crops Subsector	23,551,023	25,392,490	27,068,648	26,184,546	28,264,611	27,829,699	30,058,512
Livestock Slaughter	5,806,231	6,646,071	7,713,965	7,722,162	9,029,699	10,003,551	10,932,280
Poultry	916,650	987,878	1,176,332	1,197,557	1,299,524	1,336,524	1,604,103
Milk	70,991	71,922	75,660	77,381	89,055	97,404	125,862
Eggs	836,630	921,894	1,054,840	1,107,408	1,207,118	1,376,731	1,538,179
Subtotal for Livestock Subsector	7,630,502	8,627,765	10,020,792	10,104,508	11,555,366	12,814,270	14,200,424
Sum Total of t	31,181,525	34,020,255	37,089,440	36,289,054	39,819,977	40,643,969	44,258,936

Sources of Information: Taiwan Agricultural Yearbooks, 1960-1973. Department of Agriculture, Taiwan Provincial Government.

Table 4.2. Estimated Value Products of Major Crops and Livestock Products in Taiwan, 1959-1972

Year / Commodity	1959	1960	1961	1962	1963	1964	1965
	NT$ = 1,000						
Rice	6,910,725	9,616,748	10,483,711	10,021,902	10,001,054	10,919,339	11,011,763
Sweet Potato	1,320,419	1,754,810	1,889,109	2,048,355	2,048,355	2,438,864	2,276,936
Corn	54,129	73,080	85,391	101,367	120,725	147,014	141,828
Soybean and Other Beans	371,785	416,191	456,148	407,251	433,295	469,201	466,143
Tea	255,922	288,020	371,302	342,733	354,584	299,647	275,956
Sugarcane	1,244,206	1,218,555	1,385,389	1,515,944	1,729,276	3,185,624	1,839,070
Peanut	531,305	662,628	681,331	657,689	684,884	821,617	741,926
Fruits	760,316	876,327	1,010,002	1,122,656	1,122,656	1,649,380	2,146,269
Vegetables	782,073	950,360	1,047,461	1,095,339	1,252,339	1,421,564	1,611,011
Subtotal for Major Crops Subsector	12,230,880	15,855,719	17,409,845	17,313,236	17,747,236	21,352,251	20,510,901
Livestock							
Slaughter	2,840,075	3,580,561	4,365,159	4,617,830	4,944,112	5,494,702	6,134,654
Poultry	404,664	482,484	540,450	622,078	682,060	802,972	828,959
Milk	37,330	40,075	57,498	65,987	70,274	81,647	64,565
Eggs	460,958	657,656	620,917	655,357	676,081	761,547	727,944
Subtotal for Livestock Subsector	3,743,028	4,760,665	5,584,025	5,961,252	6,372,529	7,130,866	7,737,122
Sum Total of t	15,973,918	20,616,385	22,933,810	23,274,488	24,119,698	28,483,117	28,248,024

Table 4.2. Continued.

Year / Commodity	1966	1967	1968	1969	1970	1971	1972
	NT$ = 1,000						
Rice	11,917,852	12,512,958	13,511,701	13,591,523	13,680,226	13,491,294	14,181,785
Sweet Potato	2,450,589	2,644,233	2,999,865	3,135,983	2,809,510	2,847,924	3,206,733
Corn	179,427	169,806	167,153	160,145	225,776	192,220	237,069
Soybean and Other Beans	497,142	536,320	568,299	560,591	451,286	485,329	414,281
Tea	347,438	372,994	467,483	817,490	927,759	493,366	525,411
Sugarcane	1,743,197	1,559,212	1,565,312	1,676,871	1,601,952	1,948,547	2,352,619
Peanut	774,503	824,075	837,455	811,590	785,893	824,210	818,639
Fruits	2,585,425	2,923,735	3,252,185	3,293,718	3,824,030	3,649,809	4,258,302
Vegetables	1,873,681	1,986,392	2,422,903	2,979,013	3,922,923	3,607,501	4,223,476
Subtotal for Major Crops Subsector	22,369,249	23,529,725	25,792,555	26,296,494	28,229,355	27,540,205	30,218,343
Livestock							
Slaughter	6,100,756	6,466,377	7,757,430	8,125,637	8,482,232	9,995,308	11,372,545
Poultry	893,439	953,483	1,091,304	1,219,138	1,308,808	1,378,847	1,500,308
Milk	57,519	65,660	73,464	87,445	105,351	121,149	142,507
Eggs	853,641	992,535	1,116,271	1,046,577	1,085,070	1,387,154	1,716,040
Subtotal for Livestock Subsector	7,905,341	8,478,055	10,038,468	10,487,798	10,981,461	12,882,458	14,731,400
Sum Total of t	30,274,594	32,007,780	35,831,024	36,784,293	39,210,816	40,422,663	44,949,745

The estimated value products are calculated by the identity:

Estimated value product i_t = per hectare yield i_t x price i_t x hectares cropped i_t for i = 1,. . .,18 and t = 1959,. . .,1972,

and where the prices and hectares cropped are historically given.

Table 4.3. Ratios of Estimated Value Products/Historical Value Products for Major Crops and Livestock Products, 1959-1972

Year / Commodity	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Rice	1.148	1.024	1.020	1.004	.965	.969	.930	.956	.943	.958	1.080	1.000	1.046	.976
Sweet Potato	1.013	.958	.938	.950	1.302	.981	.998	.942	.866	1.038	.967	.980	1.003	1.126
Corn	1.287	1.212	1.038	.890	1.079	.975	.905	.969	.754	.910	1.094	1.084	1.018	.936
Soybean	1.004	.971	1.045	1.018	1.171	1.023	.896	1.015	.896	.946	1.063	.963	1.098	.934
Tea	1.143	1.161	1.267	1.001	.958	.995	.835	.908	.831	.934	1.161	1.171	.854	.903
Sugarcane	.906	1.074	.959	1.128	1.068	.977	.895	.922	1.040	.919	1.057	1.143	.916	1.046
Peanut	1.062	1.004	.998	1.064	1.111	.957	.927	.967	.805	1.043	1.111	.872	1.106	1.026
Fruits	1.313	1.254	1.339	1.217	1.223	.888	.782	.874	.874	.904	.975	1.066	.951	1.111
Vegetables	1.018	1.021	1.064	.997	1.130	1.195	1.036	1.057	1.032	.903	.906	.900	.864	.933
Subtotal Average for Major Crops Subsector	1.094	1.030	1.026	1.020	1.020	.978	.920	.950	.927	.953	1.004	.999	.990	1.005
Livestock Slaughters	.904	.960	1.002	.976	1.016	1.093	1.143	1.051	.973	1.006	1.052	.939	.999	1.040
Poultry Meat	.955	.986	.980	1.016	1.051	1.072	.956	.975	.965	.928	1.018	1.064	1.032	.935
Milk	1.168	.933	1.075	1.406	.930	.764	.774	.810	.913	.971	1.130	1.183	1.244	1.132
Eggs	1.005	1.081	1.109	1.009	.934	.857	.993	1.020	1.077	1.058	.945	.899	1.008	1.116
Subtotal Average for Livestock Subsector	.923	.977	1.012	.987	1.009	1.055	1.097	1.036	.983	1.002	1.037	.950	1.005	1.051
Average for Two Subsectors	1.048	1.018	1.023	1.018	1.024	.996	.963	.971	.941	.966	1.014	.985	.995	1.016

The ratios are obtained by: $\hat{VP}_{i_t} / VP_{i_t}$ as presented in Tables 4.2 and 4.1, respectively, for $i = 1,\ldots,18$ and $t = 1959,\ldots,1972$.

It was then suspected that the fluctuations in quantity of fertilizer application, natural disasters, variations in the hectares irrigated or number of mechanized farm tools were responsible for the divergence of $\hat{VP}_t/VP_t$ ratios from unity. Subsequent enquiry showed no unusual variation in the above mentioned factors.

Since it is two out of thirteen projective equations that have serial correlation, and since no obvious explanations for their behavior is found, we have to be resigned to it and attribute it to chance occurrence.

Since output from the nonstructural projective equations are eventually fed into the structural identities, we look at the overall $\hat{VP}_t/VP_t$ ratios listed under "average for two subsectors" (last row of Table 4.3). These overall $\hat{VP}_t/VP_t$ ratios do not diverge significantly from unity. Their implications for study results--i.e. the resulting per capita income stream to the farm producer--in Chapter IX, however, should be recognized and taken into due consideration.[9]

The remaining part of this chapter investigates the overall coefficient of determination R^2 for Taiwan's agricultural value products.

Overall Coefficient of Determination

The equation for R^2 is as follows:

$$R^2 = 1 - \frac{\sum_{'59}^{'72} (Y_i - Y_i)^2}{\sum_{'59}^{'72} (Y_i - \bar{Y})^2}$$

[9]The 14-year average (1959-1972) of the $\hat{VP}/VP$ ratios is .998. That means, despite annual divergence between the estimated value products and the recorded value products from 1959 through 1972, in a longer period of time, it averages out to unity.

Values from the last rows of Table 6.1 and 6.2 are entered as Y_i and Y_i, respectively. The resulting R^2 is .9899, which means that, via identities and accounting components in Tables 4.1 and 4.2, 98.99 percent of the variation in the value products was associated with variations in the independent variables of the corresponding equations and the given factors of cropped hectarage and price.

Having delineated the methodological approaches in Chapter II, data construction in Chapter III, and the resulting regression equations in Chapter IV, the following chapters will present the projected consequences to alternative policy measures.

Implications of these alternative policy measures and analysis of the projected results will accompany each of the selected alternative policies.

CHAPTER V

PROJECTED CONSEQUENCES UNDER POLICY ALTERNATIVE I

This chapter is concerned with the presentation of the projected consequences of policy alternative one--trend policy. This chapter continues projections of: 1) major crop prices; 2) relative changes in crop prices; 3) hectares cropped; 4) per crop cash expenditure; 5) crop production; 6) value products from crop and livestock subsectors; 7) per capita income streams to the farm and nonfarm populations; and 8) past and future income differentials between the two sectors of Taiwan's population. Comparisons of income streams and analysis of consequences to this policy relative to alternatives will be presented in Chapter IX.

Crops

In Chapters III and IV, physical production of crops is estimated as a function of per hectare cash expenditures. And the per hectare cash expenditures are in turn a function of the crops' relative price changes. In making projections, therefore, prices of major crops are first determined.[1]

---

[1]The average price at the bottom of Table 5.1 is derived in the same manner as in Table 3.3 of Chapter III with one exception. In an equation $P_a \equiv \sum_{i=1}^{9} \sum_{i=1}^{9} \sum_{i=1}^{9} P_t \cdot Q_t \cdot H_t / \sum_{i=1}^{9} Q_t$, instead of Q_t, Q_{t-1} is used for years 1974 through 1984. Since the average price is used here only as a benchmark to determine the relative price changes from one year to the next, this substitution of Q_{t-1} for projective purposes is not likely to appreciably affect the outcome of relative price change ratios as listed in Table 5.2.

Table 5.1 presents the linear trend crop prices while Table 5.2 represents the resulting ratios of relative price changes.[2] According to alternative I, crop prices only increase gradually and the resulting per capita income stream to the farm person also increases gradually.[3] Table 5.3 presents the hectares cropped per major crop. One study, basing its estimates of future crop hectarages on "various authorities," suggests that "the total hectarage of rice will be reduced by 150 hectares per year."[4] However its estimates are less than one-one hundredth of the recorded data from 1970 through 1973.[5] The trend projections made in this study are much closer to reality than the above mentioned study.

---

[2]Table 5.2 is arrived at via the following equation: $\frac{P_{i_t}/P_{a_t}}{P_{i_{t-1}}/P_{a_{t-1}}}$, where P_{a_t} stands for average price for year t.

[3]Note that Table 5.1 1973's prices are not included among the projected, because historical price data on those crops for 1973 have been made available. The prices in 1973 saw a marked increase over the past trend. For example, the prices for the nine major crops for 1972 and 1973 are as follows:

(Unit: NT$/1,000 kgs.)

Year	Rice	Sweet Potato	Corn	Soybean and Other Beans	Tea
1972	5,952	973	3,576	6,466	22,188
1973	8,349	1,212	4,843	10,632	33,632

	Sugar-cane	Peanut	Fruits	Vegetables
1972	317	8,485	3,309	2,567
1973	309	10,295	3,333	3,284

Since this Chapter is concerned with trend projections historical data of 1973 are included as part of the "trend."

[4]Long Term Projections of Supply, Demand and Trade for Selected Agricultural Products in Taiwan, (Taiwan: The Research Institute of Agricultural Economics, 1970), p. 79.

[5]The above mentioned long term projection was made in 1969. The rice hectarage cropped for the period of 1970 through 1973 are: 776,139; 753,451; 741,570 and 724,164, respectively. It shows an average decrease

Table 5.1. Log Linearly Projected Price of Major Crops and Average Crop Price$_t$ in Taiwan, 1974-1984

Year / Crop	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	NT$/1,000 Kgs.										
Rice	7,307	7,636	7,980	8,339	8,339	9,107	9,517	9,999	10,394	10,864	11,357
Sweet Potato	1,156	1,229	1,299	1,373	1,451	1,533	1,621	1,713	1,810	1,914	2,023
Corn	4,475	4,649	4,829	5,017	5,211	5,412	5,624	5,843	6,002	6,304	6,549
Soybean and Other Beans	7,596	7,777	7,963	8,152	8,346	8,545	8,748	8,956	9,169	9,388	9,611
Tea	29,017	30,514	32,087	33,741	35,482	37,311	39,236	41,260	43,386	45,624	47,977
Sugarcane	314	326	339	352	366	380	395	410	426	443	460
Peanut	9,456	9,811	10,179	10,561	10,958	11,370	11,797	12,240	12,699	13,176	13,671
Fruits	3,758	3,962	4,178	4,405	4,645	4,896	5,164	5,445	5,742	6,054	6,384
Vegetables	3,457	3,771	4,113	4,485	4,892	5,215	5,819	6,347	6,922	7,549	8,234
Average	2,321	2,476	2,639	2,816	3,023	3,190	3,534	3,790	4,099	4,423	4,794

Table 5.2. Ratios of Crop Price Change Relative to Average Crop Price in Taiwan Under Policy Alternative I, 1974-1985

Year / Crop	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84
Rice	.909	.980	.981	.979	.974	.990	.943	.980	.961	.968	.965
Sweet Potato	.990	.996	.992	.992	.984	1.002	.954	.985	.978	.980	.975
Corn	.959	.974	.974	.974	.967	.984	.938	.969	.949	.973	.959
Soybean and Other Beans	.742	.960	.961	.937	.954	.970	.924	.955	.947	.949	.944
Tea	.896	.986	.987	.985	.980	.997	.903	.981	.972	.974	.970
Sugarcane	1.055	.978	.970	.977	.968	.983	.941	.964	.963	.962	.960
Peanut	.954	.973	.973	.972	.967	.983	.937	.968	.959	.962	.957
Fruits	1.171	.988	.989	.988	.983	.999	.952	.984	.975	.977	.973
Vegetables	1.092	1.023	1.024	1.022	1.016	1.011	1.007	1.017	1.008	1.011	1.006

Ratios in this table are obtained via: $\frac{P_{i_t}/P_{a_t}}{P_{i_{t-1}}/P_{a_{t-1}}}$ for i = 1,. . .,9 and t = 1973,. . .,1984

where: P_{a_t} = average price (NT$/1,000 kgs.)

Table 5.3. Logarithmic Projections of Hectares Cropped in Taiwan, 1974-1984

Year / Crop	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	Hectares										
Rice	754,000	752,015	750,015	748,083	746,114	744,166	742,217	740,267	738,333	736,400	734,467
Sweet Potato	231,085	231,446	231,087	232,162	232,539	232,883	233,244	233,607	233,965	234,329	234,692
Corn	29,146	30,583	32,092	33,678	35,337	37,081	38,910	40,830	42,844	44,959	47,169
Soybean and Other Beans	47,146	45,328	43,333	41,425	39,601	37,858	36,191	34,599	33,078	31,618	30,464
Tea	29,919	29,227	28,550	27,890	27,245	26,615	25,999	25,398	24,810	24,246	23,675
Sugarcane	92,416	92,002	91,559	91,188	90,782	90,379	89,975	89,576	89,177	88,780	88,389
Peanut	80,038	78,577	77,141	75,732	74,350	72,992	71,657	70,350	69,065	67,804	66,564
Fruits	117,006	125,554	134,721	144,559	151,118	166,448	178,600	191,644	205,639	220,655	236,769
Vegetables	161,728	168,849	176,289	184,045	192,152	200,611	209,447	218,670	228,298	238,354	248,848
Total	1,542,484	1,553,581	1,565,507	1,578,762	1,589,238	1,609,033	1,626,240	1,644,941	1,665,209	1,687,145	1,711,037

Using the data contained in Table 5.1 through 5.3, a process similar to that used for the computation of Tables 3.5 and 3.6 is used to generate projected values of per hectare cash expenditures and per hectare yields. Tables presented in Appendix B carry out such processes. Values in column 8 of each of these tables are transcribed into Table 5.6 which represents data on projected cash expenditures for major crops, 1973 through 1984. In combination with regression coefficients presented in Chapter IV, data contained in Table 5.4 are used to compute the per hectare production of major crops, 1973-1984. The resulting projected per hectare productions of these crops are listed in Table 5.5.[6]

The next step is to compute total value products from these major crops via the identity:

$$TVP \equiv \sum_{i=1}^{9} P_{i_t} \times Q_{i_t} \times H_{i_t}, \text{ for } i = 1,\ldots,9 \text{ and } t = 1973,\ldots,1984$$

where:

P_{i_t} = the unit price for time t,

Q_{i_t} = the per hectare yield of a crop for t,

H_{i_t} = the number of hectares cropped for time t.

---

of 17,325 hectares per year. The decrease has more than a hundred times faster than that projection. This rapid decrease in rice area cropped in recent years could be due to unforeseen, and hence unusual, circumstances. The log linear estimates made in this study, though appearing to be higher than the 1970-1973 data, are much closer to reality than that made by the study cited.

[6] 1973's projected crop productions are very close to the historical data which have recently been made available.

Table 5.4. Projected Cash Expenditures for Major Crops in Taiwan, Under Policy Alternative I, 1973-1984

Crop \ Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	NT$/Hectare											
Rice	6,331	5,834	6,057	6,284	6,514	6,753	7,006	7,248	7,603	7,649	7,871	8,086
Sweet Potato	6,876	6,906	7,282	7,616	8,036	8,460	8,876	9,278	9,826	10,075	10,433	10,795
Corn	4,484	4,452	4,555	4,662	4,883	4,883	5,022	5,202	5,406	5,447	5,606	5,776
Soybean and Other Beans	4,089	3,027	3,073	3,107	2,718	2,614	2,459	2,235	2,552	2,822	3,188	3,577
Tea	2,202	2,168	2,383	2,620	2,883	3,167	3,498	3,111	3,476	3,763	4,158	4,603
Sugarcane	11,004	11,794	12,112	12,419	12,875	13,306	13,598	13,936	14,291	14,394	14,762	15,103
Peanut	4,208	4,053	4,077	4,073	4,247	4,410	4,592	4,798	5,020	5,069	5,204	5,321
Fruits	17,951	21,292	22,189	23,211	24,253	25,464	26,626	27,856	29,369	29,961	31,067	32,217
Vegetables	15,425	17,089	18,479	20,029	21,672	23,439	24,784	27,326	29,776	31,383	33,624	36,018
Average	7,892	8,412	8,966	9,557	10,187	10,858	11,573	12,436	13,418	14,015	14,938	15,922

Table 5.5. Projected per Hectare Yield of Major Crops in Taiwan Under Policy Alternative I, 1973-1984

Year / Crop	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	Kgs./Hectare											
Rice	3,436	3,354	3,391	3,428	3,465	3,502	3,541	3,577	3,628	3,634	3,665	3,695
Sweet Potato	16,384	16,418	16,838	17,202	17,648	18,086	18,505	18,901	19,425	19,658	19,989	20,316
Corn	2,931	2,916	2,963	3,011	3,062	3,110	3,172	3,251	3,339	3,357	3,425	3,497
Soybean and Other Beans	1,833	1,484	1,500	1,511	1,375	1,338	1,292	1,199	1,316	1,412	1,539	1,669
Tea	732	1,176	1,053	1,115	1,115	1,181	1,250	1,324	1,402	1,485	1,572	1,665
Sugarcane	80,566	81,262	81,530	81,784	82,150	82,486	82,709	82,961	83,220	83,294	83,555	83,797
Peanut	1,291	1,276	1,279	1,278	1,296	1,312	1,329	1,348	1,368	1,372	1,384	1,394
Fruits	14,104	15,241	15,529	15,850	16,169	16,531	16,869	17,218	17,637	17,637	17,797	18,394
Vegetables	11,493	12,405	13,150	13,965	14,811	15,703	16,370	17,607	18,772	19,522	20,553	21,635

Table 5.6, column 1 shows the projected value products for these nine major crops through time. Column 2 represents the projected total value products from the time period of 1973 through 1984.[7]

Table 5.6. Projected Total Value Products from Nine Major Crops and from All Crops in Taiwan Under Policy Alternative I, 1973-1984

Year	(1) Nine Major Crops	(2) Total Value Products
	NT$ = Million	
1973	40,476	43,711
1974	41,889	45,236
1975	45,682	49,330
1976	50,310	54,331
1977	55,411	59,839
1978	61,202	66,093
1979	67,717	73,128
1980	76,282	82,377
1981	85,868	92,730
1982	94,950	102,537
1983	107,126	115,687
1985	120,736	130,385

In Table 5.7, we present the total cost to the nine major crops and to all the crops. Column 3 of Table 5.7 shows the net income to the

[7] During the past fifteen years (1959-1973), the total value products from these nine major crops accounted for the following percentages of the total value products from all crops: 1959, 93.7%; 1960, 93.6%; 1961, 92.8%; 1962, 92.9%; 1963, 91.0%; 1964, 92.3%; 1965, 92.1%; 1966, 92.9%; 1967, 91.9%; 1968, 92.3%; 1969, 93.2%; 1970, 93.1%; 1971, 92.9%; 1972, 91.9%; and 1973, 93.0%. The average percentage was 92.6%. These percentages were obtained by summing the annual value products of all crops. (See Taiwan Agricultural Yearbooks.) Dividing the TVPs from the major crops by that from all crops results in the above figures. For the period 1974 through 1984, we assume average annual TVP from minor crops to be 7.4 percent of the total.

farm population from the crop subsector. That added onto income from the livestock subsector will be the farm population's income from farming activities.[8]

Table 5.7. Total Cost for the Nine Major Crops, for all the Crops, and the Total Net Income from the Crop Subsector in Taiwan Under Policy Alternative I, 1973-1984

Year	(1) TC to Nine Major Crops	(2) TC to All Crops	(3) TVP-TC
	----------NT$:Million----------		
1973	14,498	15,571	28,140
1974	16,920	18,204	27,032
1975	18,415	19,777	29,553
1976	20,063	21,548	32,782
1977	21,889	23,509	36,331
1978	23,848	25,612	40,481
1979	26,144	28,079	45,049
1980	28,879	31,017	51,361
1981	32,070	34,444	58,287
1982	34,517	37,140	65,397
1983	38,005	40,818	74,869
1984	41,873	44,971	85,413

[8]Total cost to be the nine major crops are the summation of Total Cash Expenditure and the cost of hired labor. From Reports of Farm Record Keeping Families, we calculated that the cost to hired labor per cropped hectare for 1959 through 1972 constituted the following percentages of per hectare cash expenditure: 9.4%, 13.0%, 15.2%, 15.3%, 17.8%, 19.7%, 15.3%, 19.9%, 19.8%, 19.7%, 21.8%, 24.3%, 24.6% and 31%. For the years 1973 through 1984, the linear trend gives the following percentages: 28.7%, 30.4%, 32.2%, 34.1%, 36.1%, 38.2%, 40.4%, 42.8%, 45.3%, 47.9%, 50.8% and 53.7%. These figures, especially the latter years, present a picture of rapid cost increases to hired labor on farm.

As based on repeated statements from agricultural economists in Taiwan, labor costs will increase. But the increased costs to hired farm labor in the future, as will be shown shortly, can be offset by the increased income from nonfarming activities by farmers. The figures in column 1 of Table 5.7 are the sum of the following: 1) the sum of $\sum_{i=1}^{9} C_{i_t} \cdot H_{i_t}$ for i = 1,. . .,9 and t = 1973,. . .,1984.

C = the per hectare cash expenditures listed in Table 5.4 and,

Livestock

Given the estimated regression coefficients for livestock slaughter, poultry meat, milk and poultry egg productions in Chapter IV, and given the trend values of their respective independent variables, we present the projected productions of these four livestock categories in Table 5.8.

Table 5.8. Projected Livestock Production in Taiwan Under Policy Alternative I, 1973-1984

Year	(1) Livestock Slaughter	(2) Poultry Production	(3) Milk	(4) Eggs
	1,000 Head	1,000 Head	1,000 Ton	Million
1973	5,124	29,697	30	1,341
1974	5,458	25,549	35	1,185
1975	5,813	28,915	40	1,331
1976	6,191	29,876	45	1,449
1977	6,594	30,854	51	1,576
1978	7,023	31,836	60	1,715
1979	7,480	32,813	86	1,866
1980	7,967	33,773	78	2,031
1981	8,485	34,698	70	2,220
1982	9,037	36,127	103	2,404
1983	9,625	37,303	118	2,616
1984	10,252	38,535	135	2,847

With the above data and the linearly projected unit prices for livestock, poultry meat, milk and eggs, we may compute the value products for these livestock items. Table 5.9 presents these value products from 1973 through 1984.

H = number of hectares cropped.
And, 2) the sum from 1) above plus the annual cost to hired farm labor.
i.e. X (1 + Y) where: X = the sum from 1) above, and
Y = the percentage of hired labor cost to per hectare cash expenditure as presented in this footnote earlier.

From Reports from the Farm Record Keeping Families in Taiwan, ratios of livestock expenditures--including livestock purchases and feeds--to receipts from livestock raising are computed from 1958 through 1972. These ratios form a trend which are used to project the ratios of cost to receipts for the years 1973-1984. There is a gradual decrease over time in the cost to receipts ratios, possibly due to economies of scale. These ratios are computed in conjunction with column 5 of Table 5.9 to reach the net income from livestock raising activities as shown in Table 5.10.

Summing up the net incomes from farming activities (Table 5.7, column 3) and from livestock production (Table 5.10) we obtain the total net income to farm population in Taiwan for the projected period of 1973-1984. Table 5.11 presents the projected total income, total farming population and the per capita farm income from farming activities under policy alternative I.[9]

Table 5.11 column 3 needs further explanation. According to 1971 Taiwan Demograph Fact Book, the birth and death rates for farm and nonfarm populations in 1971 were nearly identical. We then proceed to divide the officially projected total population in Taiwan into farm and nonfarm categories.[10]

---

[9]This per capita income from farming activities has yet to be added onto per capita income from "nonfarming activities" to arrive at the per capita total farm total income. The projected population figures from 1973 through 1981 are from official sources, [The Fourth Manpower Development Plan, (Taiwan: Council for International Economic Cooperation and Development), December, 1972], whereas these for 1982 to 1984 are from log linear projection.

[10]1971 Taiwan Demographic Fact Book, Republic of China, (Taiwan: Ministry of Interior, ROC), November 1972. In this publication the population is divided into three categories: City, urban township and

Table 5.9. Projected Value Products from Livestock Subsector in Taiwan, 1973-1984

Year	(1) Livestock	(2) Poultry	(3) Milk	(4) Eggs	(5) Total VPs
			Million NT$		
1973	12,477	1,960	150	2,031	16,618
1974	13,289	1,788	165	1,815	17,057
1975	14,323	2,111	182	2,062	18,678
1976	15,750	2,300	200	2,270	20,520
1977	17,316	2,468	220	2,497	22,501
1978	19,032	2,674	242	2,748	24,696
1979	20,929	2,888	268	3,024	27,108
1980	23,008	3,151	293	3,304	29,746
1981	25,294	3,366	323	3,662	32,645
1982	27,817	3,685	355	4,027	35,884
1983	30,522	3,991	392	4,432	39,337
1984	33,615	4,316	431	4,877	43,239

Table 5.10. Projected Net Income from Livestock Production in Taiwan, 1973-1984

Year	Net Income Livestock Production
	Million NT$
1973	9,123
1974	9,501
1975	10,552
1976	11,758
1977	13,050
1978	14,521
1979	16,129
1980	17,937
1981	19,913
1982	22,140
1983	24,507
1984	27,241

Table 5.11. Projected Total Income, Total Farm Population, and Per Capita Net Farm Income from Farming Activities in Taiwan Under Policy Alternative I, 1973-1984

Year	(1) Total Net Income	(2) Total Population	(3) Total Farm Population	(4) Per Capita Farm Income from Farming Activities
	Million NT$	1,000 Persons	1,000 Persons	NT $
1973	37,264	15,505	6,033	6,177
1974	36,533	15,814	6,117	5,972
1975	40,106	16,124	6,202	6,467
1976	44,540	16,438	6,286	7,086
1977	49,381	16,755	6,372	7,750
1978	55,002	17,073	6,458	8,517
1979	61,178	17,391	6,544	9,349
1980	69,298	17,706	6,629	10,454
1981	78,200	18,015	6,712	11,651
1982	87,538	14,414	6,798	12,876
1983	99,376	18,770	6,879	14,446
1984	112,654	19,132	6,960	16,187

rural township. The sum of city and urban populations (p. 176-77) is 9,210,966. However, data from Statistical Abstract of the Republic of China, 1972 and Taiwan Agricultural Yearbook, 1972 and from Taiwan Statistical Handbook, 1972 indicate that the nonfarm population in Taiwan 1971 should be 9,036,181 rather than 9,210,966. This means, 1.8976% of the urban township dwellers in that year belongs to farming population. On page 98 of the same Demographic Fact Book, we add up the live births from cities and urban townships and multiply that by 1,8976%. That means, that many births, categorized under urban townships, belong to the farming population. Adding that onto live births listed for "rural township" dwellers and we obtain the total live births for farming sector of the population. Similarly, we subtract those live births (those added onto the farming sector) from city and urban township categories, and obtain live births for the nonfarm sector of Taiwan's population. Those birth figures were divided by their respective population sizes for the year 1971. Therefore we obtain birth rates for fam and nonfarm populations to be 2.56 and 2.52 per thousand persons, respectively. The same approach is used to calculate farm and nonfarm death rates for 1971, and the results are: 5.14% for farm and 4.73% for nonfarm populations. That means, in the year 1971, the birth and death rates for the two sectors of Taiwan's population were very close. And since the projection period for this study is from 1973 through 1984, and since the

According to Taiwan's Long Term Economic Development Plan, from 1973 to 1982, 136,000 farm persons actively engaged in agricultural production in Taiwan will leave the farms.[11] Consequently, we distribute the officially estimated 136,000 persons evenly over the ten-year period of 1973-1982 and calculate the projected farm population accordingly.[12]

Column 4 of Table 5.11 shows the projected per capita income from farming activities to the farm person, 1973-1984. For analytical purposes, we now proceed to present the estimated per capita incomes of farm persons from both farming and nonfarm activities, and to compare them from 1959 to 1972.

The per capita farm income for the year 1959 through 1972 is obtained by summing up the net incomes to the farm person from both

---

projected estimates of total population is available from the government sources, we assume that the year 1973 and the birth/death rates for farm and nonfarm populations on Taiwan had been equalized. This is likely, and it also facilitates the division of the projected total population between farm and nonfarm sectors.

[11] Republic of China, Taiwan Province's Long Term Economic Development Plan, (Taiwan: Council for International Economic Cooperation and Development, 1972), p. 61.

[12] That means, for each of the years from 1973-1984, a net of 13,600 persons migrated off farm. In the past fifteen years (1959-1973), the percentage of those engaged in farming activities to total farm population"t" were: 37.2%, 34.9%, 35.0%, 35.0%, 35.1%, 35.6%, 35.1%, 35.3%, 34.4%, 35.7%, 36.2%, 37.4%, 38.6%, 39.0% and 38.6%, respectively. And the trend for the years 1974 through 1984 are: 38.1%, 38.3%, 38.6%, 38.8%, 39.1%, 39.3%, 39.6%, 39.8%, 40.1%, 40.3%, and 40.6%, respectively. Thus, with 13,600 actively producing farm persons migrating off farm each year between 1973 and 1982, and with the above calculated rates, we reach the values of total farm population in Column 3 of Table 5.11, commencing with the historical data of 1972's farm population being 5,947,325. The equation for 1973's farm population for instance, is: 5,947,325 [1 + (officially projected birth rate for 1972--death rate)] - 13,600 = 6,032,822.

farming and nonfarming activities.[13] Table 5.12 presents the farm, nonfarm, national and the ratio of per capita farm to nonfarm incomes.

Per capita nonfarm income is derived by the following equation:

$$Ynf_t = Y_t + \frac{(Y_t - Y_f) \quad P_{f_t}}{Pnf_t}$$

where:

Ynf_t = the per capita nonfarm income,

Y_t = the national per capita income t

Y_f = the per capita income of a farm person t

Pf_t = the farm population t and,

Pnf_t = the nonfarm population t.

Column 4 of Table 5.12 indicates that the differential between per capita farm and nonfarm incomes has been increasingly tilting in favor of nonfarm persons. The concern now is whether the continuation of the trend is a desirable feature or not. Table 5.13 presents the future income differences between the two sectors of the population in Taiwan, 1973-1984. Values in column 1 of Table 5.12 are arrived at in the following manner. The per capita farm income includes 1) revenues from crop and livestock subsectors, and 2) income from nonfarming activities. Revenues from crop and livestock subsectors are obtained via:

$$\sum_{i=1}^{2} TR_{i_t} = TVP_{i_t} - TC_{i_t} - TC_{i_t}, \text{ for } i = 1 \text{ and } 2, \text{ and}$$

$$t = 1959, \ldots, 1972,$$

---

[13] This is arrived at by subtracting the province's total costs to crop and livestock raising from the province's total revenues derived from these two subsectors, divided by the farm population of that year. The per capita farm income from engagement in nonfarming activities are derived from Reports from the Farm Record Keeping Families in Taiwan, 1959-1972.

Table 5.12. Per Capita Farm and Nonfarm Income in Taiwan, 1959-1972

Year	(1) Farm	(2) National	(3) Nonfarm	(4) Ratio of Per Capita Farm to Nonfarm
	----------NT $----------			Percent
1959	2,030	3,489	4,819	42.1
1960	2,589	4,557	6,508	39.8
1961	2,836	4,953	6,990	40.6
1962	2,972	6,139	7,239	41.1
1963	2,977	5,782	8,291	35.9
1964	3,956	6,708	9,061	43.7
1965	4,047	7,032	9,518	42.5
1966	4,069	7,677	10,592	38.4
1967	4,370	8,461	11,771	37.1
1968	4,676	9,554	13,378	35.0
1969	4,035	10,449	15,271	26.4
1970	5,124	11,727	16,289	31.5
1971	5,320	13,148	18,310	29.1
1972	5,821	14,904	20,649	28.2

with the cost to hired labor included in the calculation of TC. The farmer's income from nonfarming activities is derived from Reports from Farm Record Keeping Families in Taiwan. From 1959 through 1972, each year the farmer's income from nonfarming activities is a percent of his receipts from farming activities. This series of percentages is used to make linear log projection from 1973 through 1984. Therefore, each year, from 1973 through 1984, there is a projected percentage of the farmer's income from nonfarming activities to his receipts from farming activities. The receipts from farming activities are listed in Tables 5.6 and 5.9. From 1973 through 1984, each year's receipts from farming activities

Table 5.13. Projected Per Capita Farm and Nonfarm Income Streams in Taiwan Under Policy Alternative I, 1973-1984

Year	(1) Farm	(2) National	(3) Nonfarm	(4) Ratio of Per Capita Farm to Nonfarm
	----------NT $----------			Percent
1973	6,622	17,855	25,009	26.5
1974	6,604	17,924	25,140	26.3
1975	7,231	19,839	27,719	26.1
1976	8,028	21,959	30,858	26.2
1977	8,910	24,305	33,752	26.4
1978	9,924	26,902	37,231	26.7
1979	11,070	29,777	41,063	27.0
1980	12,619	32,959	45,131	28.0
1981	14,345	36,480	49,624	28.9
1982	16,080	40,378	54,599	29.5
1983	18,397	44,693	59,907	30.7
1984	20,998	49,468	65,746	31.9

1973's national per capita income in column 2 is from historical data.

multiplied by its above mentioned percentage gives the predicted total income to the farm population from nonfarming activities. This divided by the farm population of the year gives the per capita income of the farmer from nonfarming activities. Add this latter onto figures in column 3 of Table 5.11 gives total per capita income of the farm persons as it appears in column 1 of Table 5.13.

Column 4 of Table 5.13 indicates that, under policy alternative I, by the year 1984, per capita farm incomes will still be less than one-third of that of nonfarm per capita incomes. One may, therefore, discreetly

question the wisdom of allowing the trends of crop prices, per hectare cash expenditures, crop productions, growth in income from farming activities and so forth to continue so as to deny a large sector of Taiwan's population an equitable share in the fruits of the province's general economic growth.[14]

Policy alternative I does not help to close the per capita income gap between farm and nonfarm sectors of Taiwan's population and is therefore wrong. The next chapter examines the projected results of policy alternative II, where crop prices, and hence indirectly cash expenditures, crop production and farm income stream are a function of per capita income and of population growth.[15]

---

[14] In computing the per capita farm income, the revenues from fishery and forestry subsectors are not included. This is so because the TR from fishing industry belongs to the fishing population, which is distinct from farming population as evidenced in Taiwan Agricultural Yearbooks. And the farm population as listed in column 3 of Table 5.13 does not include fishing population. We need not go into an income comparison between the fishing population and nonfarm population, since our main concern is with Taiwan's farm population. Besides, there are not detailed data available on the cost expenditures or capital investment figures for the fishing industry.

As for TR from the forestry subsector, due to the fact that few farmers derive any income from the forestry industry (i.e. most farmers work on paddy fields) as indicated in Reports from Farm Record Keeping Families in Taiwan, and since there are no figures on capital investment in forestry subsector from small farmers, we presume that forestry industry is more the concern of industries and larger corporations rather than that of small farmers.

[15] We limit this chapter and the subsequent three chapters to presenting consequences to alternative policy measures. More meaningful comparison of alternative results and analysis of merits and feasibility of policies, etc. can be given when all projected results have been presented. This will be presented in Chapter IX.

CHAPTER VI

PROJECTED CONSEQUENCES TO POLICY ALTERNATIVE II, 1973-1984

The preceeding chapter presented the income results of policy alternative I--Trend Policy. In this chapter, projections for alternative II will be given.[1] Policy alternative II is intended to examine income consequences of variations in national per capita income and in population growth. Two sets of projection values on population growth, 1971 to 1981, were made by the Population Research Council in Taiwan, one resulting from higher birth rates (with no success from the family planning program), while the other presupposing success of the said program. A comparison of available population data from 1971 through 1973 with the two projected sets shows that the actual population sizes for those three years were closer to the low birth estimate. In fact, the recorded population data for 1973 were slightly lower than the projected figure for the low population growth estimate. This implies that family planning program in Taiwan is succeeding.

Separately using (1) national per capita income t-1; and (2) the officially projected low population figures as independent variables, and crop prices as the dependent variable, regression equations were fitted. Results from both sets of regression equations show satisfactory correlations of determination, high F and acceptable s statistics. But

---

[1] We defer comparative examination of policy results to Chapter IX.

due to the high correlation between national per capita income t-1 and the projected population figures (.995), we use the officially projected population figures as an independent variable for predicting or estimating future crop prices.

This is done for the following reason. During the past two decades, family planning programs had little effect on curbing the rapid population growth rate in Taiwan. It is only in very recent years that the program has evidenced success. In fact, 1973's recorded population data was slightly lower than the government's long term population projection for the lower growth estimate. That means the future population growth will not be a trend of the past. This is to have an impact on the future prices of agricultural products. Since under policy alternative I the crop prices were a function of time, it is likely that, with slower future population growth rate and more rapid increases in agricultural production, the prices of crops will not be a trend of the past. We wish to examine under this policy alternative: what would be the consequences of future population on: 1) agricultural prices; 2) cash expenditures for agricultural production; 3) agricultural production, and 4) per capita income to the farm person. We will not know the similarity or differences between the consequences of these two policy alternatives unless this policy alternative is simulated. Therefore, the crop prices under this alternative are a function of future population size rather than time.

The regression coefficients and other statistics are as follows:

(1) Rice:

$$Y = \underset{(1.25)}{-8.7751} + \underset{(.177)}{1.7553} \log X$$

where:

Y = the price of rice (NT$/kgs.)

X = the actual size of population in Taiwan.

R^2 = .8457; Level of significance for F test is < .0005; the standard error of estimate for the equation is .0612 while the t-test statistics for $\hat{\alpha}$ and $\hat{\beta}$ are both < .0005.[2]

(2) Sweet Potato:

$$Y = -12.2815 + 2.1307 \log X$$
$$(1.061) \quad (.150)$$

R^2 = .9181; F: <.0005; S: .052; both t statistics are at the <.0005 level.

(3) Corn:

$$Y = -7.6070 + 1.564 \log X$$
$$(1.252) \quad (.1769)$$

R^2 = .8128; F: <.0005; S: .613; t_s: <.0005 and <.0005.

(4) Soybean and other beans:

$$Y = -4.0185 + 1.099 \log X$$
$$(1.271) \quad (.1795)$$

R^2 = .6752; F: <.0005; S: .0623; t_s: .005 and <.0005.

(5) Tea:

$$Y = -6.1902 + 1.4738 \log X$$
$$(1.373) \quad (.1940)$$

R^2 = .7623; F: <.0005; S: .0672; t_s: <.0005 and <.0005.

(6) Sugarcane:

$$Y = -9.8798 + 1.7212 \log X$$
$$(2.153) \quad (.3042)$$

R^2 = .6401; F: <.0005; S: .1054; t_s: <.0005 and <.0005.

---

[2]To simplify regression results for the remaining eight crops they will be presented in similar order.

(7) Peanut:

$$Y = -6.8942 + 1.5099 \log X$$
$$\quad\quad (1.0157) \quad (.1435)$$

R^2 = .8601; F: <.0005; S: .0497; t_s: <.0005 and <.0005.

(8) Fruits:

$$Y = -14.0384 + 2.4497 \log X$$
$$\quad\quad (1.5478) \quad (.2187)$$

R^2 = .8745; F: <.0005; S: .0758; t_s: <.0005 and <.0005, and

(9) Vegetables:

$$Y = -17.5947 + 2.9297 \log X$$
$$\quad\quad (.8501) \quad (.1202)$$

R^2 + .9706; F: <.0005; S: .0417; t_s: <.0005 and <.0005.

Given the above estimated coefficients, a set of projected crop prices, 1973 through 1984, is arrived at by using the officially projected population sizes in the future and is presented in Table 6.1. Following the procedure used in Chapter V, the crop price changes and their relative changes to the average are determined and are shown in Table 6.2.

Before the computation of projected per crop cash expenditure, we must first determine the average per hectare cash expenditure. In the previous chapter, dealing with policy alternative I, or trend policy, the average per hectare cash expenditure was determined by trend extrapolation. For this and the next two chapters, the value is determined by estimating the following regression equation, for the period 1959-1972, and then extrapolating:

$$Y_t = f(X_{t-1})$$

where:

Y = the average per hectare cash expenditure for t = 1959,. . .,1972

X_{t-1} = the average per hectare value product t-1.

The estimated coefficients and resulting statistics are as follows:

$$Y_t = -.5007 + 1.0163 \log X$$
$$\quad\quad (.434) \quad\quad (.1049)$$

R^2 = .8951; F: <.0005; S: .0369; t_s: .273; and <.0005.

Once the average per hectare cash expenditures through time is calculated, the same process in deriving values of per crop cash expenditures as in Chapters III and V is used for this policy alternative (see Appendices A and B, tables).[3] These projected per crop cash expenditures are presented in Table 6.3. The process of arriving at these per crop cash expenditures is carried out in tables contained in Appendix C.

From the projected per hectare cash expenditures listed in Table 6.3, and using the estimated coefficients presented in Chapter IV, the resulting per hectare yields of major crops are computed and are presented in Table 6.4. Combining the information from 1) projected crop prices in Table 6.1; 2) the projected per hectare yields in Table 6.4; and 3) the projected cropped hectarages in Table 5.4, the projected total value products from these nine major crops are presented in Table 6.5. The computation of total value products from all crops, the total cost to all crops (including costs to hired labor) and the net income from cropping activities are derived in the same manner as in Chapter V.

As for income from livestock raising activities instead of resorting to separate calculation, the computed results contained in Chapter V are

---

[3]The hectarages cropped per major crop under consideration are linearly predicted as in Table 5.3 since the resulting values have been more accurate than estimates made by several other authoritative sources.

Table 6.1. Policy Determined Prices of Major Crops in Taiwan Under Policy Alternative II, 1974-1984

Year / Crop	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	NT$/1,000 Kgs.										
Rice	7,269	7,521	7,782	8,045	8,315	8,588	8,863	9,137	9,495	9,819	10,155
Sweet Potato	1,141	1,189	1,239	1,290	1,341	1,399	1,451	1,506	1,578	1,643	1,712
Corn	4,496	4,635	4,776	4,921	5,068	5,216	5,365	5,512	5,704	5,878	6,056
Soybean and Other Beans	7,761	7,944	8,114	8,286	8,459	8,632	8,826	8,973	9,192	9,387	9,586
Tea	26,308	27,073	27,853	28,648	29,454	30,264	31,181	31,879	32,925	33,866	34,834
Sugarcane	326	337	349	360	372	384	396	408	424	438	453
Peanut	9,452	9,733	10,020	10,313	10,610	10,910	11,209	11,893	12,241	12,241	12,600
Fruits	3,955	4,148	4,349	4,557	4,772	4,992	5,217	5,442	5,743	6,018	6,307
Vegetables	3,113	3,296	3,487	3,688	3,896	4,112	4,334	4,560	4,862	5,142	5,439
Average	2,297	2,415	2,537	2,624	2,812	2,973	3,135	3,311	3,537	3,745	3,826

Table 6.2. Ratios of Crop Price Change Relative to Weighted Average Crop Price in Taiwan Under Policy Alternative II, 1974-1984*

Year / Crop	1973-1974	1974-1975	1975-1976	1976-1977	1977-1978	1978-1979	1979-1980	1980-1981	1981-1982	1982-1983	1983-1984
Rice	.914	.984	.985	1.000	.964	.977	.979	.976	.972	.977	1.012
Sweet Potato	.988	1.040	.922	1.008	.970	.987	.983	.983	.980	.984	1.018
Corn	.978	1.028	.919	.996	.961	.973	.975	.973	.969	.973	1.008
Soybean and Other Beans	.766	1.021	.972	.987	.953	.965	.970	.963	.959	.965	.999
Tea	.821	1.027	.979	.994	.959	.972	.977	.968	.967	.971	1.007
Sugarcane	1.109	1.037	.986	.993	.964	.977	.977	.976	.976	.975	1.009
Peanut	.963	1.028	.980	.995	.960	.973	.974	.972	.967	.972	1.007
Fruits	1.245	1.047	.998	1.013	.977	.989	.991	.988	.988	.990	1.026
Vegetables	.994	1.057	1.007	1.017	.986	.999	.999	.996	.999	.999	1.036

*The ratios presented in this table are obtained via the following equation:

$$\frac{P_{i_t}/P_{a_t}}{P_{i_{t-1}}/P_{a_{t-1}}} \qquad \text{for } i = 1,\ldots,9 \text{ and } t = 1973,\ldots,1984$$

where: P_i = price of crop i (NT$/1,000 kgs.) and,

P_a = average price of all crops (NT$/1,000 kgs.)

Table 6.3. Projected Per Hectare Cash Expenditures for Major Crops in Taiwan Under Policy Alternative II, 1973-1984

Crop \ Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	NT$/Hectare											
Rice	6,006	6,945	7,462	7,860	8,161	8,928	8,928	9,445	10,012	10,012	11,370	11,450
Sweet Potato	6,517	7,951	8,669	9,168	9,617	10,196	10,735	11,434	12,211	12,935	13,879	13,805
Corn	4,395	5,253	5,560	5,182	5,280	5,392	5,628	5,875	6,165	6,487	6,926	6,946
Soybean and Other Beans	3,987	8,897	4,126	4,264	4,293	4,277	4,280	4,211	4,042	4,668	5,471	5,975
Tea	2,092	2,047	2,327	2,589	2,834	3,108	3,479	3,908	4,405	4,979	5,708	6,151
Sugarcane	10,483	14,745	15,895	16,752	17,334	18,189	18,954	20,044	21,231	23,202	24,941	25,124
Peanut	4,011	4,782	5,194	5,510	5,740	5,979	6,343	6,735	7,156	7,601	8,164	8,204
Fruits	17,001	26,694	28,982	30,862	32,393	34,462	36,299	38,826	41,737	44,902	48,921	49,970
Vegetables	14,591	18,271	20,544	22,118	23,296	25,010	26,656	28,742	31,079	33,682	37,015	38,182
Average	7,584	9,926	10,495	11,819	12,515	13,321	14,387	15,619	17,002	18,545	20,507	21,276

Sources of Information: Cash expenditure$_{i_t}$ (for i = 1,. . .,9 and t = 1973,. . .,1984) are transcribed from columns of Tables in Appendix C. Average per hectare cash expenditure is derived from $Y_t = f(X_{t-1})$ where Y_t is the average per hectare cash expenditure and X_{t-1} is the average per hectare value product t-1. The $\hat{\alpha}$ and $\hat{\beta}$ coefficients are -.50071199 and +1.01538934, respectively, with R^2 = .8951, y_s = .03694885 and F test statistic being <.0005. Total cash expenditure for a given year may be obtained by multiplying the average per hectare cash expenditure by the total cropped hectares for the nine major crops for that year:

Table 6.4. Projected Per Hectare Yields of Major Crops in Taiwan Under Policy Alternative II, 1973-1984

Crop \ Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	Kgs./Hectare											
Rice	3,383	3,532	3,608	3,664	3,705	3,759	3,805	3,869	3,937	4,002	4,088	4,097
Sweet Potato	15,970	17,559	18,298	18,793	19,227	19,771	20,262	20,881	21,547	22,147	22,904	22,845
Corn	2,680	3,273	3,405	3,242	3,295	3,333	3,434	3,539	3,660	3,792	3,970	3,978
Soybean and Other Beans	1,801	1,772	1,845	1,888	1,897	1,892	1,893	1,872	1,818	2,012	2,250	2,394
Tea	732	939	889	920	950	980	1,011	1,043	1,079	1,107	1,148	1,186
Sugarcane	80,083	83,543	84,325	84,876	85,236	85,746	86,186	86,785	87,407	88,374	89,374	89,251
Peanut	1,272	1,346	1,383	1,410	1,429	1,448	1,476	1,504	1,534	1,565	1,601	1,604
Fruits	13,761	16,889	17,531	18,038	18,439	18,965	19,417	20,020	20,688	21,386	22,235	22,450
Vegetables	11,026	13,040	14,232	15,038	15,631	16,481	17,284	18,283	19,381	20,580	22,081	22,598

Table 6.5. Projected Per Hectare Value Product and Total Value Product for Major Crops in Taiwan, Under Policy Alternative II, 1973-1984

Year	Per Hectare VP	Total VP
	NT $	NT$: Million
1973	26,873	39,620
1974	28,391	43,792
1975	30,914	48,027
1976	33,765	52,860
1977	35,904	56,683
1978	38,733	61,555
1979	41,997	67,574
1980	45,658	74,251
1981	49,734	81,809
1982	54,912	91,440
1983	56,939	96,065
1984	65,212	111,580

used. This is done because the main source of income from livestock subsector is from livestock slaughter; and the independent variable explaining variations in the quantity of livestock slaughter is the national per capita income t-1, which has a simple correlation of .995 with population size which is the factor determining the crop prices under this policy alternative. For the sake of simplicity, therefore, no separate calculation is done for livestock slaughter under this alternative. Summing the TR from the crop and livestock subsectors, subtracting from them their respective costs, yields net income from farming activities as in Table 6.6 (the same as in Chapter V). Also as in Chapter V, adding total revenue (column 2 of Table 6.6) to income from non farming activities by farm persons we arrive at the total income to

Table 6.6. Projected Total Value Product, Total Cost and Net Revenue from All Crops in Taiwan Under Policy Alternative II, 1973-1984

Year	TVP	TC	NR
	---------Million NT$----------		
1973	42,552	15,456	27,096
1974	47,033	21,443	25,590
1975	51,581	24,143	27,439
1976	56,771	26,614	30,157
1977	60,878	28,881	31,997
1978	66,111	31,422	34,688
1979	72,574	34,907	37,668
1980	79,745	38,956	40,780
1981	87,863	43,644	44,219
1982	98,207	49,053	49,154
1983	103,174	56,035	47,139
1984	119,837	60,094	59,743

farm persons. That, divided by the projected farm population, and in conjunction with projected national per capita income through time, the future per capita income stream to the nonfarm person permits the income ratios between populations of the two sectors of Taiwan to be derived under policy alternative II. (See Table 6.7)

Under policy alternative II, the earlier years see higher per capita incomes to the farmer than that from alternative I. But the later years under alternative II see a lower income stream than that of alternative I. Furthermore, while under alternative I there is a slight upward trend in the ratios of "farm to nonfarm income" (Table 5.13), the income differences under alternative II as indicated by the ratios in Table 6.7 show a trend that further widens the per capita farm and nonfarm income gap.

Table 6.7. Projected Per Capita Farm and Nonfarm Income in Taiwan Under Policy Alternative, II, 1973-1984

Year	Income Stream to Farm Person	National Per Capita Income	Income Stream to Nonfarm Person	Ratio of Farm to Nonfarm Income
	----------NT $----------			Percent
1973	7,936	17,855*	24,173	32.8
1974	7,915	17,924	24,238	32.7
1975	8,607	19,839	26,859	32.0
1976	9,508	21,959	29,669	32.0
1977	10,263	24,305	32,922	31.2
1978	11,232	26,902	36,435	30.8
1979	12,349	29,777	40,291	30.6
1980	13,584	32,959	44,553	30.5
1981	14,959	36,480	49,259	30.4
1982	16,759	40,378	54,201	30.9
1983	17,355	44,693	60,510	28.7
1984	20,769	49,468	65,877	31.5

*1973's national per capita income figure is from recorded data.

Since policy alternative I in Chapter V was considered wrong and inadequate in narrowing the income gap between the two sectors of Taiwan's population, alternative II is even less acceptable. In the next chapter, we will examine consequences for farm and nonfarm income streams under policy alternative III. Instead of allowing trends to prevail (as under alternative I), or instead of permitting the gap between the per capita farm and per capita nonfarm income to widen (as under policy alternative II), the prices of some key agricultural commodities will be assumed to be supported.

In the next two chapters, policy alternatives III and IV will consider raising prices for key agricultural commodities in order to

enhance the future per capita farm income and to narrow down the differences in income streams between the farmer and nonfarm in Taiwan.

CHAPTER VII

PROJECTED CONSEQUENCES TO POLICY ALTERNATIVE III

In Chapters V and VI, future farm and nonfarm income consequences of policy alternatives I and II have been presented. From the projected consequences it was clear that neither the trend policy nor the policy which determines commodity prices according to population growth pattern are acceptable. The projections indicate that if either of these policies were adopted, per capita farm income would be approximately only one-third that of a nonfarmer by 1984 and the objective set forth in this study to "narrow the per capita income gap between the two sectors of Taiwan's population" would not be attained. Therefore, there is a need to examine a third alternative policy, its feasibility and consequences.

The third policy alternative involves sustained specified price support programs for rice, sugarcane and the livestock industry.

Recognizing the low per capita income streams to the farmer, the government in early 1974 announced plans to support prices for selected farm items. Among the crops whose prices will be supported are rice, sugarcane, corn and sorghum. At a later date, price supports for hogs were added. Actually announced support prices have been for rice and sugarcane only. This is understandable since rice is the chief crop in Taiwan and among all the crops it ranks second only to sugarcane products in value exported. The price of sugarcane is supported not

only because it has the highest export value among all crops, but also because of the number of farmers actively engaged in sugarcane production.[1] By supporting the price of sugarcane, a large sector of Taiwan's farm population may as a result reap the program's benefit.

The announced 1974 support price for rice for the year 1974 was NT$ 10 per kg. for "Ponlai" rice and NT$ 8.5 for nonglutinous native rice. Weighting the quantities and value products of their annual production in 1973,[2] the average supported price for rice in 1974 was 16.7 percent over the recorded price of 1973. This is significant not only on account of the large percentage increase in the price of rice from 1973 to 1974, but also because there already had been an unsual increase in the price of rice from 1972 to 1973. While the annual average increase for the price of rice for the past decade (1962-1972) was only 2.38 percent, there was a 40.3 percent price increase from 1972-1973 alone. And the fact that in 1974 the government was ready to support another 16.7 percent increase in the price of rice over 1973's indicates that it is feasible and justifiable to contine a price

---

[1] According to Long Term Projections of Supply, Demand and Trade for Selected Agricultural Products in Taiwan (p. 88), "there are approximately 140,000 individual cane growing farms," nearly one out of every six farms.

[2] In 1973 "Ponlai" rice constituted 83.7 percent of value product from rice production while the nonglutinous native rice 16.3 percent. The weighting procedure for 1973 was as follows:

$$P_a = \frac{\sum_{j=1}^{2} \sum_{i=1}^{2} P_i \cdot Q_j}{\sum_{j=1}^{2} Q_j} \quad \text{for i and j = 1 to 2 ("Ponlai rice and nonglutinous rice)}$$

where: P_a = average price of rice (NT$/1,000 Kgs.)
P_i^a = Prices of "Ponlai and nonglutinous rice (NT$/1,000 Kgs.) and,
Q_j^i = Quantity of "Ponlai" and nonglutinous rice (1,000 Kgs.)

support program for rice production. In this study, aside from accepting the announced 16.7 percent price increase for rice for the 1973 to 1974 period, it is believed that future increases cannot be as drastic for the following reasons: 1) if the price support level for rice were too high, the nonfarm sector of Taiwan's population might react unfavorably to the policy measure; and 2) even if an average of 11 percent annual price increase from 1974 onward would result in a figure of NT$ 27,664 per 1,000 Kgs., for rice which is close enough to the trend price of tea for that year which is not reasonable. Instead, we use an annual average increase of 9 percent in the price of rice from 1975 through 1984.

Like the price support program for rice, the support price for sugarcane production calls for the purchase of unsold quantity by the government agency at the supported price level. As for the price of sugarcane production, the announced support price for 1974 was 12.2 percent over that of 1973. Unlike rice which had a price increase from 1972 to 1973, there was a slight price decrease for sugarcane products from 1972 to 1973. For the years 1975 through 1984, we assume that the level of price support for sugarcane production could be increased at an annual rate of 11 percent, the same rate of increase projected for national per capita income.[3]

Having determined the future price policy for rice and sugarcane production, we set up Table 3.1. The future prices for the remaining major crops are identical with those in Table 6.1 where crop prices are a function of population size.

---

[3]The projected annual increase in national per capita income is 11 percent.

Table 7.1 presents the prices of major crops in Taiwan under policy alternative III. The average per 1,000 kgs. price for each year (bottom row of Table 7.1) is determined in the same manner as in Table 5.1. From the prices in Table 7.1, the crop price changes relative to the average are tabulated and presented in Table 7.2. Similar to tables in Appendix C for Chapter VI are the projected per hectare cash expenditure for major crops under policy alternative III. These are given in Appendix D. The values in column 8 of each of these said tables are transcribed onto Table 7.3. The average per hectare cash expenditures (Table 7.3 bottom row) are obtained via the same procedure as in Chapter VI where the per hectare cash expenditure for t is a function of the average per hectare value product of t-1.

A comparison of average per hectare cash expenditure under policy alternatives I, II and III reflects that, with price support program for rice and sugarcane production at the levels suggested, much incentive is given to invest more heavily in farm production under policy alternative III. Given the estimated coefficients in Chapter IV, where per hectare yield is a function of per hectare cash expenditure, there is significant resulting increases in per hectare yield of the major crops.

Table 7.6 in this chapter contains the projected per hectare yields of these major crops under policy alternative III. Comparing these projected per hectare yields with that of Table 5.5 and the Table 6.4 one may readily observe that not only the per hectare yield of rice and sugarcane see significant increases, but the remaining major crops also enjoy marked increases in per hectare yield. This is a result of

Table 7.1. Policy Determined Prices of Major Crops in Taiwan Under Policy Alternative III, 1974-1984

Crop \ Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	NT$/1,000 Kgs										
Rice	9,743	10,620	11,576	12,618	13,753	14,991	16,340	17,811	19,414	21,161	23,066
Sweet Potato	1,141	1,189	1,239	1,290	1,341	1,399	1,451	1,506	1,578	1,643	1,712
Corn	4,496	4,635	4,776	4,921	5,068	5,216	5,365	5,512	5,704	5,878	6,056
Soybean and Other Beans	7,761	7,944	8,114	8,286	8,459	8,632	8,826	8,973	9,192	9,387	9,586
Tea	26,308	27,073	27,853	28,648	29,454	30,264	31,181	31,879	32,925	33,866	34,834
Sugarcane	343	381	423	469	521	578	642	712	790	877	974
Peanuts	9,452	9,733	10,020	10,313	10,610	10,910	11,209	11,506	11,893	12,241	12,600
Fruits	3,955	4,148	4,349	4,557	4,772	4,992	5,217	5,442	5,743	6,018	6,307
Vegetables	3,113	3,296	3,487	3,688	3,896	4,112	4,334	4,560	4,862	5,142	5,439
Average	2,748	2,952	3,222	3,488	3,772	4,080	4,412	4,750	5,140	5,536	5,962

Table 7.2. Ratios of Crop Price Changes Relative to Weighted Average Crop Price in Taiwan Under Policy Alternative III*

Crop \ Year	1973-1974	1974-1975	1975-1976	1976-1977	1977-1978	1978-1979	1979-1980	1980-1981	1981-1982	1982-1983	1983-1984
Rice	1.005	1.015	.999	1.007	1.008	1.008	1.008	1.012	1.007	1.012	1.012
Sweet Potato	.811	.971	.955	.961	.962	.963	.959	.964	.968	.967	.966
Corn	.800	.960	.944	.952	.953	.591	.951	.954	. 957	.957	.957
Soybean and Other Beans	.629	.953	.936	.944	.944	.943	.945	.945	.947	.949	.948
Tea	.674	.958	.943	.950	.951	.950	.953	.950	.955	.955	.955
Sugarcane	.955	1.032	1.016	1.023	1.030	1.029	1.028	1.027	1.027	1.026	1.032
Peanut	.791	.958	.943	.951	.951	.951	.950	.953	.951	.955	.956
Fruits	1.022	.976	.961	.967	.969	.968	.966	.970	.975	.973	.973
Vegetables	.816	.986	.969	.977	.977	.976	.974	.978	.985	.982	.982

*The ratios presented in this table are obtained via:

$$\frac{P_{i_t}/P_{a_t}}{P_{i_{t-1}}/P_{a_{t-1}}} \quad \text{for } i = 1,\ldots,9 \text{ and } t = 1973,\ldots,1984$$

where: P_{a_t} = average crop price in t (NT$/1,000 kgs.)

Table 7.3. Projected Per Hectare Cash Expenditures for Major Crops in Taiwan Under Policy Alternative III, 1973-1984

Crop \ Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	NT$/Hectare											
Rice	6,606	8,265	10,840	12,241	13,866	15,743	19,417	21,024	23,488	26,369	30,000	34,216
Sweet Potato	6,517	7,222	9,022	9,779	10,533	11,435	13,488	13,853	14,698	15,749	17,252	18,913
Corn	4,395	4,728	5,909	6,357	6,879	7,442	8,917	9,115	9,703	10,460	11,398	12,455
Soybean and Other Beans	3,987	3,572	4,430	4,708	4,971	5,165	6,114	6,533	6,361	6,021	7,203	8,571
Tea	2,092	2,047	2,748	3,176	3,692	4,290	4,969	4,547	5,199	6,021	7,045	8,271
Sugarcane	10,483	13,751	18,332	21,045	24,276	28,324	35,854	39,416	44,718	51,369	59,003	68,680
Peanuts	4,011	4,400	5,366	5,583	6,118	6,681	7,708	7,699	8,134	8,652	9,237	9,806
Fruits	17,001	23,815	30,065	32,643	35,612	39,058	46,286	47,878	51,221	55,692	60,897	66,716
Vegetables	14,591	16,283	20,691	22,631	24,895	27,524	32,800	34,242	36,838	40,350	44,413	49,051
Average	7,584	9,926	12,924	14,480	16,304	18,386	20,550	24,231	26,760	29,902	33,748	38,149

Table 7.4. Projected Per Hectare Yield of Major Crops in Taiwan Under Policy Alternative III, 1974-1984

Crop \ Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	Kgs./Hectare										
Rice	3,719	4,031	4,179	4,337	4,503	4,793	4,907	5,072	5,249	5,454	5,671
Sweet Potato	16,772	18,650	19,381	20,080	20,882	22,594	22,883	23,539	24,327	25,408	26,547
Corn	3,041	3,553	3,739	3,951	4,174	4,735	4,809	5,023	5,293	5,620	5,979
Soybean and Other Beans	1,667	1,939	2,024	2,103	2,161	2,433	2,549	2,501	2,407	2,730	3,085
Tea	939	889	920	950	980	1,011	1,043	1,079	1,107	1,148	1,186
Sugarcane	82,823	85,830	87,311	88,871	90,587	93,274	94,376	95,865	97,527	99,218	101,104
Peanut	1,311	1,398	1,416	1,458	1,501	1,572	1,571	1,599	1,632	1,667	1,699
Fruits	16,036	17,825	18,504	19,250	20,074	21,683	22,018	22,703	23,583	24,559	25,598
Vegetables	11,966	14,308	15,297	16,425	17,702	20,176	20,834	22,002	23,548	25,295	27,241

heavier per hectare cash expenditures applied to all crops except tea. The price support programs for rice and sugarcane are assumed to yield benefits for other crops in terms of increased yields and value products. In other words, if the price support program for selected major crops be continued and sustained, less savings on farm will leak into industrial or service sectors. The increased profits on farm as a result of price support for rice and sugarcane productions will be retained for plow back investment in farms, not only for rice and sugarcane productions but also for the other major crops. A comparison between Table 7.3 and 6.3 attests to the positive effects of price support on per hectare cash expenditures and resulting per hectare yields on farm.

Given the price support levels for rice and sugarcane production, which are higher than for the two previous "policies" and given the overall increases in per hectare yields of major crops, the farmer's revenue from cropping activities will increase. Furthermore, given the fact that the per capita income of the farm person from nonfarming activities is a percentage of the income from farming activities, his total income will be further enhanced.[4] An examination of projected results in Table 6.5 and 7.5 shows that the total value products from these nine major crops in 1984 under alternative III almost doubled those of under alternative II. This may be achieved by adopting the suggested levels of price support for rice and sugarcane for the next 11 years, the levels which are both moderate and seemingly feasible in view of the 1974's announced levels of price support.

---

[4]The relationship between the per capita income of farm person from farming activities and from his nonfarming activities was discussed in Chapter V.

Table 7.5. Projected Average Per Hectare Value Product and Total Value Products of Major Crops in Taiwan Under Policy Alternative III, 1973-1984

Year	Per Hectare	Total
	NT $	NT$: Million
1973	26,873	39,620
1974	34,851	50,553
1975	38,978	60,555
1976	43,811	68,586
1977	49,315	77,857
1978	55,026	87,450
1979	64,722	104,141
1980	71,367	116,060
1981	79,614	130,961
1982	89,689	149,351
1983	101,196	170,732
1984	114,288	195,552

Table 7.6. Projected Total Value Product, Total Cost and Net Revenue from All Crops in Taiwan Under Policy Alternative III, 1973-1984

Year	TVP	TC	NR
	----------Million NT$----------		
1973	42,552	15,456	27,096
1974	54,294	21,443	32,850
1975	65,036	28,509	36,527
1976	73,662	32,182	41,480
1977	83,618	37,625	45,993
1978	93,921	43,369	50,552
1979	111,847	49,859	61,988
1980	124,648	69,435	64,213
1981	140,652	68,692	71,960
1982	160,403	79,094	81,309
1983	183,366	92,216	91,151
1984	210,022	107,751	102,272

As for the level of price support for hog production, the government announced that an amount of NT$ 1.5 billion (approximately U.S. $40 million) would be set aside to stabilize the prices of hog production. If the hog prices fall below that of the annually predetermined level, then the government agency concerned would purchase the unsold quantity at that supported price level.

To determine the level of price support for livestock production in this study, we assume that all livestock items are covered by this program.[5] During the 1962-1973 period, the average annual increase in the price of livestock slaughtered was only 2.51 percent. If considered in real money terms, there has been a price decrease. To support prices of livestock in terms of real money value and to meet the increased demand for meat products due to the rapid increases in per capita income in Taiwan, policy alternative III in this chapter assumes an annual price increase of 6 percent, commencing with the year 1974. Considering the conservatively predicted 11 percent annual increase in the national per capita income, a recommended 6 percent annual increase in the price of livestock items is moderate.

As for the prices of poultry, milk and egg products, the trend values in Chapter V are adopted.

Given the prices for both supported and unsupported crops, and given their respective predicted productions, the total value products

---

[5]Livestock slaughtered include hogs, beef cows, goats, etc., with hog production dominating the scene. For instance, in the year 1973, the value product from hog slaughter was 96.0 percent of the total value product from livestock subsector. Poultry production is not included here.

from crop subsector are computed and presented in column 1 of Table 7.6. These values include the projected values products from minor crops.[6]

Table 7.7 finally presents the projected per capita income streams to farmers, including income from nonfarming activities, and that of nonfarmers.[7]

Column 4 of Table 7.7 clearly manifests an improved position for the farmers with respect to per capita farm income. The improved per capita income position of farmers is not built upon the ruin of nonfarmers. An examination of the projected per capita income stream in contrast to a nonfarmer in Table 7.7 shows that the projected increases in absolute NT$ for a nonfarmer is still more rapid than that for a farmer. Meanwhile, a more equitable distribution of income is being achieved. Column 4 of Table 7.7, when compared with that of Table 6.7 points to the possibility of gradually narrowing the per capita income gap between the farm and nonfarm populations in Taiwan. And this can be achieved during this coming decade if this policy alternative III be adopted and implemented.[8]

In the following chapter, we wish to examine the consequences to yet another policy alternative in order to compare the relative merits and feasibility of alternatives III and IV.

---

[6]The calculating procedure for TVP, TC and TR in Table 7.6 is the same as for Table 6.6 of Chapter VI.

[7]The calculating procedure for Table 7.7 is the same as that for Table 5.8. For the sake of simplicity, discussion of the procedure is not duplicated.

[8]More detailed analysis of income consequences etc. will be given in Chapter IX.

Table 7.7. Projected Per Capita Income to Farm and Nonfarm Persons in Taiwan Under Policy Alternative III, 1973-1984

Year	Income Stream to Farm Person	National Per Capita Income	Income Stream to Nonfarm Person	Ratio of Farm to Nonfarm Income
	----------NT $----------			Percent
1973	7,936	17,855*	24,173	32.8
1974	9,449	17,924	23,271	40.6
1975	10,748	19,839	25,521	42.1
1976	12,212	21,959	27,994	43.6
1977	13,712	24,305	30,805	44.5
1978	15,301	26,902	34,058	44.9
1979	18,340	29,777	36,677	50.0
1980	19,880	32,959	40,786	48.7
1981	22,496	36,480	44,784	50.2
1982	25,685	40,378	48,977	52.4
1983	29,251	44,693	53,627	54.5
1984	33,399	49,468	58,656	56.9

*1973's national per capita income is from historical data.

CHAPTER VIII

CONSEQUENCES TO POLICY ALTERNATIVE IV

Under policy alternative III in the previous chapter, the annual price support increases for rice, sugarcane and livestock slaughter were 9 percent, 11 percent and 6 percent, respectively. As a result, the per capita income gap between the farm and nonfarm population in Taiwan was projected to narrow rapidly through time. A comparison among Tables 5.13, 6.7 and 7.7 shows that only policy alternative III among the three shows a trend of per capita income in favor of the farm person. However, both the policy makers and the nonfarming populace might react to policy alternative III with apprehension. To the former, measures that result in the rapid narrowing down of the said income gap could cause noticeable dissatisfaction from the non-farming sector of the population. And to the latter, rapid and steady rises in the prices of agricultural commodities, especially rice, could cause fear of an unstable economy.[1]

For the above reasons, this chapter investigates a fourth policy alternative in order to project and examine its consequences.

In this chapter, while the prices of other agricultural commodities

---

[1]It was partly because of this fear that the price of rice in the past two decades had been deliberately kept low via the fertilizer-rice barter system. With that system, the price of rice was purposefully kept low while the cost of fertilizer was pegged high. The fertilizer-rice barter system has recently been abolished by the policy makers. And price support programs for selected agricultural commodities have been initiated. The questions facing the decision makers in the coming years is: what the support levels should be.

remain at the level as in policy alternative II where commodity prices are a function of population size, the annual price support levels for rice, sugarcane and livestock slaughter are set at 8 percent, 9 percent and 5 percent, respectively. (In contrast to 9 percent, 11 percent and 6 percent, respectively for policy alternative III.) The reasons are as follows.

Despite a 40.5 percent increase in the price of rice from 1972 to 1973, the government's announced price support for rice from 1973 to 1974 was another 16.7 percent. As mentioned in Chapter VII, such dramatic price increases cannot be sustained. In the long run, the government cannot afford it, and the public will not tolerate it. Though a 9 percent annual increase as under alternative III is not unreasonable, an 8 percent annual increase could be more attractive both to the decision makers and to the nonfarm population. Rice is an important price indicator in Taiwan's economy. A slower increase in the price of rice has a psychological edge over a more rapid one.

Another possible effect of larger increase in the price of rice is diversion of other fields into rice production, causing a possible glut of rice supply and forcing down market prices. Though the absolute quantity of rice demanded will increase through time because of population growth, the per capita consumption of rice will correspondingly slightly decline as a result of rapidly increasing per capita income. A slower and surer support level for the price of rice might be an alternative candidate for consideration by the decision makers.

As for the support price for sugarcane, an 11 percent annual increase was suggested in Chapter VII. But since the consumption of

sugar in Taiwan is less than 20 percent of its annual production, the government must find ready international markets for the balance. And since the price of sugar fluctuates so widely on the international markets, the government cannot take sustained, sizeable losses should the world sugar price be low for a considerable period of time, especially since the embargo on Cuba could cease in the near future.

Given the average price increases of sugarcane in Taiwan to be 8.27 percent for the past 12 years, a moderate 9 percent guaranteed annual increase will: 1) give confidence to farmers in planning the cash expenditures; and, 2) give the government greater assurance that should "losses" occur on the international markets, they would not be so substantial as to jeopardize the support program. Besides, the number of cropped hectares of sugarcane in "t" varies and positively with the price of sugarcane in "t-1". An 11 percent support program could divert hectares planted for other crops into sugarcane production and cause more rapid increases in the prices of other short-supplied agricultural commodities.

In this chapter, the price support level set for livestock slaughter is 5 percent instead of the 6 percent in the previous chapter. During the past twelve years, the average annual price increase in livestock products was 2.51 percent. Since there will be increased demand for meat products as a result of the rapid increases in national per capita income, an annual increase in the price of livestock may be reasonably expected. But given the slow average meat price increases in the past, a 5 percent guaranteed support increase seems more feasible and acceptable than the 6 percent under policy alternative III.

With the above explanations to the levels of suggested price support for rice, sugarcane and livestock, Table 8.1 is constructed accordingly. Table 8.2, on the other hand, shows the crops' relative price changes through time. The projected per hectare cash expenditures under this alterative are computed in the same manner as in Chapters V through VII, and are presented in Appendix E.[1] The procedure of calculation for these tables are identical with their corresponding ones in the previous chapters. The predicted per hectare cash expenditure (for $i = 1,. . .,9$) under this policy alternative is listed in column 8 of each of these tables. They are then transcribed onto Table 8.3 so that comparison through time may easily be made.[2]

The projected per capita income to the nonfarmer in "t" under alternative IV is computed as in Chapters V through VII. Table 8.7 presents the projected per capita incomes to the farmer and nonfarmer in Taiwan under policy alternative IV. the projected ratios between the per capita farm and nonfarm income under this policy alternative (Table 8.7, column 4) reveal that, at the suggested levels of price support for rice, sugarcane and livestock slaughtered, the gap between the per capita farm and nonfarm income in the future may be narrowed down at a more moderate speed than that of policy alternative III.

---

[1]Since 1973 the historical crop prices and their annual average price (bottom row of Table 7.1) are the same under both policy alternatives, the "projected per hectare cash expenditure" for 1973 is omitted in this chapter. Given 1972's ratios of per hectare cash expenditures (Table 3.6), and given the 1973's historical prices, their 1973's cash expenditures and per hectare yields would be identical under policy alternatives III and IV.

[2]Analytical presentation of projection results will be given in the following chapter.

Table 8.1. Policy Determined Prices of Major Crops in Taiwan Under Policy Alternative IV, 1973-1984

Year / Crop	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	NT$/1,000 Kgs.										
Rice	9,743	10,522	11,364	12,273	13,255	14,315	15,460	16,697	18,033	19,476	21,034
Sweet Potato	1,141	1,189	1,239	1,290	1,341	1,399	1,451	1,506	1,578	1,643	1,712
Corn	4,496	4,635	4,776	4,921	5,068	5,216	5,365	5,512	5,704	5,878	6,056
Soybean and Other Beans	7,761	7,944	8,114	8,286	8,459	8,632	8,826	8,973	9,192	9,387	9,586
Tea	26,318	27,073	27,853	28,608	29,454	30,264	31,181	31,879	32,905	33,866	34,834
Sugarcane	343	374	408	445	485	529	577	629	686	748	815
Peanut	9,452	9,733	10,020	10,313	10,610	10,910	11,209	11,506	11,893	12,241	12,600
Fruits	3,955	4,148	4,349	4,557	4,772	4,992	5,217	5,442	5,743	6,018	6,307
Vegetables	3,113	3,296	3,487	3,688	3,896	4,112	4,334	4,560	4,862	5,142	5,439
Average	2,748	2,935	3,194	3,428	3,682	4,257	4,245	4,553	4,901	5,253	5,627

Table 8.2. Ratios of Crop Price Changes Relative to Weighted Average Crop Price in Taiwan* Under Policy Alternative IV, 1973-1984

Crop \ Year	1973-1974	1974-1975	1975-1976	1976-1977	1977-1978	1978-1979	1979-1980	1980-1981	1981-1982	1982-1983	1983-1984
Rice	1.005	1.011	.992	1.006	1.006	.934	1.083	1.007	1.003	1.008	1.008
Sweet Potato	.811	.976	.958	.969	.968	.904	1.040	.968	.973	.972	.971
Corn	.800	.965	.947	.961	.958	.890	1.032	.958	.961	.961	.962
Soybean and Other Beans	.629	.959	.938	.952	.950	.883	1.025	.948	.952	.953	.954
Tea	.674	.963	.945	.958	.957	.889	1.033	.953	.959	.960	.960
Sugarcane	.955	1.016	1.008	1.016	1.015	.939	1.097	1.015	1.014	1.014	1.021
Peanut	.791	.964	.946	.959	.958	.889	1.030	.957	.960	.960	.961
Fruits	1.022	.982	.964	.976	.975	.905	1.048	.972	.981	.978	.978
Vegetables	.816	.991	.972	.985	.983	.913	1.057	.981	.990	.987	.988

*The ratios presented in this table are obtained via:

$$\frac{P_{i_t}/P_{a_t}}{P_{i_{t-1}}/P_{a_{t-1}}} \quad \text{for } i = 1,\ldots,9 \text{ and } t = 1973,\ldots,1984$$

where: P_{a_t} = average price of crops (NT$/1,000 kgs.)

Table 8.3. Projected Per Hectare Cash Expenditure for Major Crops in Taiwan Under Policy Alternative IV, 1973-1984

Crop \ Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	NT$/Hectare											
Rice	6,606	8,265	10,787	12,177	13,585	15,230	16,193	18,694	21,274	23,874	26,596	29,839
Sweet Potato	6,517	7,222	9,109	9,923	10,696	11,476	11,808	13,099	14,433	15,787	17,030	18,270
Corn	4,395	4,728	5,909	6,387	6,841	7,308	7,499	8,314	9,064	9,822	10,511	11,363
Soybean and Other Beans	3,987	3,572	4,430	4,730	4,944	5,072	4,897	4,966	4,754	5,654	6,643	7,820
Tea	2,092	2,047	2,748	3,191	3,672	4,213	4,644	5,530	6,476	7,538	8,662	10,062
Sugarcane	10,483	13,751	18,114	20,646	23,301	26,235	28,034	32,759	37,641	42,469	47,315	53,902
Peanut	4,011	4,400	5,366	5,905	6,423	6,947	7,196	8,026	8,767	9,478	10,067	10,736
Fruits	17,001	23,815	30,225	33,134	35,949	38,927	40,097	44,881	49,348	54,114	58,538	63,637
Vegetables	14,591	16,283	20,810	22,996	25,176	27,627	28,802	32,436	35,916	39,731	43,397	47,625
Average	7,584	9,926	12,924	14,548	16,215	18,056	19,203	22,103	24,997	28,078	31,122	34,806

Table 8.4. Projected Per Hectare Yield of Major Crops in Taiwan Under Policy Alternative IV, 1974-1984

Crop \ Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	Kgs./Hectare										
Rice	3,719	4,025	4,173	4,310	4,459	4,541	4,739	4,925	5,096	5,262	5,445
Sweet Potato	16,772	18,736	19,516	20,227	20,918	21,205	22,280	23,335	24,355	25,252	26,113
Corn	3,041	3,553	3,751	3,936	4,121	4,196	4,509	4,790	5,066	5,311	5,608
Soybean and Other Beans	1,667	1,939	2,031	2,095	2,133	2,081	2,102	2,038	2,303	2,579	2,893
Tea	939	889	920	950	980	1,011	1,043	1,079	1,107	1,148	1,186
Sugarcane	82,823	85,703	87,104	88,421	89,731	90,472	92,236	93,839	95,253	96,538	98,111
Peanut	1,311	1,398	1,442	1,482	1,520	1,537	1,592	1,639	1,681	1,714	1,750
Fruits	16,036	17,686	18,630	19,332	20,044	20,315	21,381	22,323	23,277	24,122	25,054
Vegetables	11,966	14,369	15,481	16,563	17,751	18,312	20,009	21,590	23,278	24,863	26,648

Table 8.5. Projected Average Per Hectare and Total Value Products of Major Crops in Taiwan Under Policy Alternative IV, 1973-1984

Year	Per Hectare VP	Total VP
	NT $	NT$: Million
1973	26,873	39,620
1974	34,851	50,553
1975	39,159	60,836
1976	43,577	68,220
1977	48,444	76,482
1978	51,473	81,803
1979	59,119	95,124
1980	66,736	108,529
1981	74,830	123,091
1982	84,206	140,220
1983	94,030	158,642
1984	105,230	180,052

Table 8.6. Projected Total Value Products, Total Cost and Net Revenue from All Crops in Taiwan Under Policy Alternative IV, 1973-1984

Year	TVP	TC	NR
	----------NT$: Million----------		
1973	42,552	15,456	27,096
1974	54,294	21,443	32,850
1975	65,338	28,509	36,839
1976	73,268	32,802	40,467
1977	82,142	37,420	44,722
1978	87,856	42,591	45,265
1979	102,163	49,591	52,572
1980	116,560	55,127	61,433
1981	132,200	64,167	68,033
1982	150,596	74,268	76,328
1983	170,382	85,040	85,341
1984	193,376	98,309	95,067

Table 8.7. Projected Per Capita Income Streams to Farm and Nonfarm Persons in Taiwan Under Policy Alternative IV, 1973-1984

Year	Farm	National	Nonfarm	Ratio of Per Capita Farm to Nonfarm Income
	----------NT $----------			Percent
1973	7,936	17,855*	24,173	32.8
1974	9,449	17,924	23,271	40.6
1975	10,769	19,839	25,507	42.2
1976	11,972	21,959	28,143	42.5
1977	13,358	24,305	31,176	40.7
1978	14,102	26,902	34,689	40.7
1979	16,313	29,777	37,900	43.0
1980	18,862	32,959	41,395	45.6
1981	21,205	36,480	45,550	46.6
1982	24,076	40,378	49,919	48.2
1983	27,246	44,693	54,787	49.7
1984	30,856	49,468	60,110	51.3

In order that decision makers may weigh the merits and drawbacks of each of the four alternative policies, the following chapter analyzes in more detail the comparative consequences to these policy alternatives.

CHAPTER IX

ANALYSIS OF CONSEQUENCES TO POLICY ALTERNATIVES, CONCLUSIONS AND RECOMMENDATIONS

The background of this study, the methodology, the derivation of data used, and the results of regression analysis were presented in Chapters I through IV. Four policy alternatives and their projected impacts have been presented in Chapter V through VIII. In this chapter, the following subjects will be presented:

1. The feasibility of price support for these agricultural items.
2. Changes in factor cost consequent upon the support program.
3. The effects of the policy alternatives on resource use among crops.
4. Effects of policy alternatives on variations in per hectare yields and profits.
5. Per capita income stream possibilities to the farm and nonfarm person.
6. Implications for land utilization and farm mechanization.
7. Possible effects of off farm migration.
8. Conclusions and recommendations.

Feasibility of Price Support Program for Rice, Sugarcane and Livestock Production

The Taiwan government that initiated the price support program in 1973 for these agricultural products. The main purpose was to stabilize

and increase the income of Taiwan's farmers, who engage in the production of at least one, or even three, of these crops. Despite the unusual price increase in rice from 1972 to 1973 (40.5 percent), the government was prepared to guarantee a further price increase of 16.7 percent from 1973 to 1974. This contrasts with a 5.83 percent average annual increase in the price of rice for the past decade. As for sugarcane, the average annual price increase for the past decade was 8.27 percent with a decrease of 3.2 percent from 1972 to 1973. The price support program for sugarcane called for a 12.5 percent price increase from 1973 to 1974. These support levels indicate that, administrative costs etc. aside, the government is financially capable of undertaking such a program. The reasons could be any of the following: 1) increased export possibilities, 2) the awareness that a more equitable distribution of the economic successes, as indicated by the rapid increases in national per capita income is in order, or 3) possible rice shortage in the future due to farmer's unwillingness to invest more heavily on the farm. Under policy alternatives III and IV of this study, the suggested support levels are much less dramatic than those announced in 1973. The intent of suggesting lower price support levels is that, at more gradual rates of price increases, the program may be sustained for a longer period of time without antagonizing the nonfarm sector of the population while at the same time insuring a stable per capita income stream to farmers. Though dramatic increases in the support price of sugarcane will not greatly affect the real income of the nonfarm population, the government would suffer sizeable losses if sugar prices on the international market are depressed for an extended period fo time. Any drastic increases in

the support prices for rice could cause both panic in the minds of the public. With slower, but steady, price support levels, the government is capable of administering the program and maintaining steadier economic growth without undue inflation.

With respect to price support for livestock products, since the average annual price increase for the past decade was 2.51 percent, a support level of annual increase in price by 5 percent (as in policy alternative IV) or 6 percent (policy alternative III) in the next decade is feasible, especially in view of the: 1) projected annual increase in national per capita income of 11 percent, and 2) the expanding food canning industry in Taiwan for export purposes.

Briefly, the levels of price support program for rice, sugarcane and livestock production in Taiwan as suggested in this study can be sustained for a long period of time without undue burden on the government and without unreasonable price increases for consumers.

Possible Changes in Factor Cost as a Result of Price Support Program

It may be reasonable to suggest that, given the price support program and the consequent increment in the use of productive factors, the latter costs will increase proportionately or even outpace the product prices of suggested items. From Reports from Farm Record Keeping Families in Taiwan, largest proportions of input costs for crop raising are fertilizer and hired labor, whereas for that of livestock production are feeds. There are several resons why the increased factor costs could not appreciably affect the income streams of the farm person as projected.

1. The cost to hired labor in this study increases or decreases proportionately with the amount of cash expended for the production of a crop or livestock item. Thus, the increase in hired labor cost is already embodied in the computation. When the per hectare cash expenditure increases as a result of the price support program, cost to hired labor increases proportionately.[1]

2. There has been continuous expansion and renewal of existing fertilizer plants in Taiwan. New equipment, economies of scale, and increased production have resulted in lower fertilizer prices, calcium superphosphate and nitrophosphate are abundant enough for export.[2] The government is continuing to expand the production of fertilizer and reduce costs. Consequently, proportional increases in per hectare cash expenditure for the production of crops permit increased use of fertilizer.

3. Labor costs will increase with economic growth in Taiwan. This includes hired farm labor costs. But, cultivable land is limited. Per hectare labor input has reached the point of negative marginal returns. In more recent years, agricultural economists in Taiwan have repeatedly stated the problem of overcrowding on farm lands. Therefore it is reasonable to expect that per hectare labor input cannot increase significantly in the future. Per unit costs of hired labor will indeed increase in the future. But the expected increases in hired labor costs

---

[1] When calculating and projecting the per hectare cash expenditure, cost to hired labor is not included at first. In a later stage of computation, when calculating the total cost of crop production, the cost to hired labor is a trend percentage of total cash expenditure on all crops. See Chapter V for calculation procedure.

[2] The Sixth Taiwan Economic Development Plan, pp. 108-109. While the prices of fertilizers in Taiwan used to be much higher than in Japan, they are now either parallel to or are lower than in Japan.

have already been included in the computations.[3] Besides, the government projection indicates slow off farm migration during the next decade. There will be an increase in the absolute number of farm people. That means, in the next ten years there will be more farm people on the already overcrowded farm lands. More farm youth will be available for hire and thus increase the supply of farm labor. It does not mean that there will be significantly more labor input per cropped hectare. It does mean that, due to projected oversupply of farm labor in the next decade, the increases in per unit hired farm labor will be kept at a slower pace.

Given the above considerations, and given the already allocated increases in the costs of hired labor and other factors of production, the quantity of productive factors applied may be expected to increase for increased production.

4. As for livestock production, the principal feed is sweet potatoes. The major "consumers" of sweet potatoes in Taiwan are livestock and humans. With the rapid growth in Taiwan, the demand of humans for sweet potato will decline, thus increasing the supply for feed purposes. And given the projected slight increase in the hectares of sweet potato to be planted for the next decade (Table 5.1) plus the projected rapid increases in per hectare yields due to increased per hectare cash to be expended (Tables 7.3 and 8.3), the prices of sweet potatoes for livestock production are not likely to outstrip the projected figures.

Having given consideration to and having included the increases in cost in our calculation, hopefully the projected per capita farm income will not deviate appreciably from future reality.

---

[3]See Chapter V, footnote 8.

Effects of Policy Alternatives on Resource Use Among Crops[4]

Table 9.1 presents the projected per hectare cash expenditure on major crops under the four alternatives, for the years 1974, 1979 and 1984. Table 9.2 shows the projected percentage increases in per hectare cash expenditure under these policy alternatives.

To trace the projected per hectare cash expenditure on rice and sugarcane production through time, Figures 1 and 2 are presented.[5]

a) Under policy alternative I, where the average per hectare cash expenditure is a function of time, cash expenditures per hectare increases only gradually through time for each crop.[6]

From 1973 through 1984, the projected per hectare cash expenditure for rice and sugarcane will increase only by 27.7 and 37.3 percent,

---

[4]Here only per hectare cash expenditure is analyzed. Land area being static, the remaining factor or production is labor. But in the initial stages of this study, labor input was shown to have high correlation with cash expenditure, causing multicolinearity problem in the projective equations. Labor was subsequently dropped from the equations as an independent variable. Variations in the per hectare application of capital (cash expenditure), therefore, might also be applicable to the amount of labor applied.

[5]For annual figures on the projected per hectare cahs expenditure for various crops, see Tables 5.4, 6.3, 7.3 and 8.3.

[6]Under policy alternative I, there is a drop in the per hectare cash expenditure for soybean production from 1974 to 1979. This is so because the total amount expended on soybean production is an insignificant fraction of the total cash expended for the production of all crops, and in the process of rounding (see Tables in Appendix B, from 1974 through 1984), an advance or a drop in the last decimal point in column 5 of these tables makes enough difference to make ti seem as if a sudden increase or decrease has been realized in the per hectare cash expdended for soybean production. This is a rounding imperfection rather than reality. Isolated instances like these occur. Since these are isolated cases, and since the contribution of these crops to the total cash expended for the production of all crops is small, these imperfections are accepted and acknowledged.

Table 9.1. Projected Per Hectare Cash Expenditure on Major Crops in Taiwan Under the Four Policy Alternatives, 1974, 1979 and 1984

	Policy Alternative											
	I			II			III			IV		
	1974	1979	1984	1974	1979	1984	1974	1979	1984	1974	1979	1984
	NT $											
Rice	5,834	7,006	8,086	6,945	8,928	11,450	8,265	19,417	34,216	8,265	16,193	29,839
Sweet Potato	6,906	8,876	10,795	7,951	10,735	13,805	7,222	13,488	18,913	7,222	11,808	18,270
Corn	4,452	5,022	5,776	5,253	5,628	6,946	4,728	8,917	12,455	4,728	7,499	11,363
Soybean and Other Beans	3,027	2,459	3,577	3,897	4,280	5,975	3,572	6,114	8,571	3,572	4,897	7,820
Tea	2,168	3,498	4,603	2,047	3,479	6,151	2,047	4,969	8,271	2,047	4,664	10,062
Sugarcane	11,794	13,598	15,103	14,745	18,954	25,124	13,751	35,854	68,680	13,751	28,034	53,902
Peanut	4,053	4,592	5,321	4,782	6,343	8,204	4,400	7,708	9,806	4,400	7,196	10,736
Fruits	21,292	26,626	32,217	26,694	36,299	49,970	23,815	46,286	66,716	23,815	40,097	63,637
Vegetables	17,089	24,784	36,018	18,271	26,656	38,182	16,283	32,800	49,051	16,283	28,802	47,625

Table 9.2. Projected Percentage Increases in Per Hectare Cash Expenditure in Taiwan Under the Four Policy Alternatives, 1979 and 1984 as a Percent of 1974

Crop \ Year	Policy Alternative I		II		III		IV	
	1979	1984	1979	1984	1979	1984	1979	1984
	Percent							
Rice	120.1	138.6	128.6	164.9	234.9	414.0	195.9	361.0
Sweet Potato	128.5	156.3	135.0	173.6	186.8	261.9	163.5	253.0
Corn	112.8	129.7	107.1	132.2	188.6	263.4	158.6	240.3
Soybean and Other Beans	81.2	118.2	109.8	153.3	171.2	239.9	137.1	218.9
Tea	161.3	212.3	170.0	300.5	242.7	404.1	226.9	491.5
Sugarcane	115.3	128.1	128.5	170.4	260.7	499.5	203.9	392.0
Peanut	113.3	131.3	132.6	171.6	175.2	222.9	163.5	244.0
Fruits	125.1	151.3	136.0	187.2	194.4	280.1	168.4	267.2
Vegetables	145.0	210.8	145.9	209.0	201.4	301.2	176.9	292.5

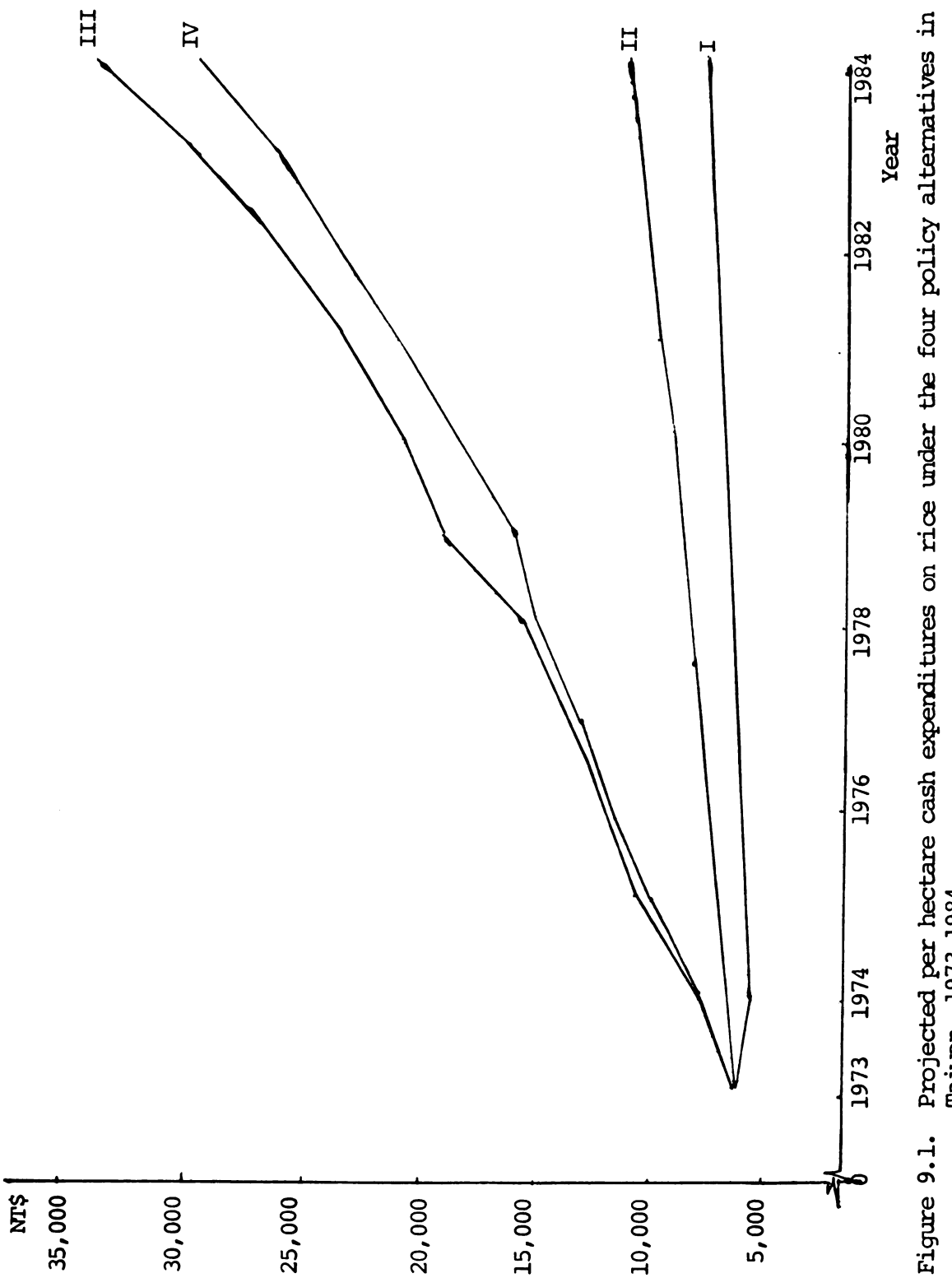

Figure 9.1. Projected per hectare cash expenditures on rice under the four policy alternatives in Taiwan, 1973-1984.

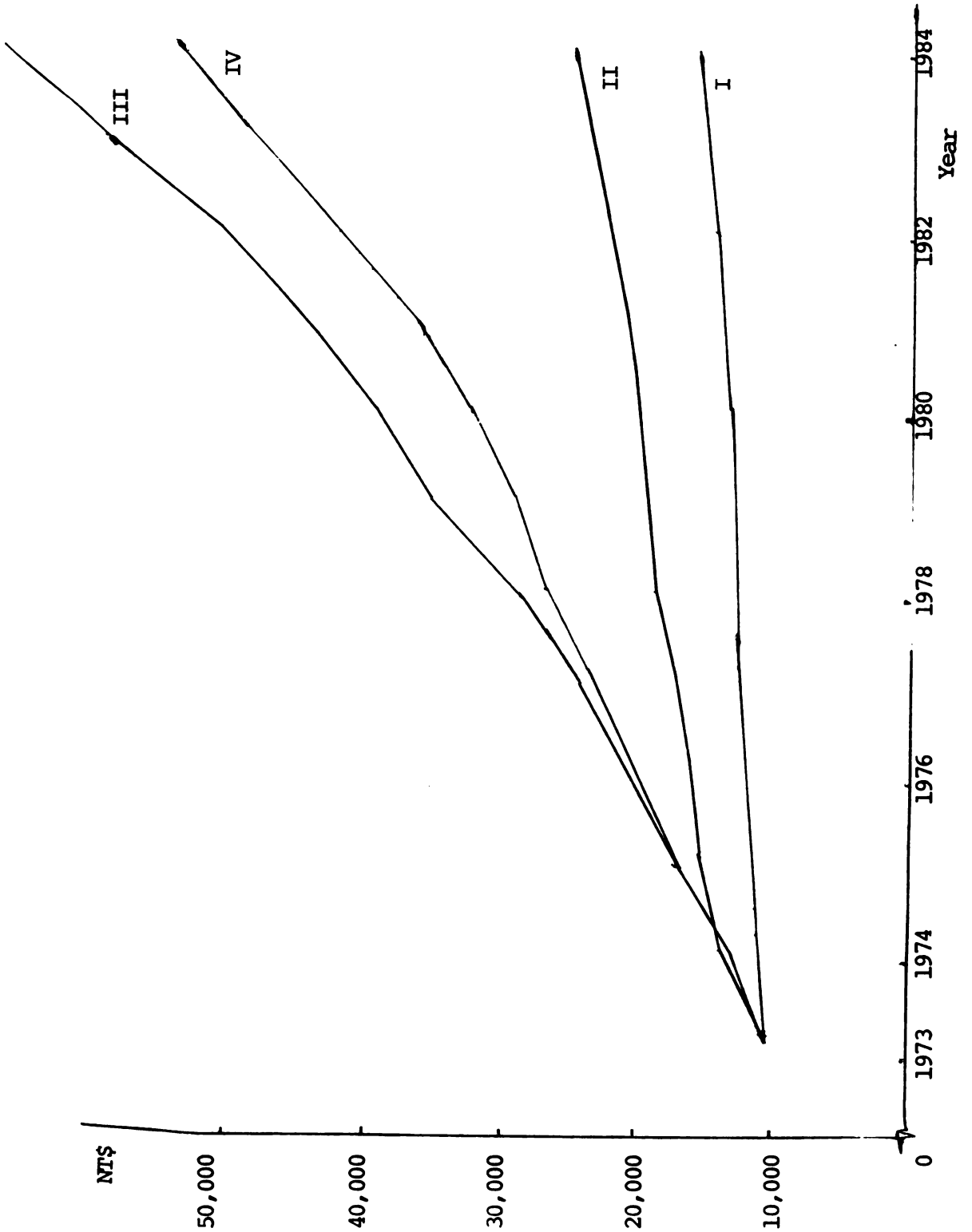

Figure 9.2. Projected per hectare cash expenditures on sugarcane production in Taiwan Under the four policy alternatives, 1973-1984.

respectively. But the projected percentage increases in the per hectare cash expended for sweet potato, tea, fruits and vegetables are far more substantial: 56.3, 112.3, 51.3 and 110.8 percent, respectively. Figures 9.1 and 9.2 also clearly indicate the slow growth in the projected per hectare cash expenditure on rice and sugarcane production under alternative I.

Under alternative I, the slow increases in the per hectare cash expenditure on rice and sugarcane production are due to: 1) steady increases in the prices of tea, fruits and vegetables during the past, whereas the prices of rice and sugarcane increased more "eratically" for the same time period. Therefore, it pays more to invest heavier in these crops than in rice and sugarcane production; 2) the uncertain wide fluctuations of sugar prices on the international market which results in the unwillingness on the part of risk-averting Taiwanese sugarcane producers to invest heavily in sugarcane production; and, 3) the depressed price of rice in the past. Under the mandatory rice-fertilizer barter system, the price of rice has been deliberately kept low and the cost of fertilizer high. This caused the relatively slow increment in the per hectare cash expenditure on rice production during the past, and is now reflected in the future under this policy alternative where the projected per hectare cash expenditure is a function of time.

If this trend is followed, price increases of rice and sugarcane products will lag behind these for fruits, vegetables and tea, resulting in relatively slow increases in the amount of cash to be expended on rice and sugarcane production, and slow increases in the per hectare yields of these two important crops.

The price structure of these major crops as a function of time

as presented under policy alternative I (Table 5.1) would be undesirable in the sense that, the resulting deployment of resources among crops, cash expenditure and correspondingly labor input, would be such that the more rapid increases in production would not be for crops which would find ready markets and which would appreciably increase per capita farm income.[7]

b) Under alternative II, the prices of crops are a function of population. This might appear to be a redundunt study of alternative I where prices are a function of time. In the Taiwanese economy, however, one unique factor prompts for such an effort. Because of this facotr, we must examine the projected consequences to this alternative to be certain they are either similar to or different from those of alternative I.

And the unique factor is this. The rate of natural increase in Taiwan's population had always been high. From 1952 through 1962, the

---

[7] See and compare Tables 5.13, 6.7, 7.7 and 8.7. Admittedly, from the estimated coefficients presented in Chapter IV, fruits and vegetables production are more responsive to increments in per hectare cash expenditure than rice and sugarcane. But the crops whose per hectare yields need to increase more rapidly than others are rice and sugarcane whose increased supply will not exceed demand, and whose domestic surplus can be more readily exported.

The Taiwan government has not chosen to support the prices of fruits, vegetables and tea product, but has instead elicited to support the product prices of rice and sugarcane. Two of the possible reasons are: 1) the government is not administratively capable of controlling the prices of fruits and vegetables; and, 2) the product prices of rice sugarcane and even sorghum, whose value product in 1973 accounted for only .2 percent of the total value product of all crops are supported, because increases in the production of these crops are more urgently needed to meet the prospective domestic or international demand.

annual rate of natural increase in population ranged between 3.67 percent and 3.10 percent. Despite an intensive campaign by the government to curb population growth, the rate of natural increase still remained high in the following decade. Birth rates in 1968 and 1969 remained at 2.93 and 2.80 percent, respectively. It is only in very recent years that a sizeable decline in birth rate and in the rate of natural increase is reported. In 1972, the birth rate fell to 2.41 percent whereas the rate of natural increase declined from 1962's 3.10 percent to 1972's 1.94 percent. According to the msot recent official population projection, the birth rate will further decline. This will affect the prices of agricultural commodities. For, agricultural production will continue to increase at a more rapid rate than that of population. Excess of supply over demand will at least slow down increases in the price of agricultural commodities, which will be different from the trend prices as under alternative I. Therefore, there is the need for us to examine the possible consequence of family planning program to the per capita farm income. For this reason, this policy alternative II is introduced.

The resulting distribution of resource use among crops under policy alternative II is presented in Table 6.3. Tables 9.1 and 9.2 compare relative increases in per hectare cash expenditure for the major crops under the four different policy alternatives. Figures 9.1 and 9.2 indicate that the increases in per hectare cash expenditure on rice and sugarcane will be very gradual during the period of projection.

Again, the fastest increases in per hectare cash expenditure are for tea, fruits and vegetable production. Though sugarcane production

receives a significant "investment" boost over alternative I, the relative increase in per hectare cash expenditure for rice is still low. Given the high "elasticities" of production for fruits and vegetables, the market might be faced with their oversupply, leading to reduced prices for these crops and to unwillingness on the part of farmers to invest in farms and desire to invest farm savings in the industrial sector.

The fact that, among the major crops, the government only supports the prices of rice and sugarcane is a signal that the distribution of resource use among crops should be such that rice and sugarcane production receive prior consideration. According to the projected amount of cash expenditure among crops under alternative II, however, the fastest increases are not on rice and sugarcane. This alone points to the inadequacy of policy alternative II.

Inadequate as policy alternative II is with respect to the distribution of resource use, Table 9.2 shows that policy alternative II is an improvement over that of I. By the year 1984, the increases in the projected cash expenditure for rice and sugarcane plantation are far more substantial than that under alternative I: 64.9 percent versus 38.6 percent for rice and 70.4 percent versus 28.1 percent for sugarcane.

However, given the price structure under this policy alternative: 1) despite marked increase in rice production over that of policy alternative I, the per capita farm income does not increase appreciably due to the projected low unit price of rice; and, 2) the farm person will receive considerably less under alternative II than under I for equal quantities of farm produce. This will discourage productive efforts and investment incentives on the part of the farm producers.

If we were solely concerned with per hectare yield or total production of crops, the distribution of resource use resulting from policy alternative II is superior to that of I.[8] But if we are concerned with the size of per capita farm relative to nonfarm increases, policy alternative II is not an improvement over that of I.[9]

c) Under alternative III, where the prices of rice and sugarcane are supported at the annual increase rates of 9 percent and 11 percent, respectively, the per hectare cash expenditures for the major crops witness a more dramatic redistribution than either alternative I or II. In contrast to the two previous policy alternatives, alternative III projects drastic increase over time in the projected per hectare cash expenditures on rice and sugarcane production. Table 9.1 in this chapter indicates that, with price support for rice and sugarcane, producers simultaneously invest heavily in rice and sugarcane production and in other crops. Thus, due to the expected higher yields and higher revenues from price support, the perennial outflow of capital from the farm to the industrial and service sectors may be expected to decline.

---

[8]This result is in large measure attributable to the fact that, under policy alternative II the average per hectare cash expenditure is a function of per hectare VP t-1, which is significantly higher than its counterpart under alternative I which is simply a function of time. (See last rows of Tables 5.9 and 6.3.) See also columns 9 of Tables in Appendices B and C where the ratios of per hectare cash expenditure for individual major crop to that of the province's average per hectare cash expenditure are presented. The changes in the said ratios for rice, sugarcane, fruits and vegetables from 1973 through 1984, for example, for the two policy alternatives, are as follows:

		Rice	Sugarcane	Fruits	Vegetables
Policy	1973	.696	1.743	2.746	1.923
Alternative I	1984	.508	.949	2.023	2.262
Policy	1973	.696	1.743	2.746	1.923
Alternative II	1984	.538	1.181	2.349	1.795

[9]See Tables 5.8 and 6.7.

Compared with 27.7 percent and 90.6 percent increases in per hectare cash expenditure on rice production for alternatives I and II, respectively, alternative III shows a 418.0 percent increase. Given the estimated coefficient for rice production, by the year 1984, the resulting per hectare rice yield under alternative III will be 53.5 percent and 38.4 percent higher than that of alternatives I and II respectively. This would not only alleviate a possible rice shortage problem in the future but would permit rice export.[10]

As for the per hectare cash expenditure on sugarcane production, its percentage increases are the greatest over the years among all crops. This, of course, is due to the suggested 11 percent price support level for sugarcane production. In a latter section, when the net profit from each of these price and cash expenditure alternatives are analyzed, it will become clear that large incentives are provided when the price supports at the highest level are considered.

d) Under alternative IV, which assumes eight and nine percent annual increases in the prices of rice and sugarcane, respectively, the per hectare cash expenditure increases for vairous crops are not as large as under alternative III but greater than for the first two alternatives. The projected percentage increases from 1974 to 1979 and 1984 are presented in Table 9.2.

Under this policy alternative, the resource distribution favors rice, tea, fruits, sugarcane, and vegetable production, but because of

---

[10]See Long Term Projections of Supply, Demand and Trade for Selected Agricultural Products in Taiwan, where the projected surplus of rice for export by 1980 will fall to a very insignificant quantity, while the historical data on the hectares of rice planted from 1970-1973 have dropped much faster than the above study had projected. According to this projection, made in 1969, the hectares of rice cropped in the future will decline by 200 hectares annually.

the annual price support increase for sugarcane production is 9 percent, the resulting increases in cash expenditures per hectare for sugarcane production are not as drastic as under policy alternative III, where the average annual price increase is 11 percent. However, for the reasons given in Chapter VIII, the increases in per hectare yields of major crops, their resulting increases in revenues and profits to the producers are enough to narrow significantly the gap between the per capita farm and nonfarm income in Taiwan (see Table 8.12).

While the projected per hectare cash expenditure for the remaining crops—sweet potato, corn, soybean, and peanut--increase after the pattern as under policy alternative III, tea production increases faster than under policy alternative III perhaps due to the rounding in our mathematical computation. For instance, in Table E.10 of Appendix E, when the "unadjusted total cash expenditure for tea" is divided by the sum of column 5, the resulting percentage would have been .3671 if we had used four instead of three decimal points. when .4 percent in column 6 is reconverted into "adjusted total cash expenditure for tea" in column 7, the "projected expenditure for tea production" is magnifired to increase per hectare cash expenditure for tea in column 8. But since the total value product from tea production does not constitute a significatn portion of the total value product for all crops, such inaccuracy does not appreciably affect teh outcome of per capita income stream of the farm person, and probably its effect on the per capita farm income could be cancelled out by the rounding down of investment figures for other crops.

To conclude this subsection, then, with given levels of price

support for rice and sugarcane production, the per hectare cash expenditure on all major crops may be expected to rise appreciably, thus solving the problem of unwillingness of farmers to invest adequately in farms, and reducing the flow of farm savings to the nonfarm sectors of the economy.

Effects of Policy Alternatives on Variations in Per Hectare Yields and on Value Products

The per hectare yield of an individual crop under alternative policy measures is listed in Tables 5.5, 6.4, 7.4 and 8.4. Their marginal increments as a direct result of price policies are difficult to measure, since yield, due to the nature of our computational process, is only indirectly a function of prices. But the rate of increase under each policy alternative may be made clear by the following table.

Table 9.3. Projected Per Hectare Yield Increase Under Alternative Policy Measures in Taiwan, 1984 as a percent of 1973

Crop	Policy Alternatives			
	I	II	III	IV
	----------Percent----------			
Rice	118.7	131.6	182.1	174.9
Sweet Potato	127.3	143.1	166.3	163.9
Corn	126.8	144.3	216.9	203.4
Soybean and Other Beans	106.2	152.3	196.2	184.0
Tea	186.5	132.8	132.8	132.8
Sugarcane	110.0	117.2	132.7	128.8
Peanut	103.2	118.7	125.8	129.5
Fruits	119.5	145.8	166.3	162.7
Vegetables	178.0	186.0	224.2	219.3

The greatest per hectare yield increases are under policy alternative III. The relatively smaller gains in the per hectare yields of rice and sugarcane can be attributed to the relatively low response to increased cash expenditure. But due to the levels of price support for them, the resulting incremental revenues from these and other crops are sufficient to narrow the gap between the per capita farm and nonfarm incomes in Taiwan.

Under policy alternative I, with the exception of tea and vetables, there are hadly any increases in the per hectare yields of crops. The fact that the per hectare yields under alternative II are higher than that under alternative I also implies that the per hectare cash expenditures have been greatly increased. In so far as per hectare yields are concerned, alternative III and IV are close together.

Figures 9.3 and 9.4 show the projected per hectare yields of rice and sugarcane under the four alternatives. Comparing alternatives I and II in these figures, one may conclude that the increase in per hectare yield are very gradual for these two crops with alternative II showing improvement over I.

To the farm producers, it is the per hectare's alternative net profits under alternative III or IV that is of interest. Table 9.4 presents the alternative per hectare net profits to the major crops by the year 1984.[11] As for rice the per hectare incremental profits under alternative III and IV are very pronounced over that of I or II. With a 6.62 or 5.62 percent annual increase over the past decade's average increase

---

[11] For costs to the consumers as a result of price support, see the following subsection on "Income Consequences to the Farm and Nonfarm Person Under the Four Policy Alternatives." The cost to the government is not known, and no information is available.

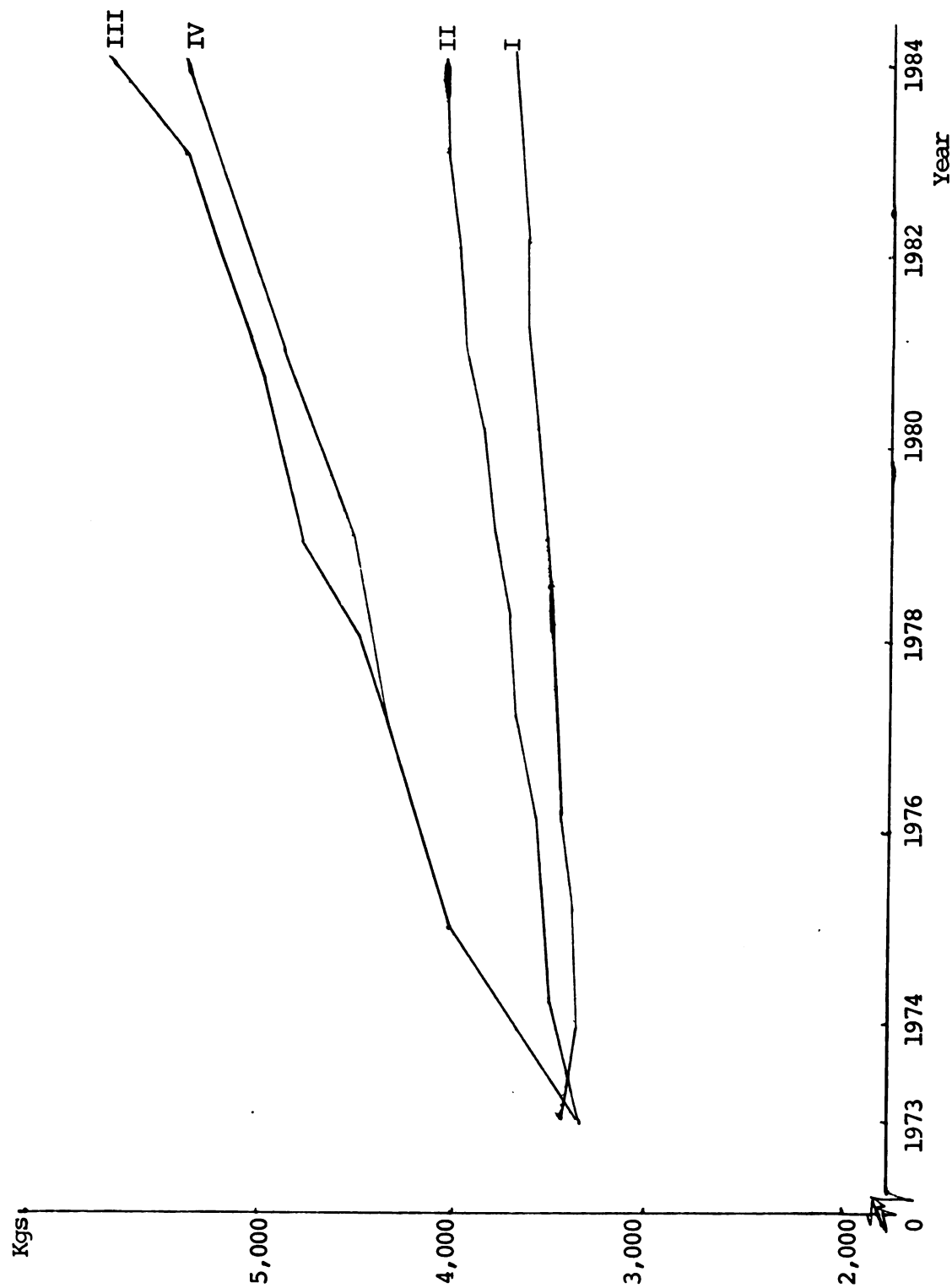

Figure 9.3. Projected per hectare yield of rice in Taiwan under the four policy alternatives, 1973-1984.

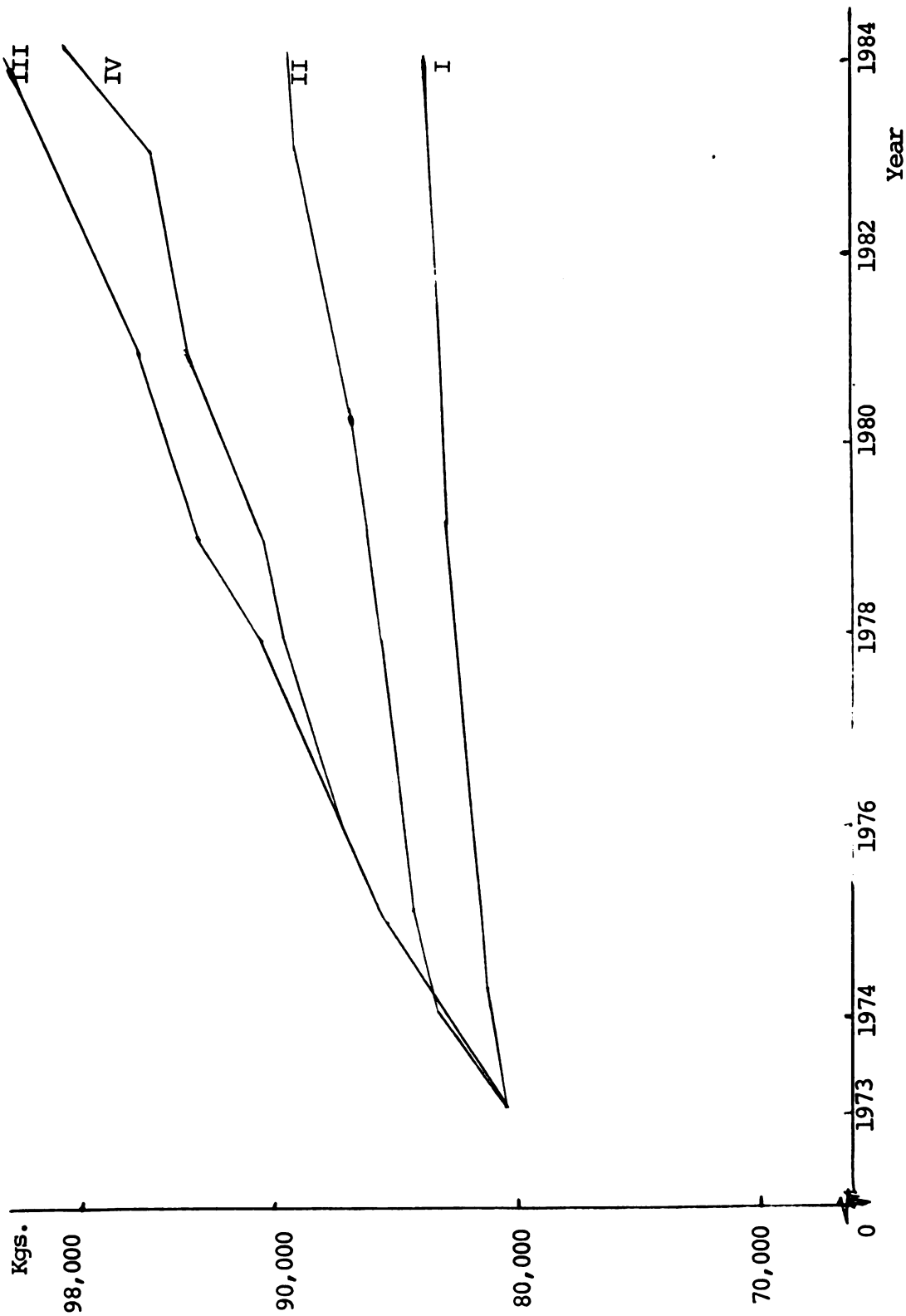

Figure 9.4. Projected per hectare yield of rice in Taiwan under the four policy alternatives, 1973-1984.

Table 9.4. Projected Per Hectare Profit Under Alternative Policies in Taiwan for the Year 1984*

Crop	Policy Alternatives			
	I	II	III	IV
	NT $			
Rice	33,878	30,155	96,591	84,691
Sweet Potato	30,304	25,306	26.535	26,435
Corn	17,126	17,145	23,754	22,599
Soybean and Other Beans	12,464	16,974	21,002	19,912
Tea	75,279	35,162	33,042	31,251
Sugarcane	23,441	15,307	29,795	26,058
Peanut	13,736	12,006	11,601	11,314
Fruits	85,210	91,622	94,731	94,379
Vegetables	142,125	84,729	99,113	97,313

*The above figures are arrived at by: $(\text{Yield} \cdot P_i) - \text{Cost}_i$, for $i = 1,\ldots,9$. Here the cost refers to the per hectare cash expenditure$_i$, with cost to hired labor not included. Since in our computation of cost of hired labor in the four previous chapters (see Chapter V, footnote 8), cost to hired labor is a percentage of cash expenditure for a given year, the proportion of profits under these various policy alternatives remains the same.

in the price of rice,[12] i.e., suggested price support program levels--the per hectare profit could nearly triple. While the increases in per hectare profit from sugarcane plantation does not seem as dramatic as for rice, the increases are significant nevertheless.[13]

---

[12] From 1962 to 1972, the average annual increase in the price of rice was 2.38 percent. Under alternatives III and IV, the suggested annual increases are 9 and 8 percent respectively.

[13] Under policy alternative I, the unit prices for crops are a function of time, whereas their unit prices under the other three

Price supports for rice and sugarcane production do indeed contribute significantly to the per hectare profit of farmers. The effects of price support for livestock slaughtered are likewise significant. Under all four policy alternatives, total value products from the livestock subsector consistently account for approximatley one-third of the total value products from the crop subsector. Since the quantity of livestock slaughtered under all four policy alternatives is a function of national per capita income t-1,[14] the only variations in revenue to livestock producers would be due to the leves of price support for livestock. Table 9.5 presents the net contributions of livestock production under the four policy alternatives.

Though the net difference in income among different alternatives during the early years is not large, the difference becomes more pronounced through time.

---

alternatives are, with the exception of rice and sugarcane under policy alternatives III and IV, all a function of population size. And since unit prices under policy alternative I are higher than that under II, the per hectare profits under policy alternative I are higher than if their respective unit prices had been a function of the projected population size like under the other policy alternatives. This perhaps helps to explain the relatively high per hectare profit of sweet potato, tea, sugarcane and vegetables under column I of Table 9.2. Since the future prices of crops, in the absence of price support for any crops, are more likely to be a function of population sizes rather than of trend, a more meaningful comparison can be made among consequences of alternatives II, III, and IV only. The consequences from policy alternative I are therefore references rather than for reflecting a future possible reality. The increases in per hectare profit for sugarcane plantation are significant under policy alternatives III and IV, not only because of sizeable increases in NT$, but also because of the fact that the levels of price support for sugarcane under these policy alternatives are a mere 2.73 percent and 0.73 percent annual increase over the past average increases (8.27 percent).

[14] See pages 84-86.

Table 9.5. Per Capita Farm Profit from the Livestock Subsector Under the Four Policy Alternatives, 1973-1984

Year	Policy Alternative		
	I and II	III	IV
	NT $		
1973	1,512	1,512	1,512
1974	1,553	1,626	1,614
1975	1,702	1,846	1,819
1976	1,870	2,071	2,026
1977	2,048	2,317	2,249
1978	2,249	2,563	2,503
1979	2,465	2,910	2,781
1980	2,706	3,266	3,096
1981	2,967	3,660	3,442
1982	3,257	4,106	3,830
1983	3,562	4,599	4,255
1984	3,914	5,160	4,735

The price of livestock slaughtered under policy alternatives I and II are the same--both being a function of time. Under policy alternative II, the future prices of crops are a function of the officially projected population size in Taiwan. But when it comes to the livestock subsector, since there is no price support for livestock slaughter is suggested, and since the quantity of livestock slaughter$_t$ is a function of national per capita income t-1--which has a simple correlation of .995 with population sizes, then for the sake of convenience, the price of livestock items under policy alternative II assumes taht of policy alternative I. As for policy alternatives III and IV, the support prices are set at the annual increase rates of 6 percent and 5 percent respectively.

The figures in Table 9.3 are arrived at via the following equation:

$$Y_{i_t} = \frac{[(Q_t \times P_{i_t}) + \sum_{j=1}^{3} TR_{j_t}] - TC_t}{FP_t}$$

for i = policy alternatives I, III, and IV
t = 1973,. . .,1984, and
j = 1 to 3 for milk, poultry and egg production

where:

Y_{i_t} = the farm person's net income from the livestock subsector.
Q_t = quantity of livestock slaughter t
P_{i_t} = Unit price of livestock item$_i$
TR_{jt} = total revenue from j production
TC_j = total cost to the livestock subsector production, and
FP_t^j = farm population for the year t.

N.B. The price support for the livestock subsector is only for livestock slaughter under policy alternatives III and IV. The prices of milk, poultry and egg productions are not covered by the support program. The 1973 price for livestock is historical, resulting in the identical net income to the farm person from livestock production under all policy alternatives.

Income Consequences to the Farm and Nonfarm Population Under the Four Policy Alternatives

The per capita farm income has been increasing over the period 1959 through 1972. But while the national per capita income has increased 327 percent during the same period, the per capita farm income has increased only by 187 percent.

Given the equation for a nonfarm person's income:

$$Y_{nf_t} = \frac{(Y_t - Y_{f_t}) \cdot P_{f_t}}{P_{nf_t}} + Y_t \qquad \text{for } t = 1973, \ldots, 1984$$

where:

Y_{nf_t} = the per capita income to a nonfarm person

Y_t = national per capita income

Y_{f_t} = the per capita income to a farm person

P_{f_t} = farm population, and,

P_{nf_t} = nonfarm population

It means that the smaller is "Y_{f_t}" the greater is "Y_{nf_t}" which results in a greater difference between the per capita incomes of a farm and nonfarm person. The ratio of per capita farm to nonfarm income was 42.1 percent in 1959 but declined to 28.2 percent in 1972. Considering that about 38 percent of Taiwan's population engage in farming, this inequitable distribution in the face of rapid increases in national per capita income should not be permitted to continue for the reasons stated in the introductory chapter.

If farmers had the proper training and institutional opportunity to move to the industrial or service sector for higher income, they would.

This presupposes: 1) that the industrial sector or service sector had enough openings to absorb the farmers who would like to move; 2) that the government has widespread training program for the would-be off farm migrants; 3) that farm labor is sufficiently adaptable to nonfarm production; and, 4) that the farm labor is sufficiently mobile. Job training porgrams in Taiwan do exist, but not on a scale large enough to meet the demand. And conditions 1, 3 and 5 are not met. Therefore, a mass exodus from the farm due to low relative per capita income on farm could cause urban congestion and massive urban unemployment.

Now we may proceed to examine more closely how the four different alternatives will eventually affect the possible income streams of farmers. Figures 9.5 and 9.6 present the projected per capita income of farm and nonfarm persons under the alternative policy measures. Figure 9.7 shows the ratios through time of per capita farm to nonfarm income.

Under policy alternative I, absolute per capita farm incomes continue to increase. From 1972 to 1984, they increase by 260.7 percent while the nonfarm per capita incomes increases by 218.4 percent. Percentagewise, the per capita farm income increases faster than that of a nonfarmer. However, by 1984, the farmer would still receive only 31.9 percent of a nonfarmer's per capita income.

The prices of farm products under policy alternative I are a function of time. The percentage gains in income made by the farmer are from his income sources from nonfarming activities, which does not indicate any improvement on the farm scene. Clearly, if closing income gap between the two sectors is an obejctive, alternative I has little to offer.

In terms of improving the income streams of farmers, policy

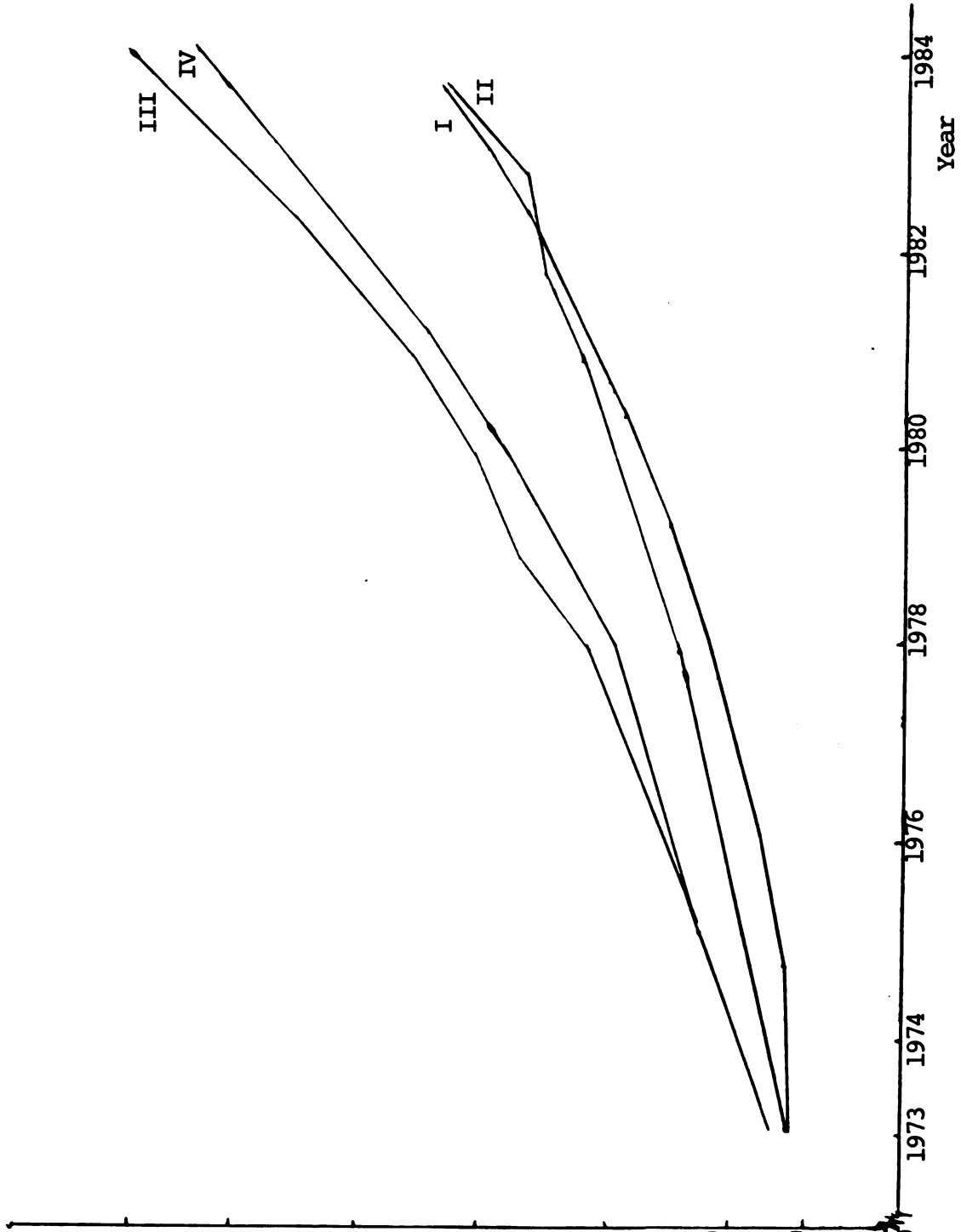

Figure 9.5. Projected per capita farm income in Taiwan under the four policy alternatives, 1973-1984.

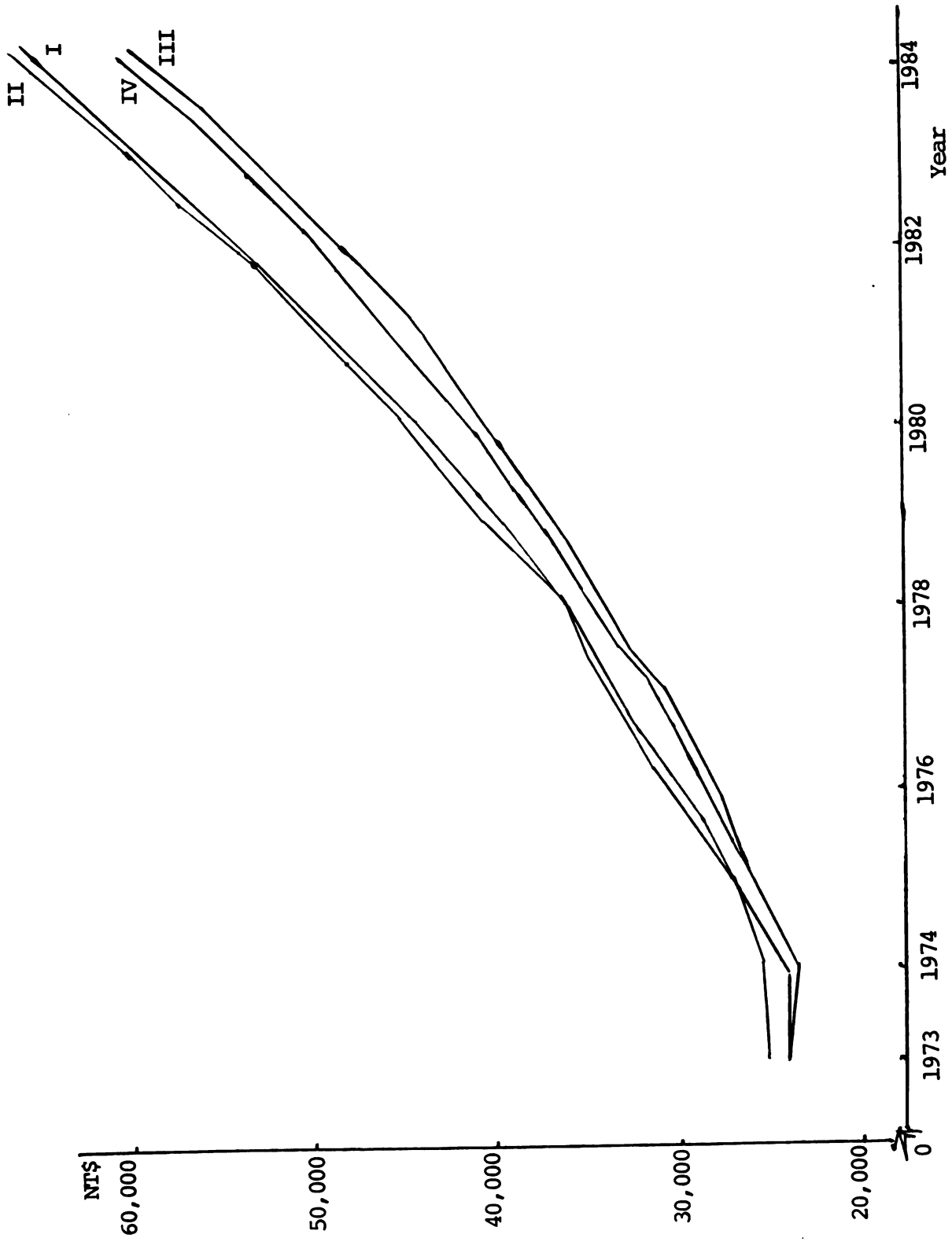

Figure 9.6. Projected per capita nonfarm income in Taiwan under the four policy alternatives, 1973-1984.

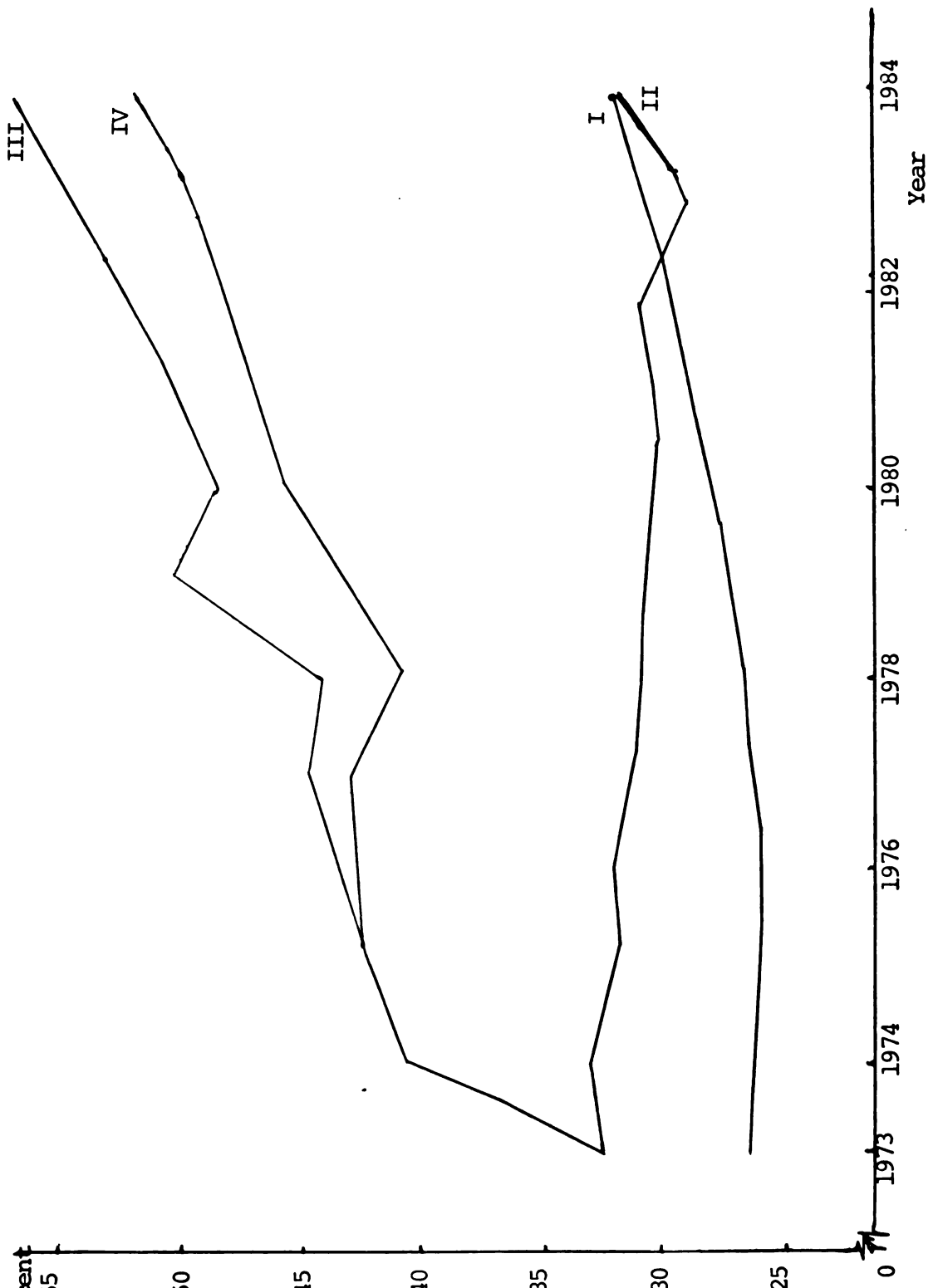

Figure 9.7. Projected percentages of farm to nonfarm income under the four policy alternatives, 1973-1984.

alternative II is not an improvement over that of I. The projected 1984 average per hectare cash expenditure under policy alternative II doubles that of I, and the resulting per hectare yields are substantially over those for policy alternative I, (see tables 5.5 and 6.4) however, the per capita farm incomes are approximately the same as under policy alternative I. This is partly due to the predicted lower per unit prices of crops under policy alternative II, and partly because of the lower per hectare total cost under policy alternative I. As a consequence, policy alternative II has little contribution to make in closing the income gap between the two sectors of Taiwan's population.

A very substantial increase in the per capita farm income is predicted under policy alternatives III and IV. Not only are the per hectare cash expenditures for the various crops much increased, the corresponding per hectare yields also increase.

From Table 9.6 it is clear that alternatives III and IV will greatly enhance the income stream to the farm person. What is the corresponding "loss" to the nonfarm person if one of these two alternatives was adopted? Table 9.6 indicates that the nonfarm per capita money income would increase by nearly 219 percent from 1972 to 1984 if either alternative I or II is adopted. If so, the farm person's income increase is nearly 260 percent. But, if the nonfarm person's income increases were 184.1 percent or 191.1 percent as under alternative III or IV respectively, then the per capita farm income would increase by 473.8 percent and 430.1 percent. In other words, if policy alternative III or IV were adopted instead of II, then at the slight "sacrifice" to the nonfarm persons'

future money income, a very substantial gain to the farm person's money income could be realized.[15]

Table 9.6. Projected Per Capita Farm and Nonfarm Incomes in Taiwan Under the Four Policy Alternatives (1984 as a Percent of 1972)

	Policy Alternative			
	I	II	III	IV
	Percent			
Farm	360.7	356.8	573.8	530.1
Nonfarm	318.4	319.5	284.1	291.1
Ratio of Farm to Nonfarm Person's Income	31.9	31.5	56.9	51.3

The merits of policy alternatives III and IV may be summarized under the following categories: 1) the suggested levels of price support for rice, sugarcane and livestock production, as have already been initiated by the government, are within reasonable limits; 2) the suggested policies will result in increased "plow back" of on-farm-investment to increase per hectare yields; 3) the increased production of

[15] The projected per capita farm and nonfarm income streams are money income. That means, in terms of real income or disposable income, the projected incomes would be smaller, and increases in the rates as discussed in the above paragraph would be slower. This study does not scrutinize the tax structure in Taiwan. Therefore, it is difficult to ascertain the projected per capita income increases in terms of disposable income. And because the future rates of inflation is not projected, it is not possible to convert those projected income increases from money income to real income. What remains unaffected are probably the ratios of per capita farm to nonfarm income through time.

crops, especially sugarcane and rice, will make available greater quantity to be earmarked for export and for earning the much needed foreign currency; 4) much increased per capita income to the farmer at low "expense" to the nonfarm person is thus made possible enabling a more equitable distribution of economic fruits among the two sectors of Taiwan's population; 5) the suggested policies will greatly enhance the purchasing power of the farm person, creating greater demand for industrial products and helping to speed up industrial expansion; 6) while narrowing the said income gap, the suggested policies will still allow absolute increases in the per capita income of a nonfarm person to be faster than that of a farmer; and, 7) the policies will help to solve the problems of land fragmentation and inability to mechanize farms in Taiwan as discussed below.

Possible Effects of Policy Alternatives III and IV on Farm Mechanization and Land Consolidation Programs in Taiwan

The farm mechanization program was initiated in 1956. Aside from a limited quantity of locally made power tillers, the mechanized tools inclue power and hand sprayers, pumps, dusters and rice threshers. To introduce less labor-intensive tractors, planters, harvesters, etc. to the farm lands is not feasible under the present conditions in Taiwan. The main obstacle is the overly fragmented farm lands in Taiwan. The land consolidation program aimed at the more efficient usage of very limited cultivable land in Taiwan was initiated nearly two decades ago. Each Four Year Economic Development Plan stated the annual objectives of land area to be consolidated. But the program was halted completely a few years ago. Instead, regulations prohibiting further fragmentation of farm lands were introduced. Small holdings lead to an unwillingness

and inability to purchase heavier mechanized tools. Thus, the land consolidation program was stopped and the farm mechanization program has had little success.

Part of the problem originates from the high value placed on land ownership. Transition from tenant to ownership status as a result of land reform further reinforces the conclusion that land now owned by the family must be kept within the family.

Part of the problem also involves the value of security. Insecurity in the past has made farmers cautious about risking the only property they can now call their own. Monetary incentives provided with price supports, as suggested under policy alternatives III and IV would reduce their fear and gradually change the values traditionally assigned to land ownership and the security of property ownership.

Unless the farm producers themselves see that under policy alternatives III and IV, their security will be safeguarded and that "prosperity" is in sight if they voluntarily consolidate adjacent lands and cooperatively invest in heavier mechanized farm tools for increased production and gains, the land consolidation and farm mechanization programs will continue to meet strong resistance.

With the investment, production, and income possibilities projected under policy alternatives III and IV in this study, farmers will, especially the younger ones, consolidate and perhaps cooperate. Institutional changes in the past have been influenced by income motives. The Taiwanese farmers are not a likely exception provided productive incentives are present. It is believable tnat the incentives provided under policy alternatives III and IV in this study are a step in the right direction. The bottleneck in solving the land consolidation/farm

mechanization problems of Taiwan may, with the adoption or modification of the proposed policies, be effortlessly broken in time.

Possible Effect of Policy Alternatives III and IV to Off Farm Migration in Taiwan

It may be suspected that a more inequitable distribution of income favoring the nonfarm person will induce a greater flow of surplus labor from the farm to other sectors of the economy. However, historical data indicate that the widening income gap between the farm and nonfarm population did not result in a consistent pattern of off-farm migration in Taiwan. Urban employment opportunity and rural needs for labor--in the absence of widespread mechanized farm equipment--seem to be the two crucial determinants of off farm or back to farm migration. Though this is not a study of off-farm migration in Taiwan, it may be postualted that, 1) with higher economic incentives to mechanize and consolidate farms, less labor will be needed on farm; 2) the projected rapid increases in the per capita farm income will increase demand for industrial products and thsu creating more nonfarm jobs for surplus farm labor; and 3) since moving to cities has a pronounced social value in Taiwan, implementation of policy alternatives III and IV will hasten off farm migration in an orderly manner and will gradually relieve the population congestion problem in rural Taiwan. Whether policy alternative III or IV is more desirable is the choice of decision makers, i.e., in view of 1) forestalling social problems, 2) equitableness between sectors of population; 3) cost of administration; 4) "costs" to the nonfarm population; and 5) speedier economic development in Taiwan.

Conclusions and Recommendations

To briefly summarize: 1) this study outlined the problems on farm in Chapter I; 2) stated methodology in Chapter II; 3) explained the method of constructing certain nonavailable but required data in Chapter III; 4) presented results of regression analysis and using identities and of accounting components in Chapter IV; 5) projected the alternative per hectare cash expenditures, yields, value products and income streams to the farm and nonfarm person in Taiwan, 1973 through 1984, alternative, in Chapters V through VIII, respectively; and 6) discussed the potential merits of policy alternatives III and IV over that of I and II in this present chapter.

In consulting study results in this research effort, the reader needs to bear the following points in mind:

1) Some of the data used in making projections in this study are derived. In other words, desired historical data specifically suited for projective pruposes of this nature are lacking;

2) the projective equations are of questionable structural value as the many variables and relationships among them needed to write structural equations are not well known. The projective equations in this study are probably only partially reduced form of unspecified structural equations. The strength of the whole model resides primarily on having the estimated results fed into structural identities in a latter stage of computation.

3) the harvested hectarages of major crops do not vary from one policy alternative to another. In other words, the projected hectarages for the production of rice, for instance, are assumed to be the same for all four policy alternatives. And,

4) The lack of more specific directives from policy makers concerning future agricultural policies in general, and future agricultural commodity prices in particular, make the somewhat arbitrary determination of price support levels under alternatives III and IV less authoritative.

Bearing the above qualifications to this study's results in mind, we conclude and recommend the following:

1) better detailed data on agricultural inputs be compiled for future use;

2) that research be conducted annually on the factors influencing off-farm migration so that planned and orderly population redistribution between farm and nonfarm sectors in the future may be devised;

3) that the impact of farm price support programs on farm mechanization and land consolidation in Taiwan be measured to enable the future planning of implementation of the said programs; and,

4) that the policy alternatives III and IV be given serious consideration for adaptation and implementation. It will have a relatively low "cost" to the nonfarm population and the per capita farm income may be epxected to rise rapidly to narrow the income gap between the two sectors of Taiwan's population. We also strongly believe that a number of perennial problems on Taiwan's farms may "resolve themselves" in time if policy alternatives III and IV are implemented.

BIBLIOGRAPHY

Chang, Hang Yue. "A Comparative Study on the Standard of Living Between Taiwan's Farmers and Nonfarmers," Research Studies on Structural Changes in Taiwan's Agriculture. Vol. 1. Taipei: Joint Commission on Rural Reconstruction (April, 1972).

Chang, Teh Seiu. "Agriculture and Economic Development," Special Collection on Agricultural Economics Studies, Vol.II. Taipei: Joint Commission on Rural Reconstruction (December 1967).

_____, Long Term Projections of Supply, Demand and Trade for Selected Agricultural Products in Taiwan. Taipei: National Taiwan University. 1970.

Chen, Cheng Sang. An Economic and Social Geography. Taipei: Fu Ming Geographic Institute of Economic Development. 1963.

Chen, Hee Wang. "Economic Analysis of Taiwan's Small Farms," Taiwan Land Credit Quarterly. Vol. IV, No. 4. (1967).

Chen, Tsao Tcheng and Lin Tsong Yi. "The Impact of Input Price Changes on Taiwan's Agricultural Income," Spcial Collection on Agricultural Economics Studies, Vol. I, Taipei: Joint Commission on Rural Reconstruction (December, 1966).

Fung, V. C. "The Elasticities of Production of Nine Major Crops in Taiwan: Estimates and Analysis," Special Collections on Agricultural Economics Studies, Vol. II, (December, 1967).

Hsu, Wen Fu. "A Study of Taiwan's Agricultural Product Prices and Farm Income," Research Studies on Structural Changes in Taiwan's Agriculture, Vol. I, Taipei: Joint Commission on Rural Reconstruction (April, 1972).

Hu, T. C. and Hu Hon Yiu. A Study on Agricultural Price of Taiwan. Taipei: Joint Commission on Rural Reconstruction. 1968.

Johnson, Glenn L., O. J. Scoville, G. K. Dike, and C. K. Eicher. Strategies and Recommendations for Nigerial Rural Development, 1969-1985. East Lansing, Michigan: Michigan State University (CSNRD) (1969).

_____, and L. K. Zerby. What Economists Do About Values: Case Studies of and Answers to Questions They Don't Dare Ask. East Lansing, Michigan: Michigan State University Press. 1971.

_____. A Generalized Simulation Approach to Agricultural Sector Analysis with Special Application to Nigeria. East Lansing, Michigan: Michigan State University Press, 1971.

_____, et. al. Managerial Processes of Midwestern Farmers. Ames, Iowa: Iowa State University Press. 1961.

_____. Korean Agricultural Sector Analysis and Recommended Development Strategies, 1971-1985. East Lansing, Michigan: Michigan State University KASS Team. 1972.

Kmenta, Jan. Elements of Econometrics. New York: The MacMillan Co., 1971.

Lee, Juo Ting. Economic Policy and Economic Development. Taipei: Council on International Economic Cooperation and Development. 1968.

Lee, Teng Hue. "Developmental Imbalance Between Agricutlure and Industries: Symptoms and Possible Solutions," Issues on Taiwan's Agricultural Development, Vol. I. Taipei: Joint Commission on Rural Reconstruction (April, 1971).

_____. Taiwan Farm Income and Capital Needs: An Analysis. Taipei: Joint Commission on Rural Reconstruction (1967).

_____. "Taiwan Labor Costs and Commodity Prices." Taipei: Joint Commission on Rural Reconstruction (Mimeo).

Mao Yu Kang. "A Study of Agricultural Incomes and Input Cost Changes in Taiwan," Research Studies on Structural Changes in Taiwan's Agriculture, Vol. 1, Taipei: Joint Commission on Rural Reconstruction (April, 1972).

_____. "A Study on Taiwan's Farm Sizes," Special Collection on Agricultural Economy, Vol. V (December, 1970).

Peng, Tien Song. "Present Problems and the Future of Agricultural Mechanization in Taiwan, Republic of China," Agricultural Mechanization in South East Asia. (Spring, 1971).

Shen, Tsung Yuan. "Taiwan Agriculture: Current Situation and Future Prospect," Issues on Taiwan's Agricultural Development, Vol. 1 (April, 1971).

Taiwan, Central Research Institute Division of Economic Research. Projections on Taiwan's Economy. 1973.

Taiwan, Council on International Economic Cooperation and Development. The Fourth Manpower Development Plan. 1972.

_____. Long Term Economic Development Plan in Taiwan, Republic of China. 1972.

_____. Manpower and Economic Development. 1970.

_____. Statistical Abstracts of Taiwan. 1972.

_____. Manpower Supply and Demand in Taiwan: An Estimate. 1971.

_____. Taiwan Farm Mechanization and Labor Utilization. 1972.

_____. Taiwan's Four Year Economic Development Plan, Republic of China. Nos. I to VI, 1965, 1969, 1971, 1973.

_____. Third Manpower Development Plan of Taiwan. 1971.

Taiwan, Department of Land Policy. Taiwan Province's Land Consolidation: Directives and References. 1970.

Taiwan, Joint Commission on Rural Reconstruction. A Study on the Problems of Farm Mechanization in Taiwan. 1970.

_____. Special Directives From the Central Government on Aids to Speedier Agricultural Development. 1973.

_____. A Study on Rural Labor Mobility in Relation to Industrialization and Urbanization in Taiwan. 1964.

_____. Taiwan Agricultural Statistics, 1901-1965. 1966.

_____. Taiwan Farm Income Survey of 1967 - With a Brief Comparison with 1952, 1957 and 1962. 1970.

Taiwan, Ministry of Interior. Implementing Land Consolidation Program: A Draft. 1971.

_____. 1971 Taiwan Demographic Fact Book, Republic of China. 1972.

Taiwan, Provincial Government, Department of Agriculture and Forestry. Report From Farm Record Keeping Families in Taiwan. Vols 1958-1973.

_____. Report on Taiwan's Agricultural Input-Output Survey, 1970. 1971.

Taiwan, Provincial Government Agricultural Survey Commission. Taiwan Agricultural Survey Report, Vols. 1963, 1967 and 1971.

_____. A Study on Taiwan's Agricultural Commodity Prices. 1968.

_____. Taiwan Agricultural Yearbook, Vols. 1959-1974.

Taiwan, Provincial Government Department of Development. Taiwan Labor Statistical Report. Vols. 1958-1972.

Taiwan, Provincial Government Department of Statistics. Taiwan Family Income Survey Report. 1971.

Taiwan, Provincial Labor Survey Research Center. Taiwan Area Labor Statistical Survey Report. Vols. 1967-1972.

Taiwan, Agricultural Economics Research Institute. A Study on Taiwan's Farm Mechanization and Off-Farm Migration. Taichung: Tsung Shin University. 1971.

Tsai, Hun Tsing. "The Impact of Land Reform on Taiwan's Farmers," Special Collection on Agricultural Economic Studies, Vol. 1. (December, 1966).

Wang, Yiu L. "An Appraisal of Fertilizer-Rice Barter System," Issues on Taiwan Agricultural Development. Vol. 1, (April, 1971).

Wonnacott, Ronald J. and Thomas H. Wonnacott. Econometrics. New York: John Wiley and Sons, Inc., 1970.

APPENDICES

APPENDIX A

DERIVATION OF ADJUSTED PER HECTARE CASH EXPENDITURES IN TAIWAN, 1959-1968

Table A.1. Derivation of Adjusted per Crop per Hectare Cash Expenditure, 1968

Crop	Ratio of Per Hectare Expenditure$_i$ to the Provinces's Average Per Hectare Cash Expenditure for 1969	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1967-68	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	1968's Ratio of Per Hectare Expenditure to the Province's Average per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Million)		(NT$ Million)	(NT $)	
Rice	.756	.948	.717	4,154	3,281	.375	3,383	4,283	.739
Sweet Potato	.916	1.021	.935	5,416	1,301	.149	1,344	5,594	.966
Corn	.568	.897	.509	2,949	63	.007	63	2,953	.510
Soybean and Other Beans	.427	.894	.382	2,213	155	.018	162	2,320	.400
Tea	.321	1.282	.412	2,387	81	.009	81	2,369	.409
Sugarcane	1.489	1.071	1.595	9,240	886	.101	911	9,502	1.640
Peanut	.541	.942	.510	2,954	281	.032	289	3,029	.523
Fruits	2.637	.967	2.550	14,772	1,357	.155	1,398	15,219	2.627
Vegetables	1.942	.990	1.923	11,140	1,310	.151	1,362	11,501	1.985
Mushroom	41.555	.985	40.932	237,119	28	.003	27	232,981	40.218
					8,756	1.000			

Source of Information:
Column 2 - cf. Table 3.4, column '67-'68
Column 4 - Column 3 x 1968's provincial average per hectare cash expenditure. cf. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1968. Number of hectares cropped is from Taiwan Agricultural Yearbook, 1969.
Column 7 - Column 6 x 1968 total cash expenditure for the production of the major crops. cf. Table 3.1, column 9
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1968. Number of hectares cropped is from Taiwan Agricultural Yearbook, 1969.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. cf. Table 3.1, column 11.

Table A.2. Derivation of Adjusted per Crop per Hectare Cash Expenditure, 1967

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1968	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1966-67	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	1967's Ratio of Per Hectare Expenditure to the Province's Average per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.739	1.049	.704	3,579	2,817	.357	2,804	3,562	.701
Sweet Potato	.966	1.053	.917	4,662	1,102	.140	1,099	4,650	.915
Corn	.510	1.047	.534	2,715	65	.008	62	2,617	.515
Soybean & Other Beans	.400	1.035	.414	2,105	151	.019	149	2,081	.409
Tea	.409	1.149	.470	2,389	82	.010	79	2,277	.448
Sugarcane	1.640	.995	1.632	8,297	748	.095	746	8,273	1.627
Peanut	523	1.039	.543	2,761	270	.034	267	2,727	.536
Fruits	2.627	1.061	2.787	14,169	1,249	.158	1,241	14.080	2.769
Vegetables	1.985	1.184	2.350	11,947	1,371	.174	1,367	11,908	2.342
Mushroom	40.218	1.045	42.028	213,670	24	.003	24	209,224	41.153
					7,879	.998			

Sources of Information:
Column 1 - Table A.1, column 9
Column 2 - Table 3.4, column '66-'67
Column 4 - Column 3 x 1967 provincial average per hectare cash expenditure. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1967. Number of hectares cropped is from Taiwan Agricultural Yearbook, 1968.
Column 7 - Column 6 x 1967 total cash expenditure for the production of the major crops. Table 3.1, column 9.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1967. Number of hectares cropped is from Taiwan Agricultural Yearbook, 1968.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 3.1, column 11.

Table A.3. Derivation of Adjusted per Crop per Hectare Cash Expenditure, 1966

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1967	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1965-66	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	1966's Ratio of Per Hectare Expenditure to the Province's Average per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT $ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.701	.882	.618	3,036	2,394	.367	2,786	3,533	.719
Sweet Potato	.915	.918	.840	4,126	972	.149	1,131	4,803	.978
Corn	.515	1.016	.523	2,569	57	.009	68	3,075	.626
Soybean & Other Beans	.409	.883	.361	1,773	126	.019	144	2,032	.414
Tea	.448	.869	.389	1,911	66	.010	76	2,200	.448
Sugarcane	1.627	.881	1.433	7,309	744	.114	866	8,188	1.667
Peanut	.536	.902	.483	2,372	233	.036	273	2,788	.568
Fruits	2.769	.788	2.182	10,718	827	.127	964	12,491	2.543
Vegetables	2.342	.836	1.958	9,618	1,086	.166	1,260	11,165	2.273
Mushroom	41.153	.885	36.420	178,895	19	.003	23	212,193	43.199
					6,524	1.000			

Sources of Information:
Column 1 - Table A.2, column 9.
Column 2 - Table 3.4, column '65-'66.
Column 4 - Column 3 x 1966 provincial average per hectare cash expenditure. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1966. Number of hectares cropped, Taiwan Agricultural Yearbook, 1967.
Column 7 - Column 6 , 1966 total cash expenditure for the production of the major crops. Table 3.1, column 9.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1966. Number of hectares cropped, Taiwan Agricultural Yearbook, 1967.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 3.1, column 11.

Table A.4. Derivation of Adjusted per Crop per Hectare Cash Expenditure, 1965

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1966	Crop Price Change$_{it}$ Relative to Average Crop Price 1964-65	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	1965's Ratio of Per Hectare Expenditure to the Province's Average per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.719	.977	.702	3,175	2,454	.370	2,545	3,292	.728
Sweet Potato	.987	.973	.952	4,306	1,008	.152	1,045	4,466	.987
Corn	.626	.884	.553	2,501	47	.007	48	2,586	.572
Soybean and Other Beans	.414	.906	.375	1,696	122	.018	124	1,713	.379
Tea	.448	1.049	.470	2,126	74	.011	76	2,186	.483
Sugarcane	1.667	.921	1.535	6,943	769	.116	798	7,207	1.593
Peanut	.568	1.030	.585	2,646	274	.041	282	2,721	.602
Fruits	2.543	.884	2.248	10,068	660	.100	688	10,599	2.343
Vegetables	2.273	1.078	2.450	11,081	1,206	.182	1,251	11,504	2.543
Mushroom	43.199	.929	40.132	181,517	14	.002	14	172,872	38.221
					6,629	.999			

Sources of Information: Column 1 - Table A.3, column 9
Column 2 - Table 3.4, column 64-65
Column 4 - Column 3 x 1965 provincial average per hectare cash expenditure. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1965. Number of hectares cropped, Taiwan Agricultural Yearbook, 1966.
Column 7 - Column 6 x 1965 total cash expenditure for the production of the major crops. Table 3.1, column 9
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1965. Number of hectares cropped, Taiwan Agricultural Yearbook, 1966.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 3.1, column 11.

Table A.5. Derivation of Adjusted per Crop per Hectare Cash Expenditure, 1964

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1965	Crop Price Change$_{it}$ Relative to Average Crop Price, 1963-64	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	1964's Ratio of Per Hectare Expenditure to the Province's Average per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.728	1.177	.857	3,868	2,959	.385	2,587	3,382	.749
Sweet Potato	.987	1.146	1.131	5,105	1,256	.163	1,095	4,452	.986
Corn	.572	1.246	.713	3,218	65	.008	54	2,681	.594
Soybean and Other Beans	.379	1.236	.468	2,113	155	.020	134	1,835	.407
Tea	.483	1.134	.548	2,474	87	.011	74	2,098	.465
Sugarcane	1.593	.527	.840	3,793	360	.047	316	3,323	.736
Peanut	.602	1.004	.604	2,889	291	.038	255	2,534	.561
Fruits	2.343	1.293	3.029	13,673	711	.093	625	12,011	2.661
Vegetables	5.543	1.539	3.914	17,668	1,786	.233	1,566	15,484	3.430
Mushroom	38.221	1.213	46.362	209,278	12	.002	13	243,173	53.871
					7,681	1.000			

Sources of Information:
Column 1 - Table A.4, column 9.
Column 2 - Table 3.4, column '63-'64.
Column 4 - Column 3 x 1964 provincial average per hectare cash expenditure. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1964. Number of hectares cropped, Taiwan Agricultural Yearbook, 1965.
Column 7 - Column 6 x 1964's total cash expenditure for the production of the major crops. Table 3.1, column 9.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1964. Number of hectares cropped, Taiwan Agricultural Yearbook, 1965.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 3.1, column 11.

Table A.6. Derivation of Adjusted per Crop per Hectare Cash Expenditure, 1963

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1964	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1961-62	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	1963's Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.749	.944	.707	2,863	2,145	.369	2,165	2,890	.716
Sweet Potato	.986	.939	.926	3,749	851	.146	857	3,776	.939
Corn	.594	1.023	.608	2,462	49	.008	47	2,360	.583
Soybean and Other Beans	.407	1.022	.416	1,684	131	.023	135	1,735	.429
Tea	.465	.868	.404	1,636	59	.010	57	1,564	.386
Sugarcane	.736	1.787	1.315	5,324	501	.086	505	5,363	1.325
Peanut	.561	1.018	.571	2,312	219	.038	223	2,358	.582
Fruits	2.661	1.005	2.674	10,827	527	.091	534	10,964	2.708
Vegetables	3.430	.928	3.183	12,888	1,311	.226	1,326	13,041	3.221
Mushroom	53.871	.917	49.400	200,021	15	.003	18	236,904	58.509
					5,808	1.000			

Sources of Information:
Column 1 - Table A.5, column 9.
Column 2 - Table 3.4, column '62-'63.
Column 4 - Column 3 x 1963 provincial average per hectare cash expenditure. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1963. Number of hectares cropped, Taiwan Agricultural Yearbook, 1964.
Column 7 - Column 6 x 1963's total cash expenditure for the production of the major crops. Table 3.1, column 9.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1963. Number of hectares cropped, Taiwan Agricultural Yearbook, 1964.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 3.1, column 11.

Table A.7. Derivation of Adjusted per Crop per Hectare Cash Expenditure, 1962

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1963 (1)	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1961-62 (2)	Columns 1 x 2 (3)	Unadjusted Per Hectare Cash Expenditure$_i$ (4)	Unadjusted Total Cash Expenditure for Crop$_i$ (5)	Column 5 Divided by the Sum of Column 5 (6)	Adjusted Total Cash Expenditure for Crop$_i$ (7)	Adjusted Per Hectare Cash Expenditure$_i$ (8)	1962's Ratio of Per Hectare Expenditure to the Province's Average per Hectare Cash Expenditure (9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.716	.949	.679	2,571	2,042	.383	2,164	2,725	.720
Sweet Potato	.939	1.034	.971	3,677	859	.161	909	3,893	1.028
Corn	.583	.942	.549	2,079	38	.007	40	2,155	.569
Soybean and Other Beans	.429	.887	.381	1,443	112	.021	119	1,522	.402
Tea	.386	.924	.357	1,352	49	.009	51	1,411	.373
Sugarcane	1.325	1.036	1.373	5,200	486	.091	514	5,500	1.452
Peanut	.582	.950	.553	2,094	202	.038	215	2,230	.589
Fruits	2.708	1.156	3.130	11,853	567	.106	599	12,531	3.309
Vegetables	3.221	.851	2.741	10,380	978	.183	1,034	10,972	2.897
Mushroom	—	—	—	—	—	—	—	—	—
					5,333	.999			

Sources of Information: Column 1 - Table A.6, column 9
Column 2 - Table 3.4, column '61-'62
Column 4 - Column 3 x 1962's provincial average per hectare cash expenditure. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1962. Number of hectares cropped, Taiwan Agricultural Yearbook, 1963.
Column 7 - Column 6 x 1962 Total Cash Expenditure for the production of the major crops. Table 3.1, column 9.
Column 8 -

Table A.8. Derivation of Adjusted per Crop per Hectare Cash Expenditure, 1961

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1962	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1960-61	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	1961 Ratio of Per Hectare Expenditure to the Province's Average per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.720	.822	.592	2,311	1,808	.345	2,020	2,581	.661
Sweet Potato	1.028	.922	.948	3,701	872	.166	972	4,122	1.056
Corn	.569	.917	.522	2,038	31	.006	35	2,297	.588
Soybean and Other Beans	.402	.865	.348	1,359	118	.022	129	1,487	.381
Tea	.373	.947	.353	1,378	62	.012	70	1,562	.400
Sugarcane	1.452	1.070	1.554	6,067	608	.116	679	6,779	1.736
Peanut	.589	.880	.518	2,022	199	.038	222	2,256	.578
Fruits	3.309	.978	3.236	12,633	569	.108	632	14,048	3.598
Vegetables	2.897	.958	2.775	10,834	981	.187	1,095	12,090	3.097
Mushroom	—	—	—	—	—	—	—	—	—
					5,249	1.000			

Sources of Information:
Column 1 - Table A.7, column 9
Column 2 - Table 3.4, column '60-'61
Column 4 - Column 3 x 1961 provincial average per hectare cash expenditure. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1961. Number of hectares cropped, Taiwan Agricultural Yearbook, 1962.
Column 7 - Column 6 x 1961 total cash expenditure for the production of the major crops. Table 3.1, column 9.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1961. Number of hectares cropped, Taiwan Agricultural Yearbook, 1962.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 3.1, column 11.

Table A.9. Derivation of Adjusted per Crop per Hectare Cash Expenditure, 1960

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1961	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1959-60	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	1960's Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.661	.980	.648	2,281	1,748	.346	1,797	2,345	.666
Sweet Potato	1.056	.954	1.007	3,545	834	.165	857	3,641	1.034
Corn	.588	.986	.580	2,042	28	.006	31	2,250	.639
Soybean and Other Beans	.381	.887	.338	1,190	101	.020	109	1,219	.346
Tea	.400	1.072	.429	1,510	69	.014	73	1,591	.452
Sugarcane	1.736	1.019	1.769	6,227	595	.118	613	6,416	1.823
Peanut	.578	.954	.551	1,940	195	.039	203	2,017	.573
Fruits	3.598	.943	3.393	11,943	495	.098	509	12,288	3.491
Vegetables	3.097	.986	3.054	10,750	985	.195	1,013	11,059	3.142
Mushroom	---	---	---	---	---	---	---	---	---
					5,050	1.001			

Sources of Information:
Column 1 - Table A.8, column 9.
Column 2 - Table 3.4, column '59-'60.
Column 4 - Column 3 x 1960 provincial average per hectare cash expenditure. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1960. Number of hectares cropped, Taiwan Agricultural Yearbook, 1961.
Column 7 - Column 6 x 1960's total cash expenditure for the production of the major crops. Table 3.1, column 9.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1960. Number of hectares cropped, Taiwan Agricultural Yearbook, 1961.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 3.1, column 11.

Table A.10. Derivation of Adjusted per $Crop_i$ per Hectare cash Expenditure, 1959

Crop	Ratio of Per Hectare $Expenditure_i$ to the Province's Average Per Hectare Cash Expenditure for 1960	Crop $Price\ Change_i$ Relative to Average Crop Price 1958-59	Columns 1 x 2	Unadjusted Per Hectare Cash $Expenditure_i$	Unadjusted Total Cash Expenditure for $Crop_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for $Crop_i$	Adjusted Per Hectare Cash $Expenditure_i$	Ratio fo Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.666	1.094	.729	2,759	2,141	.416	2,320	2,990	.790
Sweet Potato	1.034	.988	1.022	3,868	876	.170	948	4,186	1.106
Corn	.639	.854	.546	2,067	24	.005	28	2,411	.637
Soybean and Other Beans	.346	.795	.275	1,041	91	.018	100	1,151	.304
Tea	.452	.761	.344	1,302	59	.001	61	1,353	.357
Sugarcane	1.823	.716	1.305	4,939	490	.095	530	5,340	1.411
Peanut	.573	.905	.519	1,964	195	.038	212	2,138	.565
Fruits	3.491	.771	2.692	10,189	409	.080	446	11,112	2.936
Vegetables	3.142	.816	2.546	9,705	857	.167	931	10,551	2.788
Mushroom	---	---	---	---	---	---	---	---	---
					5,142	1.000			

Sources of Information:
Column 1 - Table A.9, column 9.
Column 2 - Table 3.4, column 1958-59
Column 4 - Column 3 x 1959 provincial average per hectare cash expenditure. Table 3.1, column 11.
Column 5 - Column 4 x number of hectares $cropped_i$ in 1959. Number of hectares cropped, Taiwan Agricultural Yearbook, 1960.
Column 7 - Column 6 x 1959's total cash expenditure for the production of the major crops. Table 3.1, column 9.
Column 8 - Column 7 divided by the number of hectares $cropped_i$ in 1959. Number of hectares cropped, Taiwan Agricultural Yearbook, 1960.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 3.1, column 11.

APPENDIX B

PROJECTED PER HECTARE CASH EXPENDITURES IN TAIWAN UNDER POLICY ALTERNATIVE I, 1973-1984

Table B.1. Projected Per Crop Per Hectare Cash Expenditure Under Policy Alternative I, 1973

Crop	Ratio of Per Hectare Cash Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1972 (1)	Crop Price Change$_i$ Relative to Average Crop Price$_i$ 1972-1973 (2)	Columns 1 x 2 (3)	Estimated Per Hectare Cash Expenditure$_i$ (4)
				NT $
Rice	.696	1.152	.802	6,331
Sweet Potato	.851	1.024	.871	6,876
Corn	.510	1.113	.568	4,484
Soybean and Other Beans	.383	1.352	.518	4,089
Tea	.224	1.245	.279	2,202
Sugarcane	1.743	.800	1.394	11,004
Peanut	.535	.997	.533	4,208
Fruits	2.746	.828	2.274	17,951
Vegetables	1.923	1.016	1.954	15,425

Sources of Information: Column 1 - Table 3.6, column 9.
Column 2 - Table 3.4, colum 1972-73
Column 4 - Column 3 x 1973's estimated provincial average of cash expenditure for per hectare cropped. See Table 5.4.

Table B.2. Projected per Crop per Hectare Cash Expenditure Under Policy Alternative I, 1974

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1973	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1973-74	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectares Cash Expenditure$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.802	.909	.729	6,132	4,624	.339	4,399	5,834	.695
Sweet Potato	.871	.990	.862	7,251	1,676	.123	1,596	6,906	.821
Corn	.568	.959	.545	4,585	134	.010	130	4,452	.529
Soybeans and Other Beans	.518	.742	.384	3,230	152	.04	143	3,027	.360
Tea	.279	.896	.250	2,103	62	.005	65	2,168	.258
Sugarcane	1.394	1.055	1.471	12,374	1,144	.084	1,090	11,794	1.402
Peanut	.533	.954	.508	4,273	342	.025	324	4,053	.482
Fruits	2.274	1.171	2.663	22,401	2,621	.192	2,491	21,292	2.531
Vegetable	1.954	1.092	2.134	17,951	2,903	.213	2,764	17,089	2.032
					13,659	1.001			

Sources of Information:
Column 1 - Table B.1, column 3.
Column 2 - From column 1973-74 of Table 5.2.
Column 4 - Column 3 x 1974's provincial average per hectare cash expenditure. cf. Table 5.4.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1974. cf. Table 5.3.
Column 7 - Column 6 x 1974's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1974. cf. Table 5.3.
Column 9 - Column 8 divided the provincial average of per hectare cash expenditure. cf. Table 5.4.

Table B.3. Projected per Crop per Hectare Cash Expenditure, Under Policy Alternative I, 1975

Crop	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure for 1974	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1974-75	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.695	.980	.681	6,106	4,592	.327	4,555	6,057	.676
Sweet Potato	.821	.996	.818	7,334	1,697	.121	1,685	7,282	.812
Corn	.529	.974	.515	4,617	141	.010	139	4,555	.508
Soybean and Other Beans	.360	.960	.346	3,102	141	.010	139	3,073	.343
Tea	.258	.986	.254	2,277	67	.005	70	2,383	.266
Sugarcane	1.402	.978	1.371	12,292	1,131	.080	1,114	12,112	1.351
Peanut	.482	.973	.469	4,205	330	.023	320	4,077	.445
Fruits	2.531	.988	2.501	22,424	2,815	.200	2,786	22,189	2.475
Vegetables	2.632	1.023	2.079	18,640	3,147	.224	3,120	18,479	2.061
					14,061	1.000			

Sources of Information: Column 1 - Table B.2, column 9
Column 2 - Column 1974-75 of Table 5.2
Column 4 - Column 3 x 1975's provincial average per hectare cash expenditure. cf. Table 5.4.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1975. cf. Table 5.3
Column 7 - Column 6 x 1975's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1975. cf. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. cf. Table 5.4.

Table B.4. Projected per Crop per Hectare Cash Expenditure Under Policy Alternative I, 1976

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1975	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1975-76	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectares Cash Expenditure$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.676	.981	.663	6,336	4,752	.315	4,713	6,284	.658
Sweet Potato	.812	.992	.806	7,703	1,786	.118	1,765	7,616	.797
Corn	.508	.974	.495	4,731	152	.010	150	4,662	.488
Soybean and Other Beans	.343	.961	.330	3,154	137	.009	135	3,107	.325
Tea	.266	.987	.263	2,513	71	.005	75	2,620	.274
Sugarcane	1.351	.970	1.310	12,520	1,146	.076	1,137	12,419	1.299
Peanut	.445	.973	.433	4,138	319	.021	314	4,073	.426
Fruits	2.475	.989	2.448	23,396	3,152	.209	3,127	23,211	2.429
Vegetables	2.061	1.024	2.110	20,065	3,555	.236	3,531	20,029	2.096
					15,070	.999			

Sources of Information:
Column 1 - Table B.3, column 9
Column 2 - Table 5.2, column 1975-76
Column 4 - Column 3 x 1976's provincial average per hectare cash expenditure. cf. Table 5.4.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1976. cf. Table 5.3.
Column 7 - Column 6 x 1976's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1976. cf. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. cf. Table 5.4.

Table B.5. Projected per Crop per Hectare Cash Expenditure, Under Policy Alternative I, 1977

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1976	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1976-77	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectares Cash Expenditure$_i$	Ratio of Per Hectares Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.658	.979	.644	6,560	4,907	.303	4,873	6,514	.639
Sweet Potato	.797	.992	.791	8,058	1,871	.116	1,866	8,036	.789
Corn	.488	.974	.475	4,839	163	.010	161	4,775	.469
Soybean and Other Beans	.325	.937	.305	2,915	121	.007	113	2,718	.267
Tea	.274	.985	.270	2,750	77	.005	80	2,883	.283
Sugarcane	1.299	.977	1.269	12,927	1,179	.073	1,174	12,875	1.264
Peanut	.426	.972	.414	4,217	319	.020	321	4,247	.417
Fruits	2.429	.988	2.400	24,449	3,534	.218	3,506	24,253	2.381
Vegetables	2.096	1.022	2.142	21,821	4,016	.248	3,989	21,672	2.127
					16,187	1.000			

Sources of Information: Column 1 - Table B.4, column 9
Column 2 - Table 5.2.
Column 4 - Column 3 x 1977's provincial average per hectare cash expenditure. cf. Table 5.4.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1977. cf. Table 5.3.
Column 7 - Column 6 x 1977's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1977. cf. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. cf. Table 5.4.

Table B.6. Projected Per Crop Per Hectare Cash Expenditure, Under Policy Alternative I, 1978

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1977	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1977-78	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjsuted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectares Cash Expenditure$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.639	.974	.622	6,754	5,039	.292	5,039	6,753	.622
Sweet Potato	.789	.984	.776	8,426	1,959	.114	1,967	8,460	.779
Corn	.469	.967	.454	4,930	171	.010	173	4,883	.450
Soybean and Other Beans	.267	.954	.255	2,769	110	.006	104	2,614	.241
Tea	.283	.980	.277	3,008	82	.005	86	3,167	.292
Sugarcane	1.264	.968	1.224	13,290	1,206	.070	1,208	13,306	1.225
Peanut	.417	.967	.403	4,376	325	.019	328	4,410	.406
Fruits	2.381	.983	2.341	25,419	3,841	.223	3,848	25,464	2.345
Vegetables	2.127	1.016	2.161	23,464	4,509	.261	4,504	23,439	2.159
					17,242	1.000			

Sources of Information: Column 1 - Table B.5, column 9
Column 2 - Table 5.2
Column 4 - Column 3 x 1978's provincial average per hectare cash expenditure. cf. Table 5.4.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1978. cf. Table 5.3.
Column 7 - Column 6 x 1978's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1978. cf. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. cf. Table 5.4.

Table B.7. Projected per Crop per Hectare Cash Expenditure, Under Policy Alternative I, 1979.

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1979	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1978-79	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	Ratio of per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.622	.990	.616	7,129	5,305	.280	5,214	7,006	.605
Sweet Potato	.779	1.002	.781	9,039	2,105	.111	2,067	8,876	.767
Corn	.450	.984	.443	5,127	190	.010	186	5,022	.434
Soybean and Other Beans	.241	.970	.234	2,708	103	.005	93	2,459	.212
Tea	.292	.997	.291	3,368	90	.005	93	3,498	.302
Sugarcane	1.225	.983	1.204	13,934	1,259	.066	1,229	13,598	1.175
Peanut	.406	.983	.399	4,618	337	.018	335	4,592	.397
Fruits	2.345	.999	2.343	27,116	4,513	.238	4,432	26,626	2.301
Vegetables	2.159	1.011	2.183	25,264	5,068	.267	4,972	24,784	2.142
					18,970	1.000			

Sources of Infomration: Column 1 - Table B.6, column 9.
Column 2 - Table 5.2, column 1978-79.
Column 4 - Column 3 x 1979's provincial average cash expenditure per hectare. Table 5.4.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1979. Table 5.3.
Column 7 - Column 6 x 1979's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1979. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. cf. Table 5.4.

Table B.8. Projected per Crop per Hectare Cash Expenditure, Under Policy Alternative I, 1980

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1979	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1979-80	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.605	.943	.571	7,101	5,270	.266	5,380	7,248	.583
Sweet Potato	.767	.954	.732	9,103	2,123	.107	2,164	9,278	.746
Corn	.434	.938	.407	5,061	197	.010	202	5,202	.418
Soybean and Other Beans	.212	.924	.196	2,437	88	.004	81	2,235	.180
Tea	.302	.903	.273	3,395	88	.004	81	3,111	.250
Sugarcane	1.175	.941	1.106	13,754	1,238	.062	1,254	13,936	1.121
Peanut	.397	.937	.372	4,626	331	.017	344	4,798	.386
Fruits	2.301	.952	2.191	27,242	4,866	.246	4,975	27,856	2.240
Vegetables	2.142	1.007	2.152	26,762	5,605	.283	5,723	27,326	2.197
					19,806	.999			

Sources of Information:
Column 1 - Table B.7, column 9.
Column 2 - Table 5.2, column 1979-80
Column 4 - Column 3 x 1980's provincial average per hectare cash expenditure. cf. Table 5.4.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1980. cf. Table 5.3.
Column 7 - Column 6 x 1980's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1980. cf. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure.

Table B.9. Projected per Crop per Hectare Cash Expenditure, Under Policy Alternative I, 1981

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1980	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1980-81	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.583	.980	.571	7,662	5,672	.255	5,628	7,603	.567
Sweet Potato	.746	.985	.735	9,862	2,304	.104	2,295	9,826	.732
Corn	.418	.969	.405	5,434	221	.010	221	5,406	.403
Soybean and Other Beans	.180	.955	.172	2.308	80	.004	88	2,552	.190
Tea	.250	.981	.245	3,287	83	.004	88	3,476	.259
Sugarcane	1.121	.964	1.081	14,505	1,299	.058	1,280	14,291	1.065
Peanut	.386	.968	.374	5,018	353	.016	353	5,020	.374
Fruits	2.240	.984	2.204	29,573	5,667	.255	5,628	29,369	2.189
Vegetables	2.197	1.017	2.234	29,976	6,555	.295	6,511	29,776	2.219
					22,235	1.001			

Sources of Information: Column 1 - Table B.8, column 9.
Column 2 - Table 3.2, column 1980-81.
Column 4 - Column 3 x 1981 provincial average per hectare cash expenditure. cf. Table 5.4.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1981. cf. Table 5.3.
Column 7 - Column 6 divided by total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1981. cf. Table 5.3.
Column 9 - Column 8 divided by the provincial average of each$_i$ per hectare cash expenditure. cf. Table 5.4.

Table B.10. Projected per Crop per Hectare Cash Expenditure, Under Policy Alternative I, 1982

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1981	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1981-82	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure$_i$	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.567	.961	.545	7,638	5,639	.242	5,642	7,649	.546
Sweet Potato	.732	.978	.716	10,035	2,348	.101	2,357	10,075	.719
Corn	.403	.949	.382	5.354	229	.010	233	5,447	.389
Soybean and Other Beans	.190	.947	.180	2,523	83	.004	93	2,822	.201
Tea	.259	.972	.252	3,532	88	.004	93	3,763	.268
Sugarcane	1.065	.963	1.026	14,379	1,282	.055	1,284	14,394	1.027
Peanut	.374	.959	.359	5,031	347	.015	350	5,069	.362
Fruits	2.189	.975	2.134	29,908	6,150	.264	6,161	29,961	2.138
Vegetables	2.219	1.008	2.237	31,352	7,158	.307	7,165	31,383	2.239
					23,322	1.002			

Sources of Information: Column 1 - Table B.9, column 9.
Column 2 - Table 5.2, column 1981-82.
Column 4 - Column 3 x 1982's provincial average per hectare cash expenditure. cf. Table 5.4.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1982. cf. Table 5.3.
Column 7 - Column 6 x 1982's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1982. cf. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. cf. Table 5.4.

Table B.11. Projected per Crop per Hectare Cash Expenditure, Under Policy Alternative I, 1983

Crop	Ratio of Per Hectare Expenditure$_i$ in the Province's Average Per Hectare Cash Expenditure for 1982 (1)	Crop Price Change$_{it}$ Relative to Average Crop Price 1982-83 (2)	Columns 1 x 2 (3)	Unadjusted Per Hectare Cash Expenditure (4)	Unadjusted Total Cash Expenditure for Crop$_i$ (5)	Column 5 Divided by the Sum of Column 5 (6)	Adjusted Total Cash Expenditure for Crop$_i$ (7)	Adjusted Per Hectare Cash Expenditure$_i$ (8)	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure (9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.546	.968	.529	7,902	5,819	.230	5,797	7,871	.527
Sweet Potato	.719	.980	.705	10,531	2,468	.097	2,445	10,433	.698
Corn	.389	.973	.378	5,647	254	.010	252	5,606	.375
Soybean and Other Beans	.201	.949	.191	2,853	90	.004	101	3,188	.213
Tea	.268	.974	.261	3,899	95	.004	101	4,158	.278
Sugarcane	1.027	.962	.988	14,759	1,310	.052	1,311	14,762	.988
Peanut	.362	.962	.348	5,198	353	5,204	.348		
Fruits	2.138	.977	2.089	31,205	6,886	.272	6,855	31,067	2.080
Vetegables	2.239	1.011	2.264	33,820	8,061	.318	8,014	33,624	2.251
					25,335	1.001			

Sources of Information: Column 1 - Table B.10, column 9.
Column 2 - Table 5.2, column 1982-83.
Column 4 - Column 3 x 1983's provincial average per hectare cash expenditure. cf. Table 5.4.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1983. cf. Table 5.3
Column 7 - Column 6 x 1983's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1983. cf. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. cf. Table 5.4.

Table B.12. Projected per Crop per Hectare Cash Expenditure, Under Policy Alternative I, 1984

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1983 (1)	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1983-84 (2)	Columns 1 x 2 (3)	Unadjusted Per Hectare Cash Expenditure$_i$ (4)	Unadjusted Total Cash Expenditure for Crop$_i$ (5)	Column 5 Divided by the Sum of Column 5 (6)	Adjusted Total Cash Expenditure for Crop$_i$ (7)	Adjusted Per Hectares Cash Expenditure$_i$ (8)	Ratio of Per Hectare Expenditure to the Province's Average per Hectare Cash Expenditure (9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.527	.956	.509	8,104	5,952	.218	5,939	8,086	.508
Sweet Potato	.698	.975	.681	10,843	2,545	.093	2,534	10,795	.678
Corn	.375	.959	.360	5,732	270	.010	272	5,776	.363
Soybean and Other Beans	.213	.944	.201	3,200	98	.004	109	3,577	.225
Tea	.278	.970	.270	4,299	102	.004	109	4,603	.289
Sugarcane	.988	.960	.948	15,094	1,334	.049	1,335	15,103	.949
Peanut	.348	.957	.333	5,302	353	.013	354	5,321	.334
Fruits	2.080	.973	2.024	32,226	7,630	.280	7,628	32,217	2.023
Vegetables	2.251	1.006	2.265	36,063	8,974	.329	8,963	36,018	2.262
					27,258	1.000			

Sources of Information:
Column 1 - Table B.11, column 9.
Column 2 - Table 5.2, 1983-84.
Column 4 - Column 3 x 1984's provincial average per hectare cash expenditure. cf. Table 5.4.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1983. cf. Table 5.3
Column 7 - Column 6 x 1984's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped$_i$ in 1983. cf. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. cf. Table 5.4.

APPENDIX C

PROJECTED PER HECTARE CASH EXPENDITURES IN TAIWAN UNDER POLICY ALTERNATIVE II, 1973-1984

Table C.1. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative II, 1973

Crop	Ratio of Per Hectare Cash Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1972	Crop Price Change$_{it}$ Relative to Estimated Average Crop Prices 1972-73	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crops	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crops	Adjusted Per Hectare Cash Expenditure	Ratio of per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.696	1.152	8.02	6,082	4,404	.389	4,350	6,006	.792
Sweet Potato	.851	1.024	.871	6,606	1,328	.117	1,308	6,517	.859
Corn	.510	1.113	.568	4,308	132	.012	134	4,395	.580
Soybean and Other Beans	.383	1.352	.518	3,929	176	.016	174	3,987	.526
Tea	.224	1.245	.279	2,116	68	.006	67	2,092	.276
Sugarcane	1.743	.800	1.394	10,572	1,037	.092	1,027	10,483	1.382
Peanut	.535	.997	.533	4,042	293	.026	291	4,011	.529
Fruits	2.746	.828	2.274	17,246	1,599	.141	1,577	17,001	2.242
Vegetables	1.923	1.016	1.954	14,819	2,291	.202	2,257	14,591	1.924
					11,331				

Sources of Information: Column 1 - Table 4.6, column 9.
Column 2 - Table 4.4, 1972-73.
Column 4 - Column 3 x 1973's provincial average per hectare cash expenditure. cf. Table 4.3.
Column 5 - Column 4 x hectares cropped$_i$. cf. Table 5.3.
Column 7 - Column 6 x 1973's total sach expenditure.
Column 8 - Column 7 divided by the hectares cropped$_i$. cf. Table 5.3.
Column 9 - Column 8 divided by the average of per hectare cash expenditure. cf. Table 6.3.

Table C.2. Projected per Hectare Cash Expenditure on Major Crop Under Policy Alternative II, 1974

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1973	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1973-74	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.792	.914	.724	7,186	5,418	.342	5,236	6,945	.700
Sweet Potato	.859	.988	.849	8,247	1,906	.120	1,837	7,951	.801
Corn	.580	.978	.567	5,628	164	.010	153	5,253	.529
Soybean and Other Beans	.526	.766	.403	4,000	117	.007	107	3,901	.393
Tea	.276	.821	.227	2,253	67	.004	61	2,047	.206
Sugarcane	1.382	1.109	1.533	15,217	1,406	.089	1,363	14,745	1.485
Peanut	.529	.963	.509	5,052	404	.025	383	4,782	.482
Fruits	2.242	1.245	2.791	27,703	3,241	.204	3,123	26,694	2.689
Vegetables	1.924	.994	1.912	18,979	3,069	.193	2,955	18,271	1.841
					15,864	.999			

Sources of Information: Column 1 - Table C.1, column 9
Column 2 - Table 6.2.
Column 4 - Column 3 x 1974 provincial average per hectare cash expenditure. Table 6.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1974. Table 5.3.
Column 7 - Column 6 x 1974's total cash expenditure for the production of major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1974. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 6.3.

Table C.3. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative II, 1975

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1974	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1974-75	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expentiture to the Province's Average per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.700	.980	.686	7,200	5,415	.330	5,611	7,462	.711
Sweet Potato	.801	.996	.798	8,375	1,938	.118	2,006	8,669	.826
Corn	.529	.974	.515	5,405	165	.010	170	5,560	.530
Soybean and Other Beans	.393	.960	.377	3,957	179	.011	187	4,126	.393
Tea	.206	.986	.203	2,130	62	.004	68	2,327	.222
Sugarcane	1.485	1.452	1.452	15,239	1,402	.086	1,462	15,895	1.515
Peanut	.482	.973	.469	4,922	387	.024	408	5,194	.495
Fruits	2.689	.988	2.657	27,885	3,501	.214	3,639	28,982	2.762
Vegetables	1.841	1.023	1.883	19,762	3,337	.204	3,469	20,544	1.958
					16,386	1.001			

Sources of Information:
Column 1 - Table C.2, column 9.
Column 2 - Table 6.2, column 1974-75.
Column 4 - Column 3 x 1975 provincial average per hectare cash expenditure. Table 6.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1975. Table 5.3.
Column 7 - Column 6 x 1975's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1975. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 6.3.

Table C.4. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative II, 1976

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1975	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1975-76	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's average per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.711	.985	.700	8,273	6,205	.319	5,895	7,860	.665
Sweet Potato	.826	.992	.819	9,680	2,244	.115	2,125	9,168	.776
Corn	.530	.919	.483	5,709	183	.009	166	5,182	.438
Soybean and Other Beans	.393	.972	.382	4,515	196	.010	185	4,264	.361
Tea	.222	.979	.217	2,565	78	.004	74	2,589	.219
Sugarcane	1.515	.986	1.494	17,658	1,617	.083	1,534	16,752	1.417
Peanut	.495	.980	.485	5,732	442	.023	425	5,510	.466
Fruits	2.762	.998	2.756	32,573	4,388	.225	4,158	30,862	2.611
Vegetables	1.958	1.007	1.972	23,307	4,109	.211	3,899	22,118	1.871
					19,450	.999			

Sources of Information:
Column 1 - Table C.3, column 9
Column 2 - Table 6.2, column 1975-76.
Column 4 - Column 3 x 1976 provincial average per hectare cash expenditure. Table 6.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1976. Table 5.3.
Column 7 - Column 6 x 1976's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1976. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 6.3.

Table C.5. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative II, 1977

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1976 (1)	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1976-77 (2)	Columns 1 x 2 (3)	Unadjusted Per Hectare Cash Expenditure (4)	Unadjusted Total Cash Expenditure for Crop$_i$ (5)	Column 5 Divided by the Sum of Column 5 (6)	Adjusted Total Cash Expenditure for Crop$_i$ (7)	Adjusted Per Hectare Cash Expenditure for Crop$_i$ (8)	Ratio of per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure (9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.665	1.000	.665	8,362	6,255	.309	6,105	8,161	.652
Sweet Potato	.776	1.008	.782	9,834	2,283	.113	2,232	9,617	.768
Corn	.438	.996	.436	5,483	149	.009	178	5,280	.422
Soybean and Other Beans	.361	.987	.365	4,477	185	.009	178	4,293	.343
Tea	.219	.994	.218	2,741	76	.004	79	2,834	.226
Sugarcane	1.417	.993	1.407	17,693	1,613	.080	1,581	17,334	1.385
Peanut	.466	.995	.464	5,835	442	.022	435	5,740	.459
Fruits	2.611	1.013	2.645	33,261	4,808	.237	4,683	32,393	2.588
Vegetables	1.871	1.017	1.903	23,930	4,404	.217	4,288	23,296	1.861
					20,213	1.000			

Sources of Information:
Column 1 - Table C.4, column 9.
Column 2 - Table 6.2, column 1976-77.
Column 4 - Column 3 x 1976's provincial average per hectare cash expenditure. Table 6.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1977. Table 5.3.
Column 7 - Column 6 x 1976's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1977. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 6.3.

Table C.6. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative II, 1978

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1978	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1977-78	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.652	.964	.629	8,379	6,252	.302	6,393	8,569	.643
Sweet Potato	.768	.970	.745	91924	2,308	.112	2,371	10,196	.765
Corn	.422	.961	.406	5,408	191	.009	191	5,392	.405
Soybeans and Other Beans	.343	.953	.327	4,356	173	.008	169	4,277	.321
Tea	.226	.959	.217	2,891	79	.004	85	3,108	.233
Sugarcane	1.385	.964	1.335	17,784	1,614	.078	1,651	18,189	1.365
Peanut	.459	.960	.441	5,875	437	.021	445	5,979	.449
Fruits	2.588	.977	2.528	33,675	5,089	.246	5,208	34,462	2.587
Vegetables	1.861	.986	1.835	24,444	4,697	.227	4,806	25,010	1.877
					20,667	.997			

Sources of Information: Column 1 - Table C.5, column 9.
Column 2 - Table 6.2, column 1977-78.
Column 4 - Column 3 x 1978's provincial average cash expenditure per hecatre. Table 6.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1978. Table 5.3.
Column 7 - Column 6 x 1978's total cash expenditure of the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1978. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 6.3.

Table C.7. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative II, 1979

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1978 (1)	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1978-79 (2)	Columns 1 x 2 (3)	Unadjusted Per Hectare Cash Expenditure (4)	Unadjusted Total Cash Expenditure for Crop$_i$ (5)	Column 5 divided by the Sum of Column 5 (6)	Adjusted Total Cash Expenditure for Crop$_i$ (7)	Adjusted Per Hectare Expenditure for Crop$_i$ (8)	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure (9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.643	.977	.628	9,035	6,724	.287	6,644	8,928	.621
Sweet Potato	.765	.987	.755	10,862	2,530	.108	2,500	10.735	.746
Corn	.405	.973	.394	5,668	210	.009	208	5,628	.391
Soybean and Other Beans	.321	.965	.310	4,460	169	.007	162	4,280	.297
Tea	.233	.972	.226	3,251	87	.004	93	3,479	.242
Sugarcane	1.365	.977	1.334	19,192	1,735	.074	1,713	18,954	1.317
Peanut	.449	.973	.437	6,287	459	.020	463	6,343	.441
Fruits	2.587	.989	2.559	36,816	6,128	.261	6,042	36,299	2.523
Vegetables	1.877	.99	1.875	26,976	5,412	.231	5,347	26,656	1.853
					23,451	1.001			

Sources of Information:
Column 1 - Table C.6, column 9
Column 2 - Table 6.2, column 1978-79.
Column 4 - Column 3 x 1979's provincial average per hectare cash expenditure. Table 6.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1979. Table 5.3.
Column 7 - Column 6 x 1979's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1979. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 6.3.

Table C.8. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative II, 1980

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1979	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1979-80	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.621	.979	.608	9,496	7,048	.276	7,010	9,445	.605
Sweet Potato	.746	.983	.733	11,449	2,670	.105	2,667	11,434	.732
Corn	.391	.975	.381	5,951	232	.009	229	5,875	.376
Soybean and Other Beans	.297	.970	.228	4,498	163	.006	152	4,211	.270
Tea	.242	.977	.236	3,686	96	.004	102	3,908	.250
Sugarcane	1.317	.977	1.287	20,102	1.809	.071	1,803	20,044	1.283
Peanut	.441	.974	.430	6,716	481	.019	483	6,735	.431
Fruits	2.523	.991	2.500	39,048	6,974	.273	6,934	38,826	2.486
Vegetables	1.853	.999	1.851	28,911	6,055	.237	6,020	28,742	1.840
					25,527	1.000			

Sources of Information: Column 1 - Table C.7, column 9.
Column 2 - Table 6.2, column 1979-80.
Column 4 - Column 3 x 1980's provincial average per hectare cash expenditure. Table 6.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1980. Table 5.3.
Column 7 - Column 7 x 1980's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1980. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 6.3.

Table C.9. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative II, 1981

Crop	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure 1980	Crop Price Change$_{it}$ Relative to Average Crop Price$_t$ 1980-81	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.605	.976	.590	10,031	7,426	.265	7,411	10,012	.589
Sweet Potato	.732	.983	.720	12,241	2,860	.102	2,853	12,211	.718
Soybeans and Other Beans	.270	.963	.260	4,421	153	.005	140	4,042	.238
Tea	.250	.968	.242	4,114	104	.004	112	4,405	.259
Sugarcane	1.283	.976	1.252	21,287	1,907	.068	1,902	21,231	1.249
Peanut	.431	.972	.419	7,124	501	.018	503	7,156	.421
Fruits	2.486	.988	2.456	41,757	8,002	.286	7,999	41,737	2.455
Vegetables	1.840	.996	1.833	31,165	6,815	.243	6,796	31,079	1.828
					28,022	1.000			

Sources of Information: Column 1 - Table C.8, column 9.
Column 2 - Table 6.2, column 1980-81.
Column 4 - Column 3 x 1981's provincial average per hectare cash expenditure. Table 6.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1981. Table 5.3.
Column 7 - Adjusted Total Cash Expenditure for Crop$_i$.
Column 8 - Adjusted per hectare cash expenditure for Crop$_i$. Table 5.3.
Column 9 - Ratio of per hectare expenditure to the province's average per hectare cash expenditure. Table 6.3.

Table C.10. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative II, 1982

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1981	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1981-82	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.589	.972	.573	10,626	7,846	.253	7,812	10,582	.571
Sweet Potato	.718	.980	.704	13,056	3,055	.098	3,026	12,935	.697
Corn	.363	.969	.352	6,528	280	.009	278	6,487	.350
Soybean and Other Beans	.238	.959	.228	4,228	140	.005	154	4,668	.252
Tea	.259	.967	.250	4,636	115	.004	124	4,979	.268
Sugarcane	1.249	.976	1.219	23,181	2,067	.067	2,069	23,202	1.251
Peanut	.421	.967	.407	7,548	521	.017	525	7,601	.401
Fruits	2.455	.989	2.428	45,027	9,259	.299	9,234	44,902	2.421
Vegetables	1.828	.999	1.826	33,863	7,731	.249	7,689	33,682	1.816
					31,014	1.001			

Sources of Information: Column 1 - Table C.9, column 9
Column 2 - Table 6.2, column 1981-82.
Column 4 - Column 3 x 1982's provincial average per hectare cash expenditure. Table 6.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1982.
Column 7 - Column 6 x 1982's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1982. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 6.3.

Table C.11. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative II, 1983

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1982	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1982-83	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.571	.977	.558	11,443	8,427	.242	8,373	11,370	.554
Sweet Potato	.697	.984	.684	14,027	3,287	.094	3,252	13,879	.667
Corn	.350	.973	.341	6,993	314	.009	311	6,926	.338
Soybean and Other Beans	.252	.965	.243	4,983	158	.005	173	5,471	.267
Tea	.268	.971	.260	5,332	129	.004	138	5,708	.278
Sugarcane	1.251	.975	1.220	25,019	2,221	.064	2,214	24,941	1.216
Peanut	.410	.972	.399	8,182	555	.016	554	8,164	.398
Fruits	2.421	.990	2.397	49,155	10,846	.312	10,795	48,921	2.386
Vegetables	1.816	.999	1.814	37,200	8,867	.255	8,823	37,015	1.805
					34,804	1.001			

Sources of Information: Column 1 - Table C.10, column 9
Column 2 - Table 6.2, column 1982-83.
Column 4 - Column 3 x 1983's provincial average per hectare cash expenditure. Table 6.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1983. Table 5.3.
Column 7 - Column 6 x 1983's total cash expenditure for the proeuction of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1983. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 6.3.

Table C.12. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative II, 1984

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1983	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1983-84	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.554	1.012	.561	11,936	8,767	.231	8,409	11,450	.538
Sweet Potato	.667	1.018	.679	14,446	3,390	.089	3,240	13,805	.649
Corn	.338	1.008	.341	7,255	342	.009	328	6,946	.326
Soybean and Other Beans	.267	.999	.267	5,681	173	.005	182	5,975	.281
Tea	.278	1.007	.280	5,957	141	.004	146	6,151	.289
Sugarcane	1.216	1.009	1.227	26,106	2,307	.061	2,221	25,124	1.181
Peanut	.398	1.007	.401	8,532	568	.015	546	8,204	.386
Fruits	2.386	1.026	2.448	52,084	12,332	.325	11,831	49,970	2.349
Vegetables	1.805	1.036	1.870	39,786	9,901	.261	9,501	38,182	1.795
					37,921	1.000			

Sources of Information: Column 1 - Table C.11, column 9.
Column 2 - Table 6.2, column 1983-84.
Column 4 - Column 3 x 1984 provincial average per hectare cash expenditure. Table 6.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1984. Table 5.3.
Column 7 - Column 6 x 1984's total cash expneditüre for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1984. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 6.3.

APPENDIX D

PROJECTED PER HECTARE CASH EXPENDITURES IN TAIWAN UNDER POLICY ALTERNATIVE III, 1974-1984

Table D.1. Projected per Hectare Cash Expenditure for Major Crops in Taiwan Under Policy Alternative III, 1974

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1974	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1973-74	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.792	1.005	.796	7,901	5,957	.407	6,231	8,265	.833
Sweet Potato	.859	.811	.697	6,918	1,597	.104	1,669	7,222	.728
Corn	.580	.800	.464	4,606	134	.009	138	4,728	.476
Soybean and Other Beans	.526	.629	.331	3,286	155	.011	168	3,572	.360
Tea	.276	.674	.186	1,846	55	.004	61	2,047	.206
Sugarcane	1.382	.955	1.320	13,102	1,211	.083	1,271	13,751	1.385
Peanut	.529	.791	.418	4,149	332	.023	352	4,400	.443
Fruits	2.242	1.022	2.291	22,740	2,661	.182	2,787	23,815	2.399
Vegetables	1.924	.816	1.570	15,584	2,520	.172	2,633	16,283	1.640
					14,624	1.000			

Sources of Information: Column 1- Computed from Taiwan Agricultural Year Books, 1973 and 1974 editions. cf. Table C.1, column 9.
Column 2 - Table 7.2, Column 1973-74.
Column 4 - Column 3 x 1974's provincial average per hectare cash expenditure. Table 7.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1974. Table 5.3.
Column 7 - Column 6 x 1976's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1974. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 7.3.

Table D.2. Projected per Hectare Cash Expenditure for Major Crops in Taiwan Under Policy Alternative III, 1975

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1974	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1974-75	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.833	1.015	.845	10,921	8,213	.406	8,152	10,840	.839
Sweet Potato	.724	.971	.703	9,086	2,103	.104	2,088	9,022	.698
Corn	.476	.960	.457	5,906	181	.009	181	5,909	.457
Soybean and Other Beans	.360	.953	.343	4,433	201	.010	201	4,430	.343
Tea	.206	.958	.197	2,546	74	.004	80	2,748	.213
Sugarcane	1.385	1.032	1.429	18,468	1,699	.084	1,687	18,332	1.418
Peanut	.443	.958	.424	5,480	431	.021	422	5,366	.415
Fruits	2.399	.976	2.341	30,255	3,799	.188	3,775	30,065	2.326
Vegetables	1.640	.986	1.617	20,898	3,529	.174	3,494	20,691	1.601
					20,220	1.000			

Sources of Information: Column 1 - Table D.1, column 9.
Column 2 - Table 7.2, column 1974-75.
Column 4 - Column 3 x 1975's provincial average per hectare cash expenditure. Table 7.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1975. Table 5.3.
Column 7 - Column 6 x 1975's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1975. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 7.3.

Table D.3. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative III, 1976

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1975	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1975-76	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.839	.999	.838	12,134	9,101	.405	9,181	12,241	.845
Sweet Potato	.698	.955	.667	9,658	2,239	.100	2,267	9,779	.675
Corn	.457	.944	.431	6,241	200	.009	204	6,357	.439
Soybean and Other Beans	.343	.936	.321	4,648	201	.009	204	4,708	.325
Tea	.213	.943	.201	2,910	83	.004	91	3,176	.219
Sugarcane	1.418	1.016	1.441	20,866	1,927	21,045	1.453		
Peanut	.415	.943	.391	5,662	437	.019	431	5,583	.386
Fruits	2.326	.961	2.235	32,363	4,360	.194	4,398	32,643	2.254
Vegetables	1.601	.969	1.551	22,458	3,959	.176	3,990	22,631	1.563
					22,490	1.001			

Sources of Information: Column 1 - Table D.2, column 9.
Column 2 - Table 7.2, column 1975-1976.
Column 4 - Column 3 x 1976's provincial average per hectare cash expenditure. Table 7.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1976. Table 5.3.
Column 7 - Column 6 x 1976's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1976. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 7.3.

Table D.4. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative III, 1977

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1976	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1976-77	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.845	1.007	.851	13,875	10,380	.403	10,373	13,866	.850
Sweet Potato	.675	.961	.649	10,581	2,457	.095	2,445	10,533	.646
Corn	.439	.952	.418	6,815	230	.009	232	6,879	.422
Soybean and Other Beans	.325	.944	.307	5,005	207	.008	206	4,971	.305
Tea	.219	.950	.208	3,391	95	.004	103	3,692	.226
Sugarcane	1.453	1.023	1.486	24,228	2,209	.086	2,214	24,276	1.489
Peanut	.386	.951	.367	5,984	453	.018	463	6,118	.375
Fruits	2.254	.967	2.180	35,543	5,138	.200	5,148	35,612	2.184
Vegetables	1.563	.977	1.527	24,896	4,582	.178	4,581	24,895	1.527
					25,751	1.001			

Sources of Information: Column 1 - Tabld D.3, column 9.
Column 2 - Table 7.2, column 1976-77.
Column 4 - Column 3 x 1977's provincial average per hectare cash expenditure. Table 5.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1977. Table 5.3.
Column 7 - Column 6 x 1977's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1977. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 7.3.

Table D.5. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative III, 1978

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1977	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1977-78	Columns 1 x 2	Unadjusted per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.850	1.008	.854	15,702	11,715	.402	11,746	15,743	.856
Sweet Potato	.646	.962	.621	11,418	2,655	.091	2,659	11,435	.622
Corn	.422	.953	.402	7,391	261	.009	263	7,442	.405
Soybean and Other Beans	.305	.944	.288	5,295	210	.007	205	5,165	.281
Tea	.226	.951	.215	3,953	108	.004	117	4,290	.233
Sugarcane	1.489	1.030	1.534	28,204	2,560	.088	2,571	28,324	1.541
Peanut	.375	.951	.357	6,564	488	.017	497	6,681	.363
Fruits	2.184	.969	2.116	38,905	5,879	.202	5,902	39,058	2.124
Vegetables	1.527	.977	1.492	27,432	5,271	.181	5,289	27,524	1.497
					29,147	1.001			

Sources of Information: Column 1 - Tabld D.4, column 9
Column 2 - Table 7.2, column 1977-1978.
Column 4 - Column 3 x 1978's provincial average per hectare cash expenditure. Table 7.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1978. Table 5.3.
Column 7 - Column 6 x 1978's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1978. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 7.3.

Table D.6. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative III, 1979

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1978	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1978-79	Columns 1 x 2	Unadjusted per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.856	1.008	.863	17,735	13,198	.437	14,450	19,417	.945
Sweet Potato	.622	.963	.599	12,309	2,866	.095	3,141	13,488	.656
Corn	.405	.951	.385	7,912	293	.010	331	8,917	.434
Soybean and Other Beans	.281	.943	.265	5,446	206	.007	231	6,114	.298
Tea	.233	.950	.221	4,542	121	.004	132	4,969	.242
Sugarcane	1.541	1.029	1.586	32,592	2,946	.098	3,240	35,854	1.745
Peanut	.363	.951	.345	7,090	518	.017	562	7,708	.375
Fruits	2.124	.968	2.056	42,251	7,033	.233	7,704	46,286	2.252
Vegetables	1.497	.976	1.461	30,024	6,023	.199	6,580	32,800	1.596
					30,204	1.000			

Sources of Information: Column 1 - Table D.5, column 9.
Column 2 - Table 7.2, column 1978-79.
Column 4 - Column 3 x 1979's provincial average per hectare cash expenditure. Table 7.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1979. Table 5.3.
Column 7 - Column 6 x 1979's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1979. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 7.3.

Table D.7. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative III, 1980

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure in 1979	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1979-80	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.945	1.008	.953	23,092	17,139	.396	15,605	21,024	.868
Sweet Potato	.656	.959	.629	15,241	3,555	.082	3,231	13,853	.572
Corn	.434	.951	.413	10,007	389	.009	355	9,115	.376
Soybean and Other Beans	.298	.945	.282	6,833	247	.006	236	6,533	.270
Tea	.242	.953	.231	5,597	146	.003	118	4,547	.188
Sugarcane	1.745	1.028	1.794	43,470	3,911	.090	3,546	39,416	1.627
Peanut	.375	.950	.356	8,626	618	.014	552	7,699	.318
Fruits	2.252	.966	2.175	52,702	9,413	.217	8,551	47,878	1.976
Vegetables	1.596	.974	1.555	37,679	7,892	.182	7,172	34,242	1.413
					43,310	.999			

Sources of Information:
Column 1 - Table D.6, column 9.
Column 2 - Table 7.2, column 1979-80.
Column 4 - Column 3 x 1980 provincial average per hectare cash expenditure. Table 7.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1980. Table 5.3.
Column 7 - Column 6 x 1980 total cash expenditure for the production of the major crops.
Column 8 - Column 7 x 1980's by the number of hectares cropped in 1980. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 7.3.

Table D.8. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative III, 1981

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1980	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1980-81	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.868	1.012	.878	23,495	17,393	.395	17,387	23,488	.878
Sweet Potato	.572	.964	.551	14,745	3,445	.078	3,433	14,698	.549
Corn	.376	.954	.359	9,607	392	.009	396	9,703	.363
Soybean and Other Beans	.270	.945	.255	6,824	236	.005	220	6,361	.238
Tea	.188	.950	.179	4,790	122	.003	132	5,199	.194
Sugarcane	1.627	1.027	1.671	44,716	4,005	.091	4,006	44,718	1.671
Peanut	.318	.953	.303	8,108	570	.013	572	8,134	.304
Fruits	1.976	.970	1.917	51,299	9,831	.223	9,816	51,221	1.914
Vegetables	1.413	.978	1.382	36,982	8,087	.183	8,055	36,838	1.377
					44,081	1.000			

Sources of Information: Column 1 - Table D.7, Column 9.
Column 2 - Table 7.2, Column 1980-1981.
Column 4 - Column 3 x 1981's provincial average per hectare cash expenditure. Table 7.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1981. Table 5.3.
Column 7 - Column 6 x 1981's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1981. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 7.3.

Table D.9. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative III, 1982

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1981	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1981-82	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.878	1.007	.884	26,433	19,516	.391	19,469	26,369	.882
Sweet Potato	.549	.968	.531	15,878	3,721	.074	3,685	15,749	.527
Corn	.363	.957	.347	10,376	445	.009	448	10,460	.350
Soybean and Other Beans	.238	.947	.225	6,728	223	.004	199	6,021	.201
Tea	.194	.955	.185	5,532	137	.003	149	6,021	.201
Sugarcane	1.671	1.027	1.716	51,312	4,576	.092	4,581	51,369	1.718
Peanut	.304	.951	.289	8,642	597	.012	598	8,652	.289
Fruits	1.914	.975	1.866	55,797	11,474	.230	11,452	55,692	1.862
Vegetables	1.377	.985	1.356	40,547	9,257	.185	9,211	40,350	1.349
					49,946	1.000			

Sources of Information: Column 1 - Tabld D.8, Column 9.
Column 2 - Tabld 7.2, column 1981-82.
Column 4 - Column 3 x 1982's prvincial average per hectare cash expenditure. Table 7.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1982. Table 5.3.
Column 7 - Column 6 x 1982's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1982. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 7.3.

Table D.10. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative III, 1983

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1982 (1)	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1982-83 (2)	Columns 1 x 2 (3)	Unadjusted Per Hectare Cash Expenditure (4)	Unadjusted Total Cash Expenditure for Crop$_i$ (5)	Column 5 Divided by the Sum of Column 5 (6)	Adjusted Total Cash Expendiutre for Crop$_i$ (7)	Adjusted Per Hectare Cash Expenditure for Crop$_i$ (8)	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure (9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.882	1.012	.893	30,137	22,193	.388	22,092	30,000	.889
Sweet Potato	.527	.967	.510	17,211	4,033	.071	4,043	17,252	.511
Corn	.350	.957	.335	11,306	508	.009	512	11,398	.338
Soybean and Other Beans	.201	.949	.191	6,446	204	.004	228	7,203	.213
Tea	.201	.955	.192	6,480	157	.003	171	7,045	.209
Sugarcane	1.718	1.026	1.763	59,498	5,282	.092	5,238	59,003	1.748
Peanut	.289	.955	.276	9,314	632	.011	626	9,237	.274
Fruits	1.862	.973	1.812	61,151	13,493	.236	13,437	60,897	1.804
Vegetables	1.349	.982	1.325	44,716	10,658	.186	10,590	44,431	1.317
					57,160	1.000			

Sources of Information:
Column 1 - Table D.9, column 9.
Column 2 - Table 7.2, column 1982-1983.
Column 4 - Column 3 x 1983's provincial average per hectare cash expenditure. Table 7.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1983.
Column 7 - Column 6 x 1983's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1983. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 7.3.

Table D.11. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative III, 1984

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1983	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1983-84	Columns 1 x 2	Unadjusted per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.889	1.012	.900	34,334	25,217	.385	25,131	34,216	.897
Sweet Potato	.511	.966	.494	18,846	4,423	.068	4,439	18,913	.496
Corn	.338	.957	.323	12,322	581	.009	587	12,455	.326
Soybean and Other Beans	.213	.948	.202	7,706	235	.004	261	8,571	.225
Tea	.209	.955	.200	7,630	181	.003	196	8,271	.217
Sugarcane	1.748	1.032	1.804	68,821	6,083	.093	6,071	68,680	1.800
Peanut	.274	.956	.262	9,995	665	.010	653	9,806	.257
Fruits	1.804	.973	1.755	66,951	15,852	.242	15,796	66,716	1.749
Vegetables	1.317	.982	1.293	49,327	12,275	.187	12,206	49,051	1.286
					65,512	1.001			

Sources of Information: Column 1 - Table D.10, column 9.
Column 2 - Tabld 7.2, column 1983-1984.
Column 4 - Column 3 x 1984's provincial average per hectare cash expenditure. Table 7.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1984. Table 5.3.
Column 7 - Column 6 x 1984's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1984. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 7.3.

APPENDIX E

PROJECTED PER HECTARE CASH EXPENDITURES IN TAIWAN UNDER POLICY ALTERNATIVE IV, 1975-1984

Table E.1. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative IV, 1975

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1974	Crop Price Change$_i$ Relative to Average Crop Price, 1974-75	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.833	1.011	.842	10,882	8,183	.404	8,112	10,787	.835
Sweet Potato	.728	.976	.711	9,189	2,127	.105	2,108	9,109	.705
Corn	.476	.965	.459	5,932	181	.009	181	5,909	.457
Soybean and Other Beans	.360	.959	.345	4,459	202	.010	201	4,430	.343
Tea	.206	.963	.198	2,559	75	.004	80	2,748	.213
Sugarcane	1.385	1.016	1.407	18,184	1,673	.083	1,667	18,114	1.402
Peanut	.443	.964	.427	5,519	434	.021	422	5,366	.415
Fruits	2.399	.982	2.356	30,449	3,823	.189	3,795	30,225	2.339
Vegetables	1.640	.991	1.625	21,002	3,546	.175	3,514	20,810	1.610
					20,244	1.000			

Sources of Information:
Column 1 - Table D.1, column 9.
Column 2 - Table 8.2, column 1974 to 1975.
Column 4 - Column 3 x 1975's provincial average per hectare cash expenditure. Table 8.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1975. Table 5.3.
Column 7 - Column 6 x 1975's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1975. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 8.3.

Table E.2. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative IV, 1976

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1975	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1975-76	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.835	.992	.828	12,046	9,035	.401	9,133	12,177	.837
Sweet Potato	.705	.958	.675	9,820	2,276	.101	2,300	9,923	.682
Corn	.457	.947	.433	6,299	202	.009	205	6,387	.439
Soybean and Other Beans	.343	.938	.322	4,684	203	.009	205	4,730	.325
Tea	.213	.945	.201	2,924	83	.004	91	3,191	.219
Sugarcane	1.402	1.008	1.413	20,556	1,882	.083	1,890	20,646	1.419
Peanut	.415	.946	.393	5,717	441	.020	455	5,905	.406
Fruits	2.339	.964	2.255	32,806	4,410	.196	4,464	33,134	2.278
Vegetables	1.610	.972	1.565	22,768	4,014	.178	4,054	22,996	1.581
					22,556	1.001			

Sources of Information: Column 1 - Table E.1, column 9.
Column 2 - Table 8.2, column 1975-76.
Column 4 - Column 3 x 1976's provincial average per hectare cash expenditure. Table 8.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1976. Table 5.3.
Column 7 - Column 6 x 1976's total cash expnediture for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1976. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 8.3.

Table E.3. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternatives IV, 1977.

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1976	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1976-77	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.837	1.006	.842	13,653	10,214	.397	10,163	13,585	.838
Sweet Potato	.682	.969	.661	10,718	2,488	.097	2,483	10,696	.660
Corn	.439	.961	.422	6,843	230	.009	230	6,841	.422
Soybean and Other Beans	.325	.952	.309	5,010	208	.008	205	4,944	.305
Tea	.219	.958	.210	3,405	95	.004	102	3,672	.226
Sugarcane	1.419	1.016	1.442	23,382	2,132	.083	2,125	23,301	1.437
Peanut	.406	.059	.389	6,308	478	.019	486	6,423	.396
Fruits	2.278	.976	2.223	36,046	5,211	.203	5,197	35,949	2.217
Vegetables	1.581	.985	1.557	25,247	4,647	.181	4,634	25,176	1.553
					25,703	1.001			

Sources of Information:
Column 1 - Table E.2, Column 9.
Column 2 - Table 8.2, column 1976 to 1977.
Column 4 - Column 3 x 1977's provincial average per hectare cash expenditure. Table 8.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1977. Table 5.3.
Column 7 - Column 6 x 1977's total cash expenditure for the rpoduction of the major crops.
Column 8 - Column 8 divided by the number of hectares cropped in 1977. Table 5.3.
Column 9 - Column 8 divided by the provincial average for per hectare cash expenditure. Table 8.3.

Table E.4. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative IV, 1978

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1977	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1977-78	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.838	1.006	.843	15,221	11,357	.396	11,363	15,230	.843
Sweet Potato	.660	.968	.639	11,538	2,683	.093	2,669	11,476	.636
Corn	.422	.958	.404	7,295	258	.009	258	7,308	.405
Soybean and Other Beans	.305	.950	.290	5,236	207	.007	201	5,072	.281
Tea	.226	.957	.216	3,900	106	.004	115	4,213	.233
Sugarcane	1.437	1.015	1.459	26,344	2,392	.083	2,382	26,235	1.453
Peanut	.396	.958	.379	6,843	509	.018	517	6,947	.385
Fruits	2.217	.975	2.162	39,037	5,899	.205	5,883	38,927	2.156
Vegetables	1.553	.983	1.527	27,572	5,298	.185	5,309	27,627	1.530
					28,709	1.000			

Sources of Information:
Column 1 - Table E.3, column 9.
Column 2 - Table 8.2, column 1977 to 1978.
Column 4 - Column 3 x 1978's provincial average per hectare cash expenditure. Table 8.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1978. Table 5.3.
Column 7 - Column 6 x 1978's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1978. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 8.3.

Table E.5. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative IV, 1979

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1978	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1978-79	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.843	.934	.787	15,113	11,247	.390	12,050	16,193	.843
Sweet Potato	.636	.904	.575	11,042	2,571	.089	2,750	11,808	.615
Corn	.405	.890	.360	6,913	256	.009	478	7,499	.391
Soybean and Other Beans	.281	.883	.248	4,762	180	.006	185	4,897	.255
Tea	.233	.889	.207	3,975	106	.004	124	4,644	.242
Sugarcane	1.453	.939	1.364	26,193	2,367	.082	2,534	28,034	1.460
Peanut	.385	.889	.342	6,567	479	.017	525	7,196	.375
Fruits	2.156	.905	1.951	37,465	6,236	.216	6,674	40,097	2.088
Vegetables	1.530	.913	1.397	26,827	5,382	.187	5,778	28,802	1.500
					28,824	1.000			

Sources of Information:
Column 1 - Table E.4, column 9.
Column 2 - Table 8.2, column 1978 to 1979.
Column 4 - Column 3 x 1979's provincial average per hectare cash expenditure. Table 8.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1979. Table 5.3.
Column 7 - Column 6 x 1979's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1979. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 8.3.

Table E.6. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative IV, 1980

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1979	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1979-80	Columns 1 x 2	Unadjusted Per Hecatre Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.843	1.083	.913	20,180	14,978	.386	13,875	18,694	.846
Sweet Potato	.615	1.040	.640	14,146	3,299	.085	3,055	13,099	.593
Corn	.391	1.032	.404	8,930	347	.009	324	8,314	.376
Soybean and Other Beans	.255	1.025	.261	5,759	208	.005	180	4,966	.225
Tea	.242	1.033	.250	5,526	144	.004	144	5,530	.250
Sugarcane	1.460	1.097	1.602	35,409	3,186	.082	2,947	32,759	1.482
Peanut	.375	1.030	.386	8,532	611	.016	575	8,026	.363
Fruits	2.088	1.048	2.188	48,361	8,637	.223	8,016	44,881	2.031
Vegetables	1.500	1.057	1.586	35,055	7,342	.189	6,794	32,436	1.467
					38,752	.999			

Sources of Information:
Column 1 - Table E.5, column 9
Column 2 - Table 8.2, column 1979-80.
Column 4 - Column 3 x 1980's prvincial average per hectare cash expenditure. Table 8.3.
Column 5 - Column 4 x number of hecatres cropped$_i$ in 1980. Table 5.3.
Column 7 - Column 6 x 1980's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1980. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 8.3.

Table E.7. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative IV, 1981

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1980	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1980-81	Columns 1 x 2	Unadjusted Per hectare Cash Expenditure	Unadjsuted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.846	1.007	.852	21,297	15,765	.383	15,748	21,274	.851
Sweet Potato	.593	.968	.574	14,348	3,352	.082	3,372	14,433	.577
Corn	.376	.958	.360	8,999	367	.009	370	9,064	.363
Soybean and Other Beans	.225	.948	.213	5,324	184	.004	164	4,754	.190
Tea	.250	.953	.238	5,949	151	.004	164	6,476	.259
Sugarcane	1.482	1.015	1.504	37,595	3,368	.082	3,372	37,641	1.506
Peanut	.363	.957	.347	8,674	610	.015	617	8,767	.351
Fruits	2.031	.972	1.974	49,344	9,456	.230	9,457	49,348	1.974
Vegetables	1.467	.981	1.439	35,971	7,866	.191	7,854	35,916	1.437
					41,129	1.000			

Sources of Information: Column 1 - Table E.6, column 9.
Column 2 - Table 8.2, column 1980-81.
Column 4 - Column 3 x 1981's provincial average per hectare cash expenditure. Table 8.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1981. Table 5.3.
Column 7 - Column 6 x 1981's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1981. Table 5.3.
Column 9 - Ratio of per hectare expenditure to the province's average per hectare cash expenditure. Table 8.3.

Table E.8. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative IV, 1982

Crop	Ratio of Per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1981	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1981-82	Columns 1 x 2	Unadjusted Per Hectare Cash Expenditure	Unadjusted Total Cash Expenditure for Crop$_i$	Column 5 Divided by the Sum of Column 5	Adjusted Total Cash Expenditure for Crop$_i$	Adjusted Per Hectare Cash Expenditure for Crop$_i$	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.851	1.003	.854	23,979	17,704	.377	17,627	23,874	.850
Sweet Potato	.577	.973	.561	15,752	3,685	.079	3,694	15,787	.562
Corn	.363	.961	.349	9,799	420	.009	421	9,822	.350
Soybeans and Other Beans	.190	.952	.181	5,082	168	.004	187	5,654	.201
Tea	.259	.959	.248	6,963	173	.004	187	7,538	.268
Sugarcane	1.506	1.014	1.527	42,875	3,823	.081	3,787	42,469	1.513
Peanut	.351	.960	.337	9,462	653	.014	655	9,478	.338
Fruits	1.974	.981	1.936	54,359	11,178	.238	11,128	54,114	1.927
Vegetables	1.437	.990	1.423	39,955	9,122	.194	9,071	39,731	1.415
					46,926	1.000			

Sources of Information:
Column 1 - Table E.7, column 9.
Column 2 - Table 8.2, column 1981 to 82.
Column 4 - Column 3 x 1982's provincial average per hectare cash expenditure. Table 8.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1982. Table 5.3.
Column 7 - Column 6 x 1982's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1982. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 8.3.

Table E.9. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative IV, 1983

Crop	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure for 1982 (1)	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1982-83 (2)	Columns 1 x 2 (3)	Unadjusted Per Hectare Cash Expenditure (4)	Unadjusted Total Cash Expenditure for Crop$_i$ (5)	Column 5 Divided by the Sum of Column 5 (6)	Adjusted Total Cash Expenditure for Crop$_i$ (7)	Adjusted Per Hectare Cash Expenditure for Crop$_i$ (8)	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure (9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.850	1.008	.857	26.672	19,641	.373	19,585	26,596	.855
Sweet Potato	.562	.972	.546	16,993	3,982	.076	3,991	17,030	.547
Corn	.350	.961	.336	10,457	470	.009	473	10,511	.338
Soybean and Other Beans	.201	.953	.192	5,975	187	.004	210	6,643	.213
Tea	.268	.960	.257	7,998	194	.004	210	8,662	.278
Sugarcane	1.513	1.014	1.534	47,741	4,238	.080	4,201	47,315	1.520
Peanut	.338	.960	.324	10,084	684	.013	683	10,067	.323
Fruits	1.927	.978	1.885	58,665	12,945	.246	12,917	58,538	1.881
Vegetables	1.415	.987	1.397	43,477	10,363	.197	10,344	43,397	1.394
					52,705	1.002			

Sources of Information: Column 1 - Table E.8, column 9.
Column 2 - Table 8.2, column 1982-83.
Column 4 - Column 3 x 1983's provincial average per hectare cash expenditure. Table 8.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1983. Table 5.3.
Column 7 - Column 6 x 1983's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1983. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 8.3.

Table E.10. Projected per Hectare Cash Expenditure on Major Crops Under Policy Alternative IV, 1984

Crop	Ratio of per Hectare Expenditure$_i$ to the Province's Average Per Hectare Cash Expenditure for 1983 (1)	Crop Price Change$_i$ Relative to Average Crop Price$_t$ 1983-84 (2)	Columns 1 x 2 (3)	Unadjusted Per Hectare Cash Expenditure (4)	Unadjusted Total Cash Expenditure for Crop$_i$ (5)	Column 5 Divided by the Sum of Column 5 (6)	Adjusted Total Cash Expenditure for Crop$_i$ (7)	Adjusted Per Hectare Cash Expenditure for Crop$_i$ (8)	Ratio of Per Hectare Expenditure to the Province's Average Per Hectare Cash Expenditure (9)
				(NT $)	(NT$ Mill.)		(NT$ Mill.)	(NT $)	
Rice	.855	1.008	.862	30,003	22,036	.368	21,916	29,839	.857
Sweet Potato	.547	.971	.531	18,482	4,338	.072	4,288	18,270	.525
Corn	.338	.962	.325	11,312	534	.009	536	11,363	.326
Soybean and Other Beans	.213	.954	.203	7,066	215	.004	238	7,820	.225
Tea	.278	.960	.267	9,293	220	.004	238	10,062	.289
Sugarcane	1.520	1.021	1.552	54,019	4,775	.080	4,764	53,902	1.549
Peanut	.323	.961	.310	10,790	718	.012	715	10,736	.308
Fruits	1.881	.978	1.840	64,043	15,163	.253	15,067	63,637	1.828
Vegetables	1.394	.988	1.377	47,928	11,927	.199	11,851	47,625	1.368
					59,926	1.001			

Sources of Information:
Column 1 - Table E.9, column 9.
Column 2 - Table 8.2, column 1983 to 1984.
Column 4 - Column 3 x 1984's provincial average per hectare cash expenditure. Table 8.3.
Column 5 - Column 4 x number of hectares cropped$_i$ in 1984. Table 5.3.
Column 7 - Column 6 x 1984's total cash expenditure for the production of the major crops.
Column 8 - Column 7 divided by the number of hectares cropped in 1984. Table 5.3.
Column 9 - Column 8 divided by the provincial average of per hectare cash expenditure. Table 8.3.