A GENERALIZED ECONOMETRIC SPREAD SHEET (GESS) MODEL OF THE HAITIAN AGRICULTURAL SECTOR

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CHAPTER I

INTRODUCTION

Agricultural pricing policies in developing countries have not always been satisfactory. Haiti, like other developing countries, has attempted to use agricultural price policies as a stimulus to enhance development, to increase rural incomes, and to increase production of food and cash crops. Agricultural price policy can include price subsidies, export taxes, producer price supports, import licensing, etc. Often these policies have been unsatisfactory; they discriminated against the agricultural sector due to lack of analysis of their effects on producers, consumers and government. Export taxes on major commodities like coffee and cocoa have reduced producer prices and have deprived Haiti of its comparative advantage in the production of these commodities. Therefore it is the purpose of this study to scrutinize Haitian agricultural pricing policies by using a Generalized Econometric Spread Sheet and (GESS) model to determine the effects of various agricultural pricing policies upon agricultural commodity production, consumption, and net trade balances, as well as farm prices and retail prices.

Objectives and Organization of the Study

This study uses the generalized econometric spread sheet model (GESS) as a framework to estimate the effects of various price policies in Haiti. Two key scenarios, policy alternatives, will be analyzed. The first scenario consists of a reduction in tariffs from 50 to 10 percent on rice and maize. The second scenario constitutes a reduction in export taxes on coffee,from 50 to 20 percent, and sugarcane from 50 to 10 percent. The effects of these two scenarios will be determined in terms of changes in retail price, farm price, retail level demand, retail level supply, and net trade balance.

This study is organized into six chapters. Chapter I deals with problem statement and the introduction followed by the objectives and organization of the study. Chapter II gives an overview of the Haitian economy. Chapter III furnishes a review of theoretical literature on agricultural price policy. Chapter IV presents the methodological framework used to analyze the effects of agricultaral pricing policy. Chapter V deals with the empirical results and their implications. Finally chapter VI provides a summary, conclusions, and recommendations for further research.

CHAPTER II

AN OVERVIEW OF THE HAITIAN ECONOMY

Introduction

Haiti is a caribbean nation with a population of 6.4 million growing at 1.8 percent a year. Haiti's land area is approximately 28,000 square kilometers. The climate ranges from a dry heat in the plains to a semiarid climate in the mountains. The mean annual temperature is in the vicinity of 27.5 degrees centigrade. There are four seasons divided into two categories; a rainy season and a dry season. Haiti, is among the poorest countries in the Western Hemisphere, with a per capita income of approximately $400. The country has remained predominantly an agricultural based economy in which three-quarters of the population depend on agriculture for their intake of calories or on cash crops. According to a world bank study, economic growth for the 1970s averaged 5.3% a year with some improvement in income per capita.

During the early 1980s, the Haitian Government pursued several policies that disrupted the economy and slowed its growth. But in 1987 the government changed its policies. It intervened in the economy with emphasis on total expenditures; reduced tariffs on imported commodities; reduced taxes on exported goods; and backed-up these actions with incentives to the industrial sector. These actions led to an improvement in the economy. However recent political instability leading to an overthrow of the democratic government by the military regime two years ago, has caused the economic condition of Haiti to worsen.

Rice remains the major cereal consumed in the urban area. According to Holly (1955) rice and beans are the basic food of the urban population. Although the farmers do produce it, they consume very little of it; they get used to other crops like sweet potatoes, bananas, yams etc. For the period of 1970 to 1990, production ranged from 80,000 MT in 1970 to 100,000 MT in 1990. Rice is mostly used for domestic consumption. In 1970, Haiti imported 4 MT of rice valued at 4,000 US dollars. Since then import demand for rice has been on the rise. The peak year was 1977 in which imports reached a maximum of 44,000 MT. After 1977 imports of rice experienced a decrease; for example in 1978 and 1979 imports were about 16,000 MT. In 1982 imports rose to 2,500 MT and then to 4,000 MT by 1990. The decrease in imports after 1977 is primarily due to a decrease in purchasing power in both rural and urban areas and to government intervention i.e, import restrictions, duties, and import licenses on rice. Figure 1 shows production, imports, and consumption of rice for the period of 1970 to 1990 in 1,000/MT.

Maize and corn are used interchangeably in Haiti. Maize is one of the most important cereals in the Haitian diet. This food crop is cultivated both at sea level and on the slopes of various mountains in Haiti. During the early 1930s, Haiti exported corn to the neighboring countries of the Western Hemisphere like The Bahamas and Curacao. Data from 1970 to 1990 showed a decrease in maize production in Haiti from 240,000 MT in 1970 to 163,000 MT in 1990. Prior to 1975, there were no imports of maize in Haiti. Imports for 1975 were about 3,971 MT; in 1976 imports decreased to 94 MT. In 1979 they reached 25,000 MT, but declined to 5,000 MT in 1980. The 1980s experienced a sharp decline in import demand for maize from 30,000 MT in 1985 to 1,100 MT in 1990. The sharp decline in import is again due to agricultural pricing policies of the 1980s. Since Haiti has not exported maize for some time, there is negative trade balance on maize/corn. Despite low yields, which result from traditional techniques of production, Haiti still remains competitive in maize production. Figure 2 shows production, imports, and trade on maize, in 1,000/MT, for the past 21 years.

Major export crops of the economy are coffee, cotton, bananas, cocoa and sisal. Coffee, the main export crop, accounts for 36 percent of total exports. According to Lopez and Dorsainvil (1990), coffee production for the most part has remained stagnant and income to coffee growers has been persistently low. Despite low yields and high labor inputs per unit of output, Norton (1986) found that Haiti remains a competitive producer of coffee. Figure 3 shows the production, exports and consumption of coffee from 1970 to 1990 in 1,000/MT.

Sugarcane is, one of the main export crops, usually exported as sugar. During the period of French colonization, sugarcane was the main crop produced followed by indigo, cotton, and coffee. Due to the availability of slave labor and the absence of competition, sugarcane contributed greatly to the wealth of the colony and of its growers. Data collected from the period of 1970 to 1990 showed that sugarcane production remained stable averaging 3 million metric tons a year. Consumption has increased from 175,604 (MT) in 1970 to 200,000 (MT) in 1990. In terms of net trade balance, Haiti exports over 90 percent of its production. Norton (1986) in his study on Haitian Agriculture found that Haiti is a relatively low-cost producer of cane. The cost of producing cane in 1986 was between US$ 121/MT and US$ 152/MT. As a result, he suggests that Haiti should expand its cane production. Figure 4 presents sugarcane production, trade and consumption of Haiti from 1970 to 1990 in 1,000/MT.

Agricultural Pricing Policy

Hanan (1986) in an article on agricultural pricing policies and the environment in Haiti, has reported that population pressures, destruction of forests for fuel, construction, and cultivation of food crops on steep slopes are to be considered as the primary causes of soil erosion in Haiti and decreasing profitability of farms, declining per capita production, malnutrition, increased rural poverty, etc. The causes of farming practice leading to high rates of soil erosion are complex, but result largely from traditional non-market phenomenon and the government's agricultural pricing and trade policies in terms of export taxes and lack of technical support to farmers.

For the past fifteen years government policies such as import restrictions and the devaluation of the Haitian gourde vis-a-vis the U.S. dollar led to higher taxes on crops like coffee, cocoa, maize, sorghum and rice.

Approximately 15,000 hectares of cultivated land have been lost to erosion yearly. Land area devoted to coffee has been utilized for the production of cash crops. Farmers chose wrong crops for cultivation. Thus, a recommendation is that, social and economic measures need to be improved through production and resource conservation particularly in rural areas. This recommendation has been followed. In 1987 the government eliminated the export taxes on coffee. There were also some reductions in import of major commodities like rice, maize, beans, millet, sugar, pork meat, and chicken parts, etc. According to Jensen et al (1990) these commodities are still subject to import licensing and an ad valorem tax of 50 percent. Athough these reforms do bring some ameloriation in the economy, pricing policy continues to have significant effect on production, consumption, net trade balance, and retail and farm level prices.

Fig. 1. Rice production, imports, and consumption

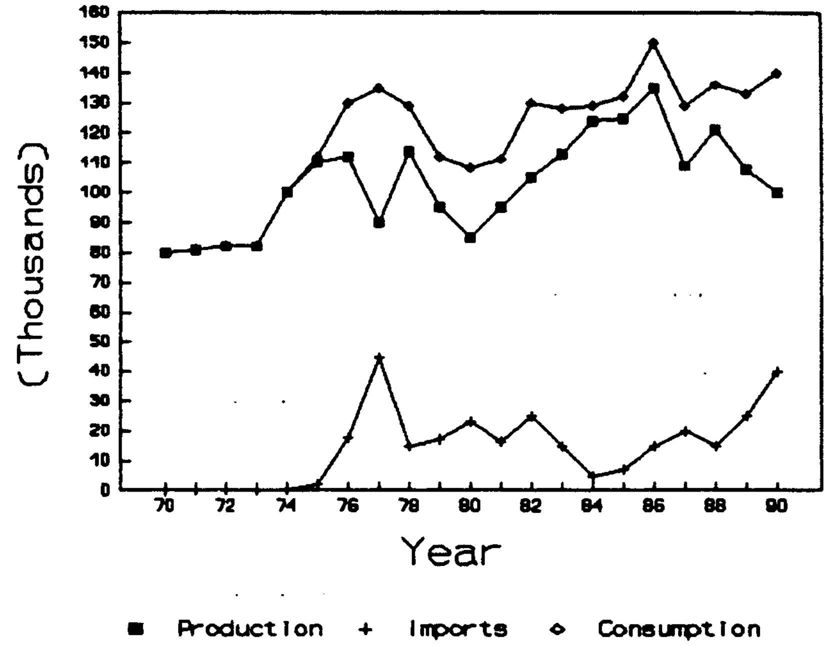


Fig. 2. Maize production, imports, and Consumption

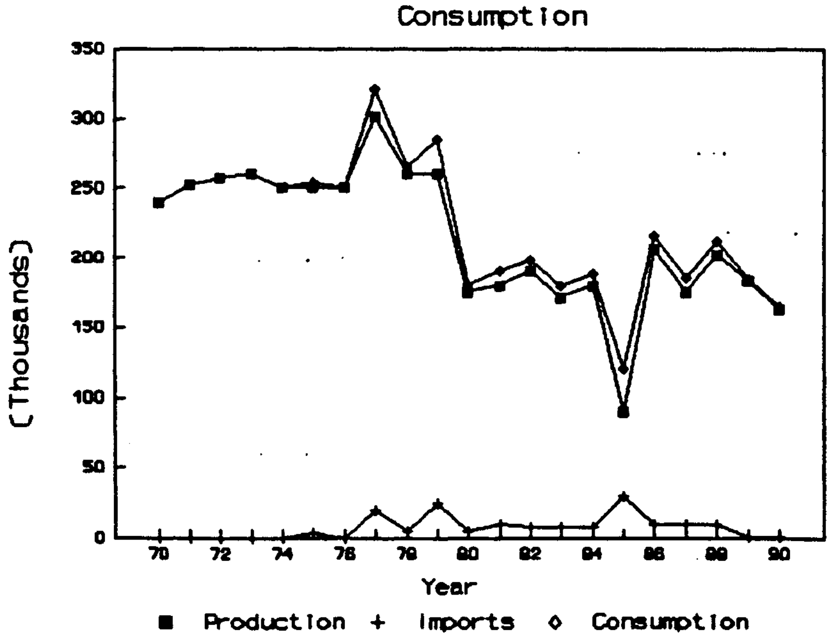
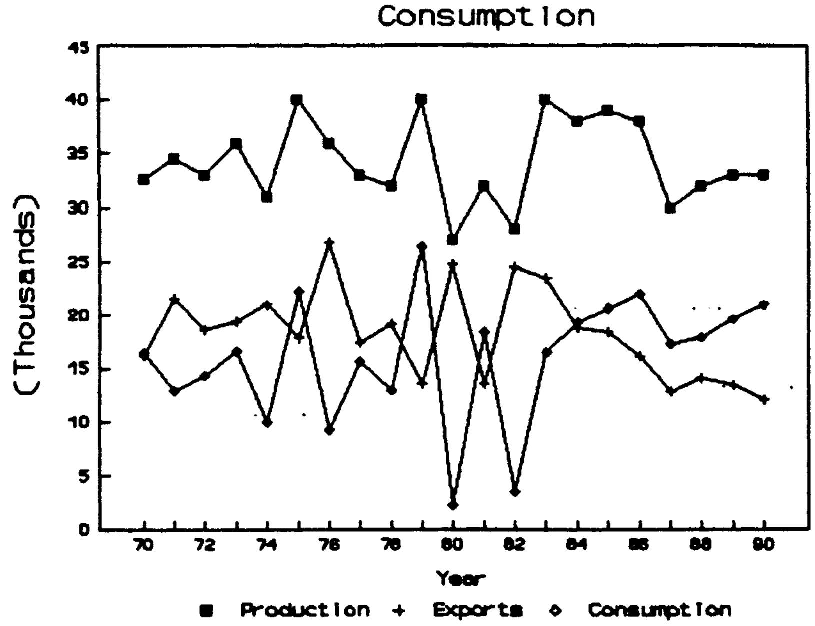


Fig. 3. Coffee production, Exports, and Consumption



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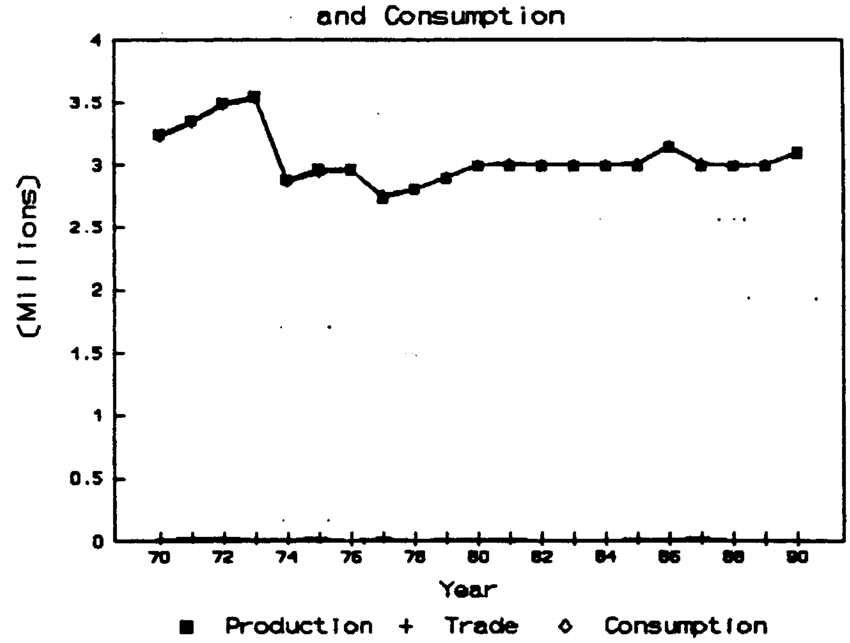

CHAPTER III

LITERATURE REVIEW

Introduction

This chapter deals with past studies related to agricultural pricing policy and government intervention in the agricultural sector. The selected studies, mostly concerned with developing countries, provide a review of issues related to agricultural policy analysis and the methodologies used to examine these issues. Their contributions will provide great insight for this study, particularly in their relations to the problem and objectives addressed in this study. This chapter is divided into two parts. The first part deals with agricultural pricing policies and the second part is concerned with agricultural price analysis.

Agricultural Pricing Policies

According to Brown (1978) for the past 25 years many developing countries have adopted agricultural pricing policies in order to decrease the prices of food and to increase the prices of manufactured goods. This has most commonly been done through trade and foreign exchange practices, along with direct price, taxes, and other market-control measures. The reason for the distortion of the terms of trade against agriculture is based on the following:

(a) that aggregate agricultural production is not very responsive to price changes;

(b) that the chief beneficiaries of higher prices would be larger farmers;

(c) that higher food and other agriculture-related prices such as clothing would most adversely affect low-income consumers; and

(d) that manufacturing provides a more rapid means of growth, and that achieving that growth depends upon large transfers of income (profits) and foreign exchange from agriculture to manufacturing.

Thus decreasing agricultural prices and increasing manufacturing prices will yield to economic growth and toward more equality in income distribution. According to Brown these policies often lead to the deterioration of the agricultural sector. He is in favor of higher prices for agricultural products and elimination of distortions that affect the terms of trade of agricultural commodities. Low agricultural prices do not provide safe haven for low-income recipients. For example low prices in Peru have reduced the production of frijol canario, a popular bean mostly consumed by low-income urban consumers. Also price controls on meat and maize in Kenya have yielded a transfer of income from low income herdsmen and farmers to middle and upper urban groups.

In terms of marketing controls, most developing countries control the marketing margin between producers and consumers by discriminating against the middlemen. Again, Peru has adopted such a policy which may represent major constraints to agricultural production and may lead to the destruction of a pool of qualified marketing agents. As a result there has been little private investment in storage facilities. Thus "periodic gluts and scarcities" occured and wholesale truckers transported goods to the central market on a daily basis to reap benefits of spatial price differences. Finally due to lack of information to both producers and consumers, a lot of transactions took place on the black market.

Pursued Brown, countries like Argentina, Egypt, Kenya, the Ivory Coast, Peru, the Philippines, Thailand, and Uruguay who set agricultural commodities prices close to world market prices experienced some improvements in the early 1980s. For example, since 1975 Uruguay has increased farm prices close to world market prices and reduced high rates of protection provided to domestic manufacturing. Kenya by January 1975, adopted free market prices for most agricultural commodities, but controls on wholesale, farm gate and retail prices still persist. Peru has moved gradually in the footsteps of Kenya. By October 1976 domestic rice prices were 10% above world prices in order to increase exports and to reduce domestic consumption. The Ivory Coast also has raised domestic prices of rice above the world market prices, moving from a deficit production to a surplus production. Early 1976 the

Philippines has raised the price of rice to farmers and consumers. Pakistan has also raised its farm gate prices of wheat, rice, and cotton and relaxed the ban on other foodstuffs exports. Finally Egypt has eased price controls to liberalize its economy.

Fox (1978), commenting on Brown's research, stated that although a rising food deficit reflects higher nominal prices, it does not necessarily mean higher food prices relative to nonfood items or amelioration of the real incomes of the rural and urban poor. According to Fox, price changes may be effective in the short run but in the long run they may not be compatible with expected trends. A good example of this was US farmers experience in the early 1980s. Farmers enjoyed the free market policy because it brought about higher prices for them. But when prices began to decline, producers and their representatives resorted to political pressures for higher prices and requested direct payments. Producer response is no different in developing countries.

The effect of uncertainty on producer, handler, processor and consumer decisions received minor attention from Brown. But according to Fox they are crucial. From his experience in Northern Brazil he found that price and yield uncertainty and risk associated with them have imposed some difficulties on modernization of the agricultural sector. Thus a program which will guarantee minimum and maximum prices could be important to many countries' developmental programs. Also, higher agricultural prices may be related to inflation. Thus understanding of the interrelationship of agricultural (food) prices and inflation is needed.

Policies that tend to decrease the cost of production, decrease consumer prices and increase supply affect the agricultural sector. This claim is reinforced by Donalt (1983) who argues that developing countries have adopted measures that affect their agricultural products. These measures lead to price distortions and often cause a welfare loss to society. In his study Donalt has made the distinction between two different country groups. The high industrial income group (The United States, Western Europe, and Japan) who favor high agricultural prices and the low income country group (Brazil, Argentina, Kenya, and so on) who keep their agricultural product prices below international market prices. The number of farmers in the first group decreased drastically despite high food prices and their strong political influence in issues relating to agriculture. Meanwhile, those in the low income group have no political influence and their numbers are enormous. Consumers in the urban areas are better off in terms of political power and income. Central to these low income groups is the tendency to neglect the agricultural sector and to put more emphasis on industrial growth consistent with Brown's (1978) arguments above.

Donalt claimed that organizations such as USAID and the World Bank are quite skeptical of government intervention in the agricultural sector in developing countries. In a 1983 meeting, the World Food Council made some recommendations to developing countries, particularly to the African nations. They were urged to increase price incentives to farmers, to reduce wide spread poverty and to achieve food self-sufficiency. The USAID proposals were as follow:

(a) Food distribution programs should be targeted to particular groups.

(b) Subsidies to agricultural inputs (fertilizer, pesticides, etc) are temporarily justified to introduce new techniques to farmers but should be phased out at the end of the program.

(c) Agricultural lending institutions receiving AID support should set interest rates according to the market demand for funds, or should make substantial efforts to reduce controls where they exist.

Scandizzo and Bruce (1980) undertook a study regarding the methodologies for measuring agricultural price intervention effects. The objective was to develop six informal measures of price intervention in six developing countries (Argentina, Egypt, Kenya, Pakistan, Thailand, and Yugoslavia). The methodologies used were:

(1) The Nominal Protection Coefficient (NPC) which is the ratio of a commodity domestic price (farm gate value) to its border price.

(2) The Effective Protection Coefficient (EPC), is the

ratio of the value added of a commodity in domestic prices to value added measured in border prices.

(3) The Effective Subsidy Coefficient (ESC), is an extended version of EPC but incorporates taxes or subsidies on primary inputs such as land, capital, and interest rates.

(4) The Producer and Consumer Subsidy Equivalents (PSE + CSE) are input subsidies net of indirect taxes without the inclusion of value added given to producers and consumers.

(5) The Domestic Resource Cost (DRC), is the gross value per acre of a crop in comparison to the gross value per acre of the next best alternative, both estimated at international market prices.

(6) The Net Economic Benefit (NEB), is the difference between the gross value of output and the total costs of all inputs, i.e., comparative advantage in terms of economic efficiency.

Scandizzo and Bruce found that market interventions in many developing countries cause domestic terms of trade to work against the agricultural sector to the disadvantage of farm income, foreign exchange earnings, and food production. In terms of recommendations they argued that developing countries should evaluate carefully their interventions and more attention should be focused on the agricultural sector than any other sector. If farmers do not receive reasonable incentives to produce food and fibers relative to comparative cost advantages, any investments in research that are used to transfer technology to farmers will be ineffective.

Jensen, Banskota, Johnson, and Manrique (1991) conducted a study concerning the analysis of agricultural and food price policy in Haiti. In this study, an adaptive policy simulation model was developed to evaluate the impacts of agricultural policies. According to this study, in early 1986, the government of Haiti began a series of economic reforms intended to reduce the degree of government price intervention, to augment efficiencies in the agricultural sector, to eliminate some of the restrictions on the amounts of food imports, and elimination of export taxes on export crops. The extent of hunger and malnutrition in Haiti has forced organizations like USAID and other donors to look at the impacts of agricultural policies and food aid on the agricultural sector. This report was in part sponsored by the USDA.

The adaptive policy simulation model was designed to operate on a microcomputer. The parameters needed for the model were as follow: basic supply and demand for commodities like rice, maize, millet, and wheat; baseline projections for population growth, inflation, and world cereal prices in order. Two policy alternatives were evaluated. First, a selective reduction of the maize import tariff was evaluated. Second, a general reduction of rice, maize, and wheat import tariffs from 50% to 10% was evaluated. As import tariffs on cereal grains were reduced, the overall cereal consumption decreased after the first year; also farm income declined. The year in which the tariffs were reduced, calories available for consumption in the rural area decreased drastically due to a strong negative effect on rural incomes. Meanwhile consumers in the urban area were better off. During the selective reduction of maize tariffs, grain consumption changed. Although maize producers' (and rural) income fell, total grain consumption increased due to a substitution effect. But with the general reduction in grain tariffs, rural incomes and calorie intake both declined, particularly in rural areas.

The study of Bruce and Scandizzo is important to developing countries because it depicts their characteristics in terms of agricultural pricing policy and it provides great insights for policymakers in developing countries. Isabelle Tsakok (1990) used the methodologies of Bruce and Scandizzo to scrutinize agricultural price policy. Her work was prepared for policymakers and their staffs, primarily, in developing countries. In Appendix C of her study she used Lotus 1-2-3, a "friendly" software, to generate coefficients such as NPC and EPC so that practitioners could determine the impacts of a given policy on production, consumption, government revenues, foreign exchange earnings, etc,.

Lutz and Saadat (1988) undertook a study on agricultural pricing policies and their effects on consumers, producers and government in seven developing countries (Argentina, Brazil, Mexico, Thailand, Indonesia, Egypt, and Kenya). Partial equilibrium analysis were used to determine the effects of various policies. A key aspect of this study is that the methodology used enabled the authors to model the linkages between commodity markets which has been lacking in most past studies on agricultural pricing policies.

To determine the effects of interlinked commodities, the partial equilibrium approach was accompanied with cross price elasticities of supply and demand. What's important about the cross price elasticities is that they help improve the correctness of the estimates of the effect of pricing policy intervention on production, consumption, net trade, government revenue, and net social welfare for each country. The partial equilibrium and linkages among markets is one of many approaches that may help scrutinize Agricultural pricing policy in Haiti. One of the limitation of their study is that the partial equilibrium approach does not contain a stochastic element that can help determine the effect of price volatility.

Schultz (1978), undertook a study concerning distortions of Agricultural incentives. According to Schultz, the role of farmers as entrepreneurs, the importance of incentives, and the effects of policy, are important parts of the reality in every country. Farmers are rational and they possess an important human capital tool which is entrepreneurship. When government exercises the entrepreneurial function, instead of farmers, by introducing new techniques to modernize the agricultural sector, their interventions have been proven less efficient to agriculture and to farm families. In terms of economic dynamics of agricultural modernization, Schultz mentioned two important influences that are worth recalling. First, economic disequilibria are inevitable. They cannot be eliminated by law, by public policy, and surely not by rhetoric. Second, the function of farm entrepreneurs is perceiving, interpreting, and responding to new and better opportunities that cannot be performed efficiently by governments.

A good example of economic dynamics of agricultural modernization was the green revolution in India. In Spring 1966, the minister of agriculture in New Delhi, despite government prohibition, imported 18,000 tons of dwarf wheat from Mexico. The new seed was well suited to the agriculture of Punjab and other areas. As a result the farm price and yield of wheat increased rapidly, thus farm entrepreneurs of Punjab adopted the seed because incentives were highly favorable. Thus the adoption of the new seed brought increases in production and real wages of farm labor. According to Schultz what is needed for low-income countries are many green revolutions.

Schultz proceeded by asking two questions. What is the incentive to which farmers respond? And what is an optimum economic incentive? The incentive to which farmers respond is the information that they use in calculating their expected costs, including risks, against the returns they expect to receive. The positive result derived from the calculation is the incentive to enjoy economic gain and avoid losses. An optimum economic result is that producers allocate resources optimally to maximize production at market clearing prices that will maximize consumer utility.

Schultz classified countries under three categories according the economic policies their government's pursue. Under the first category are those in which agricultural production is neither overvalued nor undervalued. The second category comprises those in which agricultural production is overvalued. Finally, those in which agricultural production is undervalued. Schultz emphasized the adverse production effects of policies in low-income countries that undervalue agricultural production. He believed that the unrealized economic potential of agriculture in many low-income countries is too large. The technical possibilities are there but economic opportunities for farmers are lacking. Thus farmers are not making the necessary investments, including the purchase of superior inputs. He concluded that interventions by governments are the primary cause of the lack of optimum economic incentives. To overcome persistent disequilibrium resulted from low agriculture productivity, what is needed are perhaps input availability and efficient use of allocative resources along with pricing, marketing, and economic efficiencies.

Agricultural Price Analysis

Mellor (1989) gave a broad perspective on the world food situation emphasizing its variety. According to Mellor many third world countries suffer from a food deficit and the rest of the world finds itself in a "food glut." A short term solution to the problem involves trade from surplus to deficit countries. But most LDCs have little wealth and for the most part lack of foreign exchange. One characteristic common among LDCs is that they are single crop exporters and food prices fluctuations since the 1970s have made it difficult for them to increase their earnings capability. Thus a long term solution for LDCs perhaps is to use more agricultural technology. Due to the decline of land devoted to agriculture for the past 20 years, increases in production have had to come through higher yields. Thus technology has been the engine of food production's growth. It has been argued that most developed countries must increase their financial and technical aid to less developed countries.

Roe (1989) looked at government interventions of developing countries in the agricultural sector which resulted in the transfer of resources from agriculture. Various methods have been used by governments in developing countries to increase the transfer of resources out of agriculture. Often government interventions are inefficient due to the fact that they distort price incentives in both the agricultural and industrial sectors. Some of the types of interventions used are trade restrictions to reduce agricultural exports and to protect domestic industry from non-agricultural imports. Others are low food prices for urban consumers, government subsidies on agricultural inputs, controls of marketing enterprises, and overvaluation of domestic currency. Overvaluation contributes to foreign trade deficit and debt. Even though many of these policies discriminate against the agricultural sector they have political support. Perhaps the reason is political pressure from self-seeking groups. As recommendations, these interventions should be removed; government programs should be restructured and implemented where markets clearly fail; natural monopolies should be organized to reduce cost and price; tariff and tax rates on imports and exports should be removed; effective programs should be implemented to compensate households for costs of adjustment.

Islam and Subramanian (1989) undertook a study that presents new evidence on income and price elasticities of demand and supply of agricultural exports from the developing countries. They used a consistent and fully specified supply and demand model. Past studies about elasticities of agricultural exports and recent works done by B. Balassa, J. Reidel, and M. T. Lord have been analyzed without differentiating supply from demand response. Islam and Subramanian did differentiate their supply and demand elasticities.

The model for their study was heavily based on Goldstein and Khan (1985). The demand for developing countries agricultural exports depends on the incomes of importing countries (developed countries) and on the relative prices of the exports of developing countries in the markets of developed countries. The demand equation is given by:

$$X^D = \alpha_0 + \alpha_1 Y^* + \alpha_2 (P_x - P^*) \quad (1)$$

Where X^D = demand for developing country exports

Y^* = combined real GNP of developed market economies in 1980 dollars

P_x = dollar unit values of developing country exports

P^* = price level(deflated by the GNP deflator) of developed countries in dollars

$P_x - P^*$ = relative price of exports

When domestic prices in the importing countries are entered the equation is as follow:

$$X^D=\alpha_0+\alpha_1 Y^*+\alpha_2 (P_x-P^*)+\alpha_3 (P_x^*-P^*)\alpha_3>0,\alpha_2\neq-\alpha_3 \quad (2)$$

where P_x^* = price of domestically produced commodities competing closely with developing country exports.

Supply of exports from developing countries is a function of two variables. First, export price and long term trend factors like changes in technology and infrastructure. Second short-term factors like pressure from variation in domestic demand and sudden changes in production. The equation is as follow:

$$X^{s} = \beta_0 + \beta_1(P_x - P) + \beta_2 t + \beta_3(S - \bar{S}) + \beta_4(D - \bar{D}) \qquad (3)$$

where P = price level (deflated by the GNP deflator) of developing countries in dollars.

$P_x - P$ = relative prices of exports

t = time trend

$(S-\bar{S})$ = supply shock measured as the deviation of actual production from trend

$(D-\bar{D})$ = demand pressure measured as the deviation of GNP from trend.

Some of the conclusions drawn from the study were: income and price elasticities of demand for tropical commodities such as tea, coffee, cocoa, bananas are found to be low; those of non-traditional exports like pineapples are found to be high. Thus the lesson for developing countries is to rely less on traditional commodities and to diversify toward non-traditional agricultural exports.

Summary

The studies reviewed in this section dealt with agricultural policy analysis in developing countries. They may be considered as backbones for the study in Haiti. Brown (1978) gave a good account of agricultural pricing policies in developing countries. He concluded that in order to increase the quality of life of rural cosmopolitans, and a better income distribution between urban and rural areas, most developing countries adopted agricultural policies that decreased prices of food and increased prices of manufactured goods through trade and foreign exchange practices. But these policies discriminated against the agricultural sector. For example, price controls on most agricultural commodities resulted in a transfer of income from low income farmers to middle and upper income urban groups. Thus as Donalt (1983) argued, government interventions in developing countries have had negative impacts on producers, consumers and on society's welfare. Fox (1978) argued that price and yield uncertainty and risk have imposed some problems on modernization of the agricultural sector. Schultz (1978) gave a good example of economic dynamics of agricultural modernization, namely the green revolution in India. Schultz concluded that government interventions are a primary cause of the lack of optimum economic incentives. They distort market price and provide misleading information to producers to allocate resources optimally to maximize production and consumer utility.

Scandizzo and Bruce (1980) dealt with methods for measuring the effects of agricultural price intervention. They found that market interventions in developing countries have turned domestic terms of trade against the agricultural sector. They found that income distributions became worse after interventions. In general, the policies failed to meet their objectives. Lutz and Saadat (1988) used a partial equilibrium approach accompanied with cross elasticities of supply and demand to determine the effects of interlinked commodities; and their conclusions were similar to those of Scandizzo and Bruce. Jensen et al, (1991) used an adaptive policy simulation model to analyze agricultural and food price policy in Haiti. When the tariffs on cereal grains were reduced, the overall consumption after the first year was increased; and the level of farm income was reduced due to negative impacts on rural incomes. Finally Islam and Subramanian presented evidence regarding estimates of income and price elasticities of agricultural exports in developing countries. They found low income and price elasticities of demand for tropical commodities such as tea, coffee, and bananas.

Above all, it can be argued that these studies are important to scrutinize agricultural pricing policy and government interventions in developing countries. One thing to be sure about, is that agricultural pricing policies in developing countries often discriminated against the agricultural sector. Thus, it is imperative for developing countries to evaluate carefully their interventions and to pay more attention to the agricultural sector. The study of Bruce and Scandizzo, that of Lutz and Saadat, and that of Jensen et al, will be of great importance to the proposed study in Haiti.

CHAPTER IV

METHODS

Introduction

This chapter deals with the method used to analyze agricultural pricing policy in Haiti. The method adopted for this study is based on the **Generalized Econometric Spreadsheet Simulation (GESS)** model. A number of key parameters are required before the model can be put to work. These parameters are primarily the base year quantities and prices for both supply and demand; the own and cross price elasticities of supply and demand; and historical or budget derived ratios between domestic and world prices for selected commodities. Other parameters are income per capita, population, a production cost index, and farm to retail commodity weight/unit conversion factors. These parameters form the backbone of the model and lead the way to the GESS'applications. The GESS model developed in this study comprises seven commodities, namely rice, beans, coffee, maize, bananas, sugarcane and sorghum.

According to the literature review of competitive market equilibrium, two principal methods of analysis have been used to study pricing policy. They are respectively the partial equilibrium method and the general equilibrium method. Since this study involves a single sector, agriculture, it is obvious that the basis for the **GESS** model is the partial equilibrium method. The partial equilibrium model has been used by Tolley et al.(1982) to scrutinize the agricultural pricing policies in four developing countries. Some of the advantage that arise when using the **GESS** model, in comparison to past studies found in the literature review such as Tolley et al., are the following: a) The **GESS** model gives access to a greater number of commodities; b) **GESS** can incorporate in its structure a stochastic element, useful in determining the effect of price volatility, however use of this potential is beyond the scope of this study; c) linkages among supply and demand, prices and quantities, taxes and subsidies are included; d) finally the **GESS** model uses **LOTUS 1-2-3**, a " user friendly software".

THE GESS Model

The **GESS** has been implemented to operate on a **LOTUS 1-2-3** spreadsheet, a " user friendly software". A clear understanding of supply and demand theory and elasticities are key to understanding and interpreting the results of numerous policy scenarios that can be conducted with the model. Supply and demand responses, as described by elasticities, are at the heart of the **GESS model**.

The objective of this chapter is to provide an overview of the modelling system approach used in the case of Haiti.

An Overview of Simulation Analysis

Simulation analysis defines the study of a "system" where a system is generally defined as a set of related elements arranged toward a goal or set of goals. Analysis of a system consists of defining the interconnections (structure) of the system under scrutiny and the goal(s) of the system. Having said that, it is important to determine the participants in the system, i.e. producers, consumers, policymakers, and to identifying the goals of each within the system.

Simulation can be broadly defined as a research approach that facilitates the design of a model, that can be used to conduct experiments / scenarios for the purpose of studying a problem. Following Trapp (1989) simulation is defined as the process of numerically solving a computerized mathematical model in an attempt to reproduce the actual essential elements of an operating system. Operating systems of interest to economics include firms, markets, and government agencies. This definition is analogous to an old adage among management scientists "when all else fails, simulate" which means according to Dunning (1985) if an exact analytical solution to a problem cannot be developed, reasonably good answers can be extracted via the process of simulation. Which makes sense because sometimes it is almost impossible to create a mathematical model, but the design of a computer model often makes the task easier.

Computer based Simulation is a technique to reproduce the essence of an operating system with a computer program that can be ran respectively to perform experiments under varied assumptions. In this respect, simulation is a powerful tool of policy analysis.

Flowcharting

Figuring out a sequence of GESS statements capable of representing a system can be very tedious because simulation experiments depend a great deal on mathematical statistics, econometrics, the numerical analysis techniques. Therefore it is almost imperative to develope a flowchart to help structure the logic flow. Following Baijou (1990), simulation experiments involve a sequence of nine steps as follow:

1. Formulation of the problem
2. Collection and processing of real world data
3. Formulation of mathematical model
4. Estimation of parameters of operating characteristics from real world data
5. Evaluation of the model
6. Formulation of a computer program
7. Validation

8. Design of Experiments

9. Analysis of simulation data

Figure 5, on the next page, displays the order of these nine steps.

Model Structure

Haiti, like any developing country, has a market structure similar to that depicted in figure 6. As a small open economy, Haiti's agricultural prices are exogenously determined by two principal forces: the government and the world market.

Following Trapp (1989), two important assumptions prove to be evident in the general model structure for **GESS**. The first assumption is that all prices are exogenously determined. As already mentioned Haiti has a small open economy and therefore cannot influence world market prices through either its changes in consumption or production. As a result Haiti becomes a price taker in the world market. Thus Haiti has implanted a policy of controlling agricultural prices to protect both its producers and consumers from the instability of the world market. This is true particularly for imported commodities such as wheat and oilseeds which represent fairly large items in the import budget for food consumption.

The second key assumption of the **GESS** modelling approach

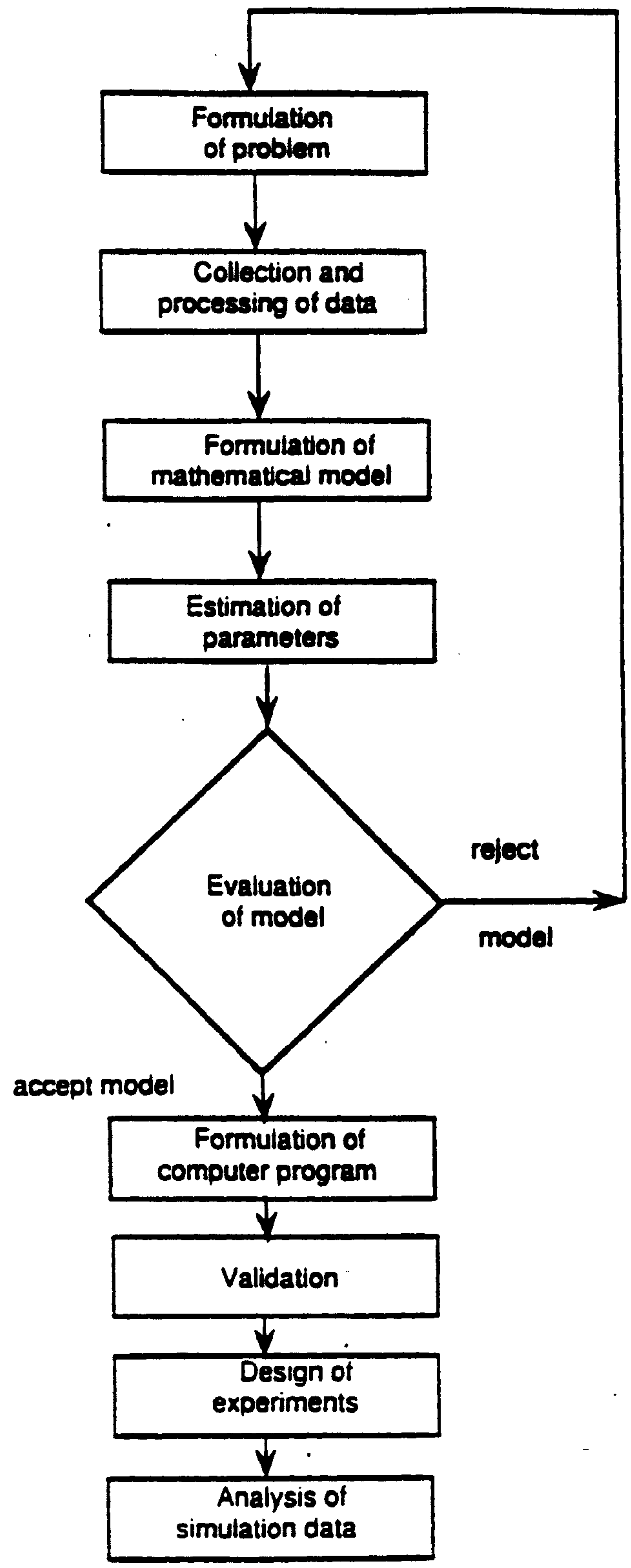

Figure 5. Flow Chart for Planning Simulation Experiments.

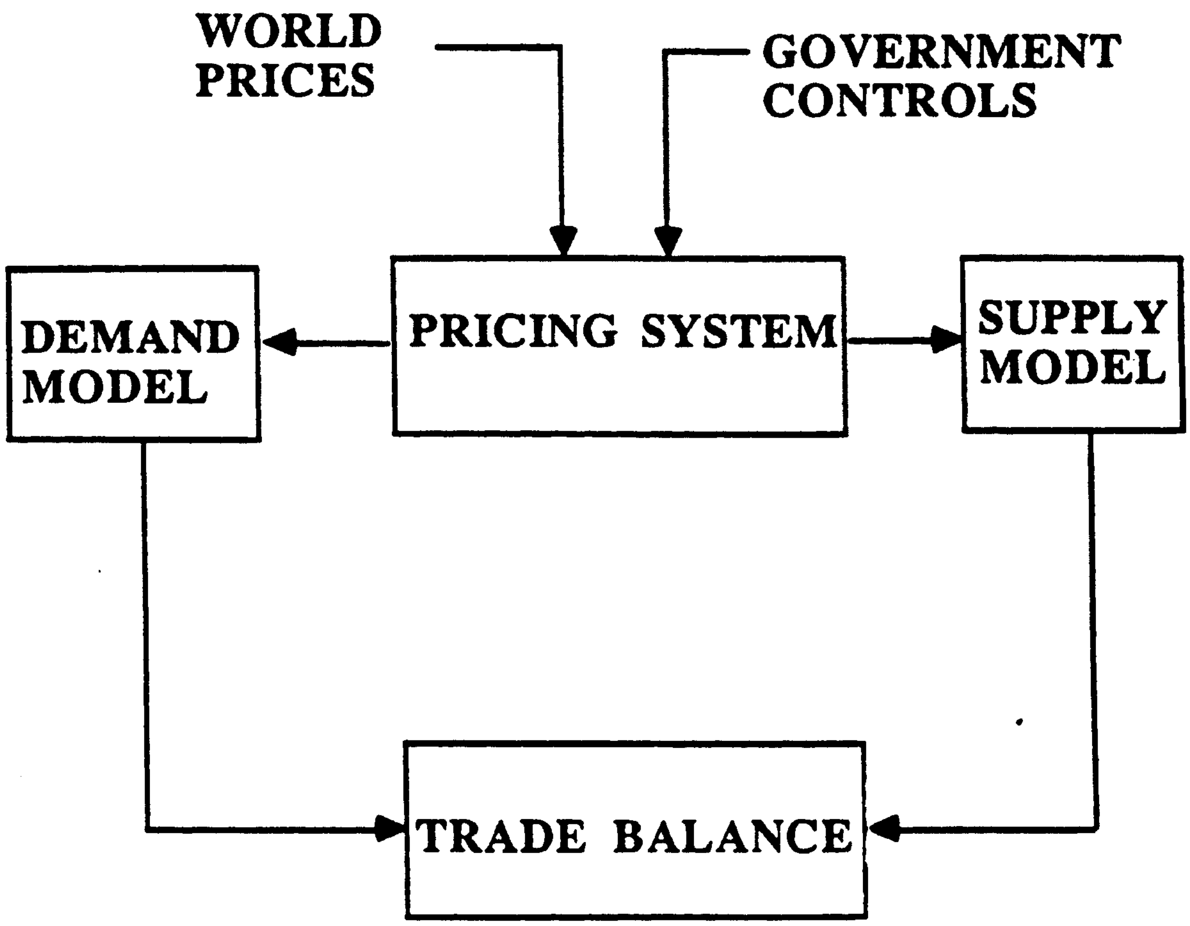

Figure 6. General Model Structure.

concerns the trade balance effects. That is any imbalance between supply and demand, given exogenous prices, will end up in trade. As we know incentives for production and consumption are created by price and government intervention in the form of quotas, import licensing, tariffs and exchange rate. Thus the supply and demand imbalance induced by the exogenous price condition should be considered as the resulting balance of incentives for trade. Thus to determine existing trade, policies directly affecting trade should also be taken into consideration.

Due to the actual trade determination the general model structure depicted in figure 6 above has been modified. Figure 7 on the next page presents the detailed model structure.

What is so distinct about figure 7 is that it permits retail prices to be considered separately from farm level prices as well as government policies influencing these market levels and their association to the world market. World market prices are directly linked to the wholesale price. In the case of Haiti wholesale price is assumed to be equal to retail and farm price.

According to Trapp (1989), depending on the size, efficiency, and distortions in the market in question, a country's wholesale price maybe a few percentage points above or below the world market price respectively for imports and exports. The primary cause of the spread is the marketing

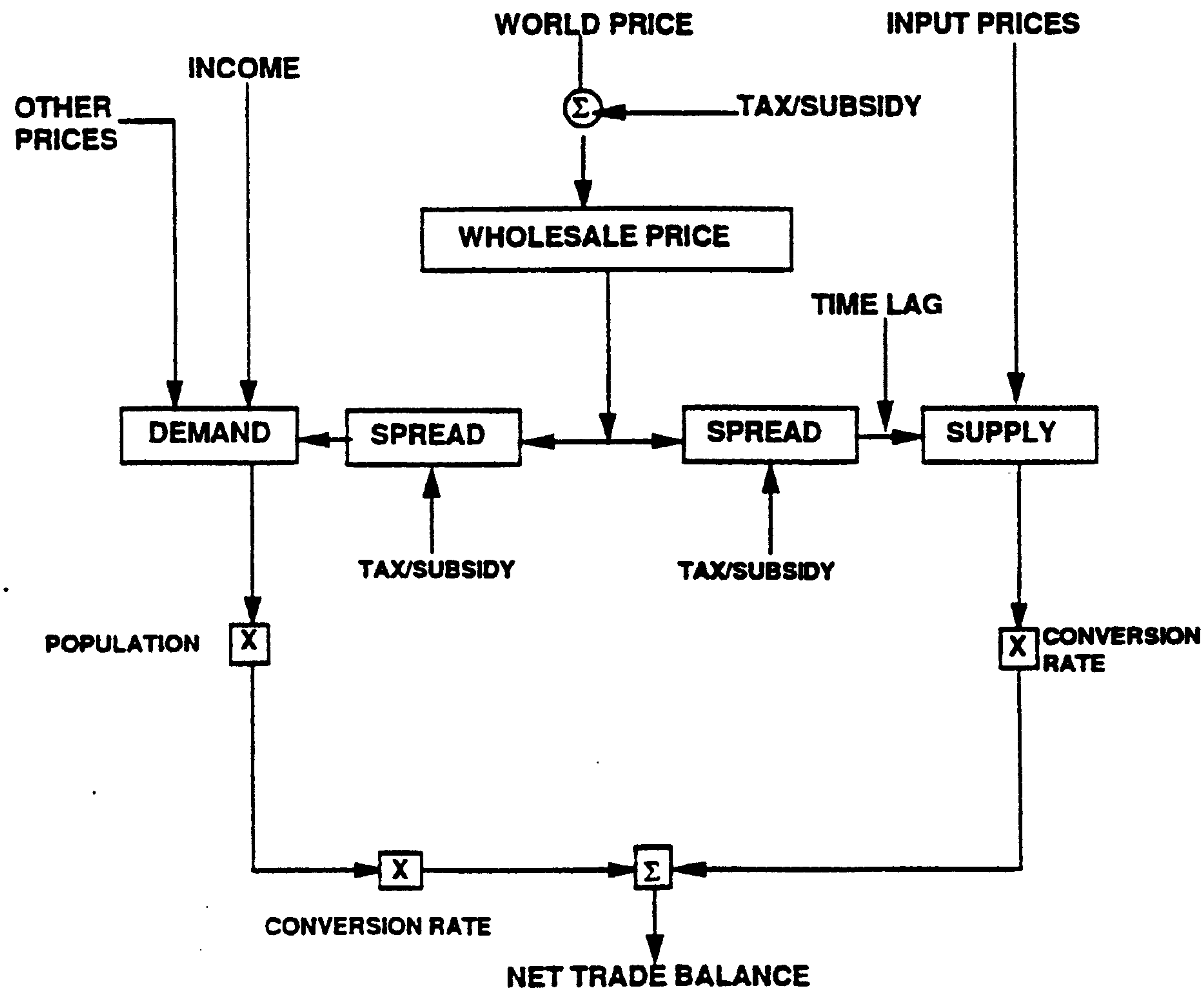

Figure 1. Detailed Model Structure.

cost and profit involved in importing and exporting. A tax or subsidy on imports or exports can drastically change the wholesale/world market price spread. An export tax or subsidy would lead to an increase in the marketing expense. In the case of Haiti similarly government interventions can drastically change the wholesale/world market price.

Modeling of supply response needs to consider in many cases that supply does not adjust immediately to price changes because of the biological time involved in production. Also consideration needs to be given to the fact that supply can be influenced by input prices as well as output prices. For example government can intervene in the market to control prices in order to eliminate world price volatility. In the case of Haiti, prices of most important commodities which constitute the backbone of the national diet are determined exogenously, and are stabilized by government control. However, even though output prices are stable, agricultural demand for inputs may still vary due to changes in demand and technology.

Demand is generally modeled as per capita demand and is assumed to be a function of its own price, prices of other substitute and complementary commodities, and income per capita. Multiplication of per capita demand by population will give total retail demand.

The existence of other competing and complementary food prices in the demand model, and input prices in the supply model raise a problem with regard to modeling the total agricultural sector. The model structure depicted in figure 7, reported by Trapp above, depicts only the model structure for one commodity. The question remains how can we use this single commodity model structure for seven commodities simultaneously? The answer is simple; it can be done by linkage through common prices. As long as all prices are assumed to be exogenously determined, this linkage is relatively straightforward. Details about the linkage will be elaborated in the following sections.

According to Trapp the general econometric model structure illustrated above has several advantages and disadvantages. The assumption of exogenous prices, if reasonably realistic, is a major advantage because it avoids complexity in the computerization and solution process.

A second advantage of the described model structure is the large number of policy variables it allows to be considered in a relatively simple model. For example in the case of Haiti the impact of fiscal and trade related policy i.e., import and export taxes and subsidies, producer price supports, input subsidies, consumer price subsidies, taxes and the issue of self-sufficiency can be addressed.

A third advantage of the explained model and spreadsheet program is its ability to facilitate model development and implementation assuming reliable time series and cross section data are available for the estimation of supply and demand elasticities.

A fourth feature of the **GESS** model, which may be considered as a disadvantage or advantage, depending on the purpose of the analysis, is that the model is focused on short-term (annual) responses to price and policy changes. The model is only capable of analyzing marginal changes in policy for one to five years into the future. Thus long run or drastic changes in prices and policies which causes structural changes cannot be adequately analyzed by the model.

Theoretical Backgrounds

A **GESS** model has been developed for use as the tool to analyze Haitian agricultural price policy. As aforementioned, the **GESS** model is based on the partial equilibrium concept. The supply and demand equations for the seven commodities and their associated elasticities are at the heart of the model. Before talking about the supply and demand equations, let us consider the theory of supply and demand elasticities.

Demand elasticities can be viewed as the responsiveness of quantity demanded to a price change for a particular good. Thus emerges the concept of own-price elasticity of demand which, according to Tomek and Robinson (1972), is the percentage change in quantity corresponding to a one percent change in price. The equation for it is as follows:

$$Eown=\frac{\Delta Qa}{\Delta Pa}X\frac{Pa}{Qa} \tag{4}$$

Cross-price elasticities of demand measure the relationship between the quantity purchased of one good and price changes of another commodity. The equation is given by:

$$Ecross=\frac{\Delta Qa}{\Delta Pb}X\frac{Pb}{Qa} \tag{5}$$

The same can be said for supply elasticities. For example the own-price supply elasticity measures the percentage change in quantity supplied in response to a one percent change in price ceteris paribus and is also defined by equation (4) where **Qa** is quantity produced. The cross-elasticities can be found also by using equation (5).

Own and cross elasticities (as well as income elasticities which measures the response of quantity to changes in income), can be found by estimating linear or log linear equations.

Following Trapp (1989) if a linear form is chosen, the following relation exists:

$$Qa=a+bPa+cPb \tag{6}$$

Thus equations 7 and 8 can be derived easily from equations 4 and 5. Given an own and cross elasticity and base period values for **Qa** and **Pa** the parameters **b** and **c** can be defined as:

$$Eown \times \frac{Qa}{Pa} = b \tag{7}$$

$$Ecross \times \frac{Qa}{Pb} = c \tag{8}$$

If a double log functional form is chosen and it is written as equation 9 then it is true that the parameters of the equation are elasticities.

$$Qa = aP_a^{b_1} P_b^{b_2} \tag{9}$$

Now the own-price and cross-price elasticities can be easily derived and they are equals to, respectively, the parameters of b_1 and b_2:

$$Eown = \frac{b_1 QaPa}{PaQa} = b_1 \tag{10}$$

$$Ecross = \frac{b_2 QaPb}{PbQa} = b_2 \tag{11}$$

It is evident that there exist a direct relationship between elasticities and slopes of the supply / demand equations. Given that the own- and cross -price elasticities have been used to define **b** and **c** of equation (6), and b_1 and b_2 of equation (9), the intercept of equation (6) or (9) can be deduced easily, i.e.

$$a = Qa - bpa - cpb \tag{12}$$

or

$$a = Qa/(Pa^{b1}\ Pb^{b2}) \tag{13}$$

This evidence leads us to the notion of relationships among elasticities and parameters which will be useful for this study.

Demand and supply elasticities for this study were found primarily from the Trade Liberalization (TLIB) database and other literature reviews pertaining to demand and supply elasticities. Elasticities that cannot be found from these primary sources were calculated using twenty-one years of data collected from the FAO Trade Yearbook and the FAO Production Yearbook.

Demand and income elasticities for coffee were found in Islam and Subramanian (1989). Own-price demand elasticity was estimated at -0.27 and income at 0.47. Tsakok (1990) estimated the income elasticity and the own-price demand elasticity for bananas to be respectively 0.4 and -0.3.

A range of estimates of commodity demand and supply elasticities were reported by Bond (1987). Income elasticity for rice was found to be 0.3 and the own-price elasticity of demand, from TLIB, estimated at -0.65. Jensen (1991) estimated the cross-price elasticity of rice to corn at 0.10 and the cross of rice to sorghum at 0.04. The cross elasticities with respect to the other four variables (beans, coffee, bananas and sugarcane) were not available. However the relationships among elasticities, more precisely the homogeneity condition and the Slutsky condition make it possible to derive the other cross elasticities.

According to the homogeneity condition the sum of the own-price and the cross-price elasticities in addition to the income elasticity for good x must be equal to zero taking into consideration the signs. Stated differently the difference between the price and income elasticity (provide that income elasticity is positive and price is negative) is equal to the sum of the cross elasticities. Following Tomek and Robinson (1972) the equation for the homogeneity condition is as follows:

$$E_{ii}+E_{i1}+E_{i2}+...+E_{iy}=0 \qquad (14)$$

where E_{ii} = own- (or direct-) price elasticity

E_{i1}, E_{i2} ... = cross-price elasticities

E_{iy} = income elasticity.

For example we know that the own-price elasticity for rice is -0.65 and the income elasticity is 0.26, thus their difference is -0.39 then the sum of the cross elasticities must equal 0.39 which yields to zero.

Using the elasticities for rice the relation is demonstrated as follow:

own-price elasticity	-0.65
cross-price with beans	0.08
cross-price with coffee	0.02
cross-price with maize	0.10
cross-price with bananas	0.10
cross-price with sugarcane	0.03
cross-price with sorghum	0.04

income elasticity	0.26
sum	0

The Slutsky condition expresses the relationship between the cross elasticities say Eij and Eji. Again following Tomek and Robinson (1972) the equation for this relationship is as follow:

$$E_{ij}=\frac{R_j}{R_i}E_{ji}+R_j(E_{ji}-E_{iy}) \tag{15}$$

where R_i = expenditure on i as a proportion of total expenditures

R_j = expenditure on j as a proportion of total expenditures

E_{ij}, E_{ji} = cross elasticities

E_{iy}, E_{jy} = income elasticities.

Known as the symmetry relation.

Equation (15) can be rewritten as,

$$E_{ij}\approx\frac{R_j}{R_i}E_{ji}. \tag{16}$$

This relation is also known as the Hotelling-Jureen relation. That is knowing the cross elasticity for commodity i and the ratio of the expenditures for commodity j and i the cross elasticity for j is easily deducted.

Again the reason for this is to be found in the relationship between price elasticities and total revenue. As we know total revenue has been defined as price multiplied by quantity. Here total revenue has two components which are inversely related. The obvious question might be how changes in price influence total revenue? The answer can be found by the magnitude of the price elasticity of demand coefficient. For example given a relevant range of prices and that demand is elastic, price and total revenue will vary inversely, that is an increase in price will lead to a reduction in total revenue and vice versa. The truth lies in the definition of elasticity of demand itself, which states that the percentage change in quantity demanded is larger than the percentage change in price. The opposite relationship holds if demand is inelastic i.e., price and total revenue will vary directly, thus as price increases total revenue will also increase.

Let us take an example to illustrate the Slutsky condition. As reported above the cross-price elasticity of rice with maize is 0.10 and the expenditures on rice and maize as a proportion of total expenditure (derived from data taken from the FAO Tradeyearbooks) are respectively 0.13 and 0.06. Now if we want to know the cross price elasticity of maize with rice, all we have to do is to apply equation (13) which can be rewritten as,

$$E_{mr} = \frac{R_r}{R_m} E_{rm} = \left(\frac{0.13}{0.06}\right)(0.10) = 0.21. \qquad (17)$$

Where E_{mr} = cross-price elasticity, of maize, with rice

R_r = expenditure on rice as a proportion of total expenditures

R_m = expenditure on maize as a proportion of total expenditures

E_{rm} = cross-price elasticity, of rice, with maize.

Given the proportion of total expenditures and assuming the cross elasticity is correct, the result suggests that a one percent change/ increase in the price of rice will result in a 0.21 percent change/ increase in the quantity of maize. Using the same procedure, other cross elasticities can be found; and the same can be said for the cross-elasticities of supply. One of the contributions of this study is the addition of a table of expenditures. In this table, the base year price for the seven commodities is multiplied by the base year quantity to give base year expenditures. Expenditures for each crop are then added to find total expenditures. The proportion of total expenditures is found by dividing base year expenditures by total expenditures.

By using the homogeneity and symmetry conditions cross elasticities do not have to be entered one by one, the proportion of total expenditures can be used to derive the cross-elasticity for each commodity. That is each cross-elasticity is derived by an equation which can be programed to find cross elasticities from own price elasticities, income elasticities and expenditure shares. The advantage of this procedure is that it saves time and it adjusts quickly. Let us say that someone doesn't like the cross-elasticity on coffee, all that must be done to consider an alternative is to change the cross elasticities. Other cross elasticities can be programed to adjust automatically using the homogeneity and symmetry condition equations. Because of the relationships among elasticities, only the elasticities in the upper triangle are entered, those in the lower triangle (the off-diagonal) are generated by equation (16) or (17).

To determine the demand matrix elasticities, Pyles (1989) gave the following properties of the demand functions:

$$\sum j\ \epsilon ij + \epsilon iy = 0 \tag{18}$$

$$\sum Wi\epsilon iy=1 \tag{19}$$

$$\sum iWi\epsilon ij=-Wj \tag{20}$$

$$Wi\epsilon ij=Wj\epsilon ji+WiWj(\epsilon jy-\epsilon iy) \tag{21}$$

$$\epsilon ij=\Phi ij-Wj\epsilon iy\epsilon jy/\gamma-Wj\epsilon iy \tag{22}$$

$$\epsilon iy=\gamma\sum j\Phi ij \tag{23}$$

$$\gamma=1/(\sum i\sum jWi\Phi ij). \tag{24}$$

where w_i is the expenditure proportion on the ith commodity. ϕ^{ij} is the elasticity of the ith marginal utility with respect to the jth commodity. γ is referred to as the flexibility of money. Finally, ϵiy, ϵjy are income elasticities, and ϵij, ϵji are cross elasticities. The first property is of course the homogeneity condition. The second property is known as the Engel aggregation condition; the sum of the shares times the income elasticities must equal to 1. The third condition is the Cournot aggregation condition. The fourth property is the Slutsky symmetry relation. According to Pyles, the remaining properties have no generally accepted names. For thorough discussion of these properties, the reader may consult Pyles. Above all those are the properties taken into consideration to derive the matrix elasticities for this study. The seven commodities considered in this study, represent a mixture of food crops, and tree-crops.

In this study two matrices of demand elasticities are used. One matrix uses own price elasticities, income elasticities, selected key cross elasticities and expenditure shares to theoretically generate a complete matrix of demand elasticities. The matrix of elasticities generated totally from elasticities reported in the literature, and self collected data. No attempt is made to make the elasticities theoretically consistent. The single matrix of supply elasticities is generated in a manner similar to the latter demand matrix.

Computer Implementation of the GESS Model

The GESS model application in the case of Haiti is completed by using a Lotus 1-2-3 spreadsheet. As aforementioned the primary data required are base year quantities and prices for supply and demand and the supply / demand elasticity matrices. These data are reported in various tables which are necessary to derive the model and assess the impact of policy changes. Some of the tables as required as well as generated by the GESS model will be reported for illustration purposes (see tables 1 through 5). Column A of tables 1 and 2 contain row names for the commodities. Column B contains the base year quantities and prices. Column C to D contain the different scenarios for policy assessment. Column E contains the percentage change between the two scenarios. Finally column H through P (not shown in tables 1 and 2) contain the demand and supply elasticities (see tables 3, 4 and 5 on page 63).

Table (1) and (2) present respectively the retail demand and the farm level supply for the seven commodities. Values in the tables are found by programed statements that relate tables of elasticities and base period values as discussed in the methods chapter to generate supply and demand equations. Using Lotus terminology, for example cell C15 represents the supply quantity for rice and it is derived by the following equation:

```
C15=+$P17*(C$34^$H17)*(C$35^$I17)*(C$36^$J17)*(C$37^$K17)*(C
$38^$L17)*(C$39^$M17)*(C$40^$N17)*(C148^$O17)               (25)
```

This equation is synonymous to equation (9) in the methods chapter. Cell C15 contains the projection of the supply quantity relative to scenario #1. P17 holds the constant term for the supply model. C34, C35, C36, C37, C38, C39, C40 contain, respectively, exogenous supply prices for the seven commodities, rice, beans, coffee, maize, bananas, sugarcane, and sorghum.

H17 contains the own-price elasticity for rice. I17, J17, K17, L17, M17, and N17 hold the cross-price elasticities for rice with beans, coffee, maize, bananas, sugarcane, and sorghum. C148 contains the production cost index for rice under scenario # 1. Cell O17 retains the cost elasticity for rice.

The symbols "*" and "^" indicate multiplication and raising to a power. The symbol "+" indicates that P17 is a positive value. When using the Lotus 1-2-3, once the supply equation for rice is entered into the computer, the supply equations for the other six commodities are easily derived. Instead of typing over equation 25 for beans, maize, etc, Lotus 1-2-3 makes it easier for the user. For example the cells C16 to C21 can be derived by using the command "COPY" and the same can be said for cells D15 to D21 under scenario # 2. Finally the symbol "$" is added to the cells implying that the command "COPY" should change only selected row and column designations.

P17 has the intercept coefficient for the supply of rice and it is derived, in Lotus terms, as follow:

P17=+B15/((B34^H17)*(B35^I17)*(B36^J17)*(B37^K17)*(B38^L17)*(B39^M17)*(B40^N17)*($B148^O17) (26)

This equation is synonymous to equation (13) presented in the methods chapter. Cell B15 contains the base year supply quantity for rice and B34, B35, B36, B37, B38, B39, and B40 contain the base year supply prices for rice, beans, coffee, maize, bananas, sugarcane, and sorghum respectively. These farm supply prices are derived by the GESS model from exogenous world prices and margins between farm, wholesale, and world prices. For example the base year farm price for rice is found by the following equation:

B34 = (B44*(B76/100))*((100+B119)/100) (27)

Where B44 = base year wholesale price quantity for rice

B76 = base year wholesale price margin for rice

B119 = base year farm level taxes (-) and subsidies (+).

Here B76 is reported in percentage terms, therefore it must be converted to a decimal by dividing by 100. Farm price equations for other commodities can be derived by the command "COPY".

The cells H17 to O17 contain the supply elasticities as defined above. The cell B148 contains the base year, production cost index, for rice. Again the intercept coefficients for the supply of beans (P18), coffee (P19), maize (P20), bananas (P21), Sugarcane (P22), and sorghum (P23) are easily found by using the command "COPY".

Similarly the demand projection for any policy scenario can be deducted as the supply projection. For example the demand for rice is found by the following equation:

C5=($P5*(C$24^$H5)*(C$25^$I5)*(C$26^$J5)*(C$27^$K5)*(C$28^$L5)*(C$29^$M5)*(C$30^$N5)*(C$140^$O5))* C$144 (28)

Where C5= demand projection (or computed result) for policy scenario # 1. $P5 contains the constant term for rice demand equation. C24, C25, C26, C27, C28, C29, and C30 contain respectively the demand prices for rice, beans, coffee, maize, bananas, sugarcane, and sorghum. H5 is the own-price elasticity of demand for rice. I5, J5, K5, L5, M5, N5 are respectively the cross elasticities of demand for rice with respect to beans, coffee, maize, bananas, sugarcane, and sorghum. C140 contains the income per capita under scenario # 1 and O5 is the income elasticity of demand for rice. Finally C144 represents total population under scenario # 1.

P5 contains the intercept coefficient for the demand for rice and it is derived as follow:

P5=(B5/B144)/((B24^H5)*(B25^I5)*(B26^J5)*(B27^K5)*(B28^L5)*(B29^M5)*(B30^N5)*(B140^O5)) (29)

Where cell B5 contains the base quantity demanded for rice and B24, B25, B26, B27, B28, B29, B30 contain the base year retail prices for rice, beans, coffee, maize, bananas, sugarcane, and sorghum. As usual cells H5 to N5 contain the own-price elasticity and cross price elasticities for rice. Cell B140 contains the base year per capita income for Haiti. O5 is the income elasticity for rice. Cell B144 contains the base year population in thousands. The coefficients for the other commodities say P7, P8, P9, P10, P11, and P12 are easily derived by the command "COPY".

The equation for the base year retail price in cell B24 is as follow:

B24 = (B44*(B87/100))*(100+B130)/100) (30)

Again B44 is the base year wholesale price quantity for rice. B87 is the base year wholesale price to retail margin for rice which is set at 100 because no data was available on the wholesale to retail margin for most of the commodities of Haiti. B130 is the retail level taxes (-) and subsidies (+) for rice as a percent of base year demand prices.

The equation for the base year wholesale price for rice is computed as follow:

B44 =(B97*(B65/100))*((100+(B108*(($B54+0.0000001)/@ABS($B54)+
0.0000001))))/100 (31)

B97 contains world price of rice. B65 holds the wholesale to world price margin; again due to lack of data, it has been set to 100 in this study. B108 has the base year import / export taxes (-) and subsidies (+) as a percent of wholesale price for rice. B54 is the base year net trade for rice and its equation is as follow:

B54 = (B15*(B159/100)) - (B5*(100/$C159)) (32)

Where B15 has the base year farm level supply for rice. B159 contains the conversion factors farm to wholesale price for rice which is set at 100 for this study. B5 holds the base retail demand for rice. Finally C159 is the conversion factors wholesale to retail price. The addition of 0.0000001 represents a default for nontradable commodities namely a zero trade balance which is the case for beans, bananas and sorghum. Without the default, the model will not operate due to division by zero error. Thus the default may be viewed as a necessary approximation for implementation to the GESS model.

Equation (31) is very important to the model because it establishes the linkage among prices that is farm, retail, wholesale and world prices. Retail and farm prices are related to wholesale prices which in turn link to world prices. Also the effect of a tax or a subsidy on wholesale is different depending on whether a particular commodity is an import or export. For example, a tax on exports will cause a decrease in domestic wholesale price relative to world price because export cost is increased. Contrarily, an import tax will lead to an increase in import cost and eventually domestic wholesale price will be increased because it will be passed, on by the importer, to domestic consumers. Again the key here about price linkages is that a price policy change will be passed through the entire system. As aforementioned two tables will be presented for illustration purposes. For further illustration of the potential uses and programing of the GESS model, the interested reader is advised to consult Trapp (1989).

TABLE 1

RETAIL LEVEL DEMAND (1000 MT)

		A	B BASE YEAR	C SCEN#1	D SCEN#2	E %CHANGE
5	(1)	RICE	136,000	136,000	136,000	0.00
6	(2)	BEANS	55,000	55,000	55,000	0.00
7	(3)	COFFEE	19,500	19,500	19,500	0.00
8	(4)	MAIZE	216,700	216,700	216,700	0.00
9	(5)	BANANAS	217,000	217,000	217,000	0.00
10	(6)	SUGARCANE	2,035,233	2,035,233	2,035,233	0.00
11	(7)	SORGHUM	107,000	107,000	107,000	0.00

TABLE 2

FARM LEVEL SUPPLY (1000 MT)

		A	B	C	D	E
			BASE YEAR	SCEN#1	SCEN#2	%CHANGE
15	(1)	RICE	109,000	109,000	109,000	0.00
16	(2)	BEANS	55,000	55,000	55,000	0.00
17	(3)	COFFEE	32,666	32,666	32,666	0.00
18	(4)	MAIZE	182,666	182,666	182,666	0.00
19	(5)	BANANAS	217,000	217,000	217,000	0.00
20	(6)	SUGARCANE	3,033,000	3,033,000	3,033,000	0.00
21	(7)	SORGHUM	107,000	107,000	107,000	0.00

CHAPTER V

EMPIRICAL RESULTS

Introduction

This chapter reports the results of different scenarios, in scrutinizing agricultural pricing policy in Haiti using the **GESS** model. Two major scenarios are adopted for this study. The first scenario consists of reducing import tariffs on maize and rice, from 50 to 10 percent. The second scenario entails a reduction of export taxes from 50 to 20 percent on coffe and a reduction on sugarcane export taxes from 50 to 10 percent. Results are estimated in terms of percentage changes in retail demand, farm level supply, retail price, farm price, wholesale price, net trade balance, and in import/export changes. These two scenarios are quite similar to those policy alternatives analyzed by Jensen et al., (1991) in their food price policy analysis in Haiti. The chapter is divided into two parts. The first part presents the supply and demand elasticities used in the **GESS** model. The second part reports policy analysis of the proposed scenarios.

SUPPLY AND DEMAND ELASTICITIES

As aforementioned, the supply and demand elasticities are at the heart of the model; therefore the specific supply and demand elasticities used here and their derivation deserve brief comment.

Table 3 contains the demand elasticities derived using homogeneity and symmetry conditions. Given the own price elasticities and the top row of cross elasticities for rice, the remaining cross price elasticities can be found with the set of properties reported earlier. The 21 years of data collected from the FAO Trade Yearbooks and the FAO Production Yearbooks were used to derive the own price and income elasticities of demand using a log functional form. Although the result showed coefficients with a negative sign for the own price elasticities, most of the coefficients for the cross and income elasticities are out of logical range; therefore the results for cross elasticities were ignored, and theoretically relations as discussed in the methods chapter were used to derive the cross elasticities.

Table 4 presents supply elasticities for the seven commodities. Nearly all the supply elasticities were found from the Trade Liberalization Database (TLBI). The cost elasticities were derived by putting a weight on the own price elasticities ranging from 50 percent to 75 percent. For example cost elasticity for rice and beans were found by taking a 75 % of the own price elasticities. The cost elasticities for coffee, maize, bananas, sugarcane, and sorghum were assigned a 50 percent weight. Assuming that the supply response for food crops is more elastic than that of tree crops. These costs are not being used for this study but they are very useful in the system to determine the impact of a subsidy.

The derived elasticities seem to be logically consistent; the own price elasticities showed correct sign and nearly all of them are greater than -1 i.e., inelastic. The own price elasticity for rice is -0.65, thus a 10 percent increase in the price of rice will decrease the demand for rice by 6.5 percent. Also the same 10 percent increase in the price of rice leads to a 1.5 percent increase in the demand for beans, a 0.21 percent increase in maize, a 1.4 percent increase in sorghum and so on. Cross price elasticities with a positive sign indicates that the commodities are substitutes which is as expected, those with a zero value indicate that the commodities are independent. The income elasticities seem to be within logical range. However the demand elasticity matrix is not without discrepancies. For example the table shows cross elasticities of sorghum with respect to coffee and sugarcane of 0.73 and 0.96 respectively which appear to be too high. Also an income elasticity for sorghum of 0.95 may be admissible but questionable. It is because of these discrepancies that the elasticities found in the literatures and reported in table 5 were included. In this table, any missing (unreported) cross elasticities were automatically assigned a value of zero.

TABLE 3

THEORETICALLY BASED DEMAND ELASTICITIES

	RICE	BEANS	COFFEE	MAIZE	BANANAS	SUGAR-CANE	SORGHUM	INCOME	EQUATION CONSTANT TERM
RICE	-0.65	0.08	0.02	0.10	0.10	0.03	0.04	0.26	34.08741
BEANS	0.15	-0.13	0.00	0.00	0.03	0.00	0.01	0.30	1.080421
COFFEE	0.07	0.00	-0.27	0.60	0.00	1.40	0.40	0.47	0.000006
MAIZE	0.21	0.00	0.34	-0.56	0.00	0.00	0.01	0.01	13.19998
BANANAS	0.05	0.01	0.00	0.00	-0.40	0.00	0.00	0.34	43.21196
SUGARCANE	0.01	0.00	0.11	0.00	0.00	-0.30	0.04	0.14	234.429
SORGHUM	0.27	0.04	0.73	0.04	0.00	0.96	-0.86	0.95	0.000025

TABLE 4

SUPPLY ELASTICITIES

	RICE	BEANS	COFFEE	MAIZE	BANANAS	SUGAR-CANE	SORGHUM	COST	EQUATION CONSTANT TERM
RICE	0.58	-0.26	0.00	-0.03	0.00	-0.02	-0.05	-0.43	181907.4
BEANS	-0.30	0.45	-0.30	0.30	0.07	0.15	-0.01	-0.34	50839.02
COFFEE	0.00	0.00	0.37	0.00	-0.20	-0.17	0.00	-0.18	47635.94
MAIZE	-0.04	0.20	0.00	0.22	-0.10	-0.20	-0.01	-0.11	180780.6
BANANAS	0.00	0.00	-0.05	-0.04	0.20	0.00	0.00	-0.15	206966.6
SUGARCANE	0.00	0.00	-0.01	-0.02	0.00	0.30	-0.01	-0.15	1744783.
SORGHUM	-0.05	-0.04	0.00	-0.04	0.00	-0.10	0.28	-0.14	198089.1

TABLE 5

LITERATURE BASED DEMAND ELASTICITIES

	RICE	BEANS	COFFEE	MAIZE	BANANAS	SUGAR-CANE	SORGHUM	INCOME	EQUATION CONSTANT TERM
RICE	-0.65	0.05	0.00	0.10	0.10	0.00	0.10	0.30	33.18418
BEANS	0.04	-0.13	0.00	0.06	0.04	0.00	0.03	0.30	1.408951
COFFEE	0.02	0.03	-0.27	0.00	0.05	0.10	0.02	0.47	0.397
MAIZE	0.15	0.00	0.00	-0.56	0.00	0.00	0.15	0.83	0.971831
BANANAS	0.08	0.04	0.00	0.02	-0.40	0.00	0.04	0.58	5.61596
SUGARCANE	0.00	0.00	0.12	0.00	0.00	-0.30	0.02	0.70	9.810979
SORGHUM	0.06	0.10	0.00	0.07	0.10	0.00	-0.30	0.95	0.037424

POLICY ANALYSIS

Since the early 1960s, the Haitian government has imposed tariffs on major imported commodities in order to increase income to producers, to stimulate self-sufficiency and thus enhance agricultural growth. Also export taxes were imposed on major exported commodities, like coffee, to generate revenue to keep the military regime in power. Both tariff and export rates were set at about 50 percent of the CIF value. Due to the stagnation of the economy, in 1987,the government has reduced both the tariff and export taxes to stimulate the economy. This reform in trade policies was achieved voluntarily without receiving trade adjustment loans from the World Bank and the IMF. To analyze the effect of these policy changes two scenarios were specified here. Scenario #1 dealt with the reduction in import tariffs to 10 percent on two major food crops. Scenario #2 reduces export taxes on coffee from 50 percent to 20 percent and reduces sugarcane export taxes from 50 percent to 10 percent.

SCENARIO #1: Reduction in Import Tariffs

Table 6, 7 and 8 summarize the results found for Scenario #1. Table 6 shows the results when only the rice tariff is reduced. Table 7 shows the results when only the maize tariff is reduced. Table 8 shows the results when both the rice and maize tariffs are simultaneously reduced from 50 to 10 percent.

Rice Tariff Reduction

The reduction of the tariff on rice, from 50 to 10 percent, leads to a reduction of retail price ($/MT), from 547 to 401, a percentage change of -26.67. Since the conversion factors of farm to wholesale, wholesale to retail and wholesale to world, were set at 100, the same reduction occured in all prices since they are modelled to be equal. Keep in mind that the reduction in retail price occurs only to the crop under scrutiny; retail prices for the other crops remain unchange. As retail price decreased, consumption of rice increased from 136,000 (MT) to 166,377 (MT) a percentage change of +22.34. Farm level supply decreased from 109,000 (MT) to 91,054 (MT) a percentage change of -16.46 due to the fact that producers received lower price for their rice production. In terms of net trade balance, imports increased from (27,000 $/MT) to (75,332 $/MT), increase the rice import of +178.97 percent. The tariff reduction reduced domestic price and increased imports, thus consumers are better off. The decrease in the import tax serves to reduce government revenue, but the increase in imports partially offsets the tax reduction. In total government revenue falls by -1.26 percent.

Beans, bananas, and sorghum are non- traded commodities (what is produced, is consumed domestically). Because of cross effects, there was some changes in retail demand level, farm supply level, and net trade balance. At the reduction of the tariff on rice, retail demand for beans decreased from 55,000 (MT) to 52,458 (MT) a percentage change of -4.62. Demand for bananas decreased by -1.68 percent. Sorghum experienced a decrease of -8.04, percent that is from 107,000 (MT) to 98,397 (MT). Also retail level demand for maize decrease by -6.31 percent.

In terms of farm level supply, quantity supplied of beans increased by +9.75 percent. That of bananas increased by +1.25 percent. Sorghum also experienced an increase of 1.56 percent change in supply. In terms of net trade balance, changes, calculation of changes for beans, bananas, and sorghum generated error terms, due to zero trade balances before the reduction in tariffs (i.e. division by zero to determine the percentage is not possible). However their new values after the tariff change are shown in the footnote of table 6. The trade balance for Maize decreased by -46.88 percent ($/MT).

The cross effects also occured on the export side. For example the quantity demanded for coffee decreased by a percentage change of -2.26. That of sugarcane experienced a slight decrease of -0.26 percentage change. The farm level supply of both coffee and sugarcane was not affected. The net trade balance for coffee increased by +3.35 percent and that of sugarcane also increased by +0.53 percentage.

Maize Tariff Reduction

For the reduction of the tariff on maize, similar effects took place. Retail price, of maize, decreased from 163 ($/MT) to 120 ($/MT) a percentage change of -26.67. Consumption increased by +18.97 percent i.e., from 216,700 (MT) to 257,804 (MT). Supply decreased from 182,666 (MT) to 170,618 (MT) a percentage change of -6.60. In terms of trade, imports of maize increased from 34,034 (MT) to 87,187 (MT) causing a percentage change in trade balance +156.17. Again government revenue decreased by the amount of the tax, but in this case was more than offset by increased import volume and other cross effects, resulting in a total increase of +2.69.

At the reduction of the tariffs, retail demand for beans and bananas remained constant at respectively, 55,000 (MT) and 217,000 (MT). Demand for rice decreased by a percentage change of -3.05. Sorghum experienced a decrease of -1.32 percent that is from 107,000 (MT) to 105,587 (MT).

In terms of farm level supply, quantity supplied of rice increased by +0.93 percent. Supply for both bananas and sorghum increased by +1.25 percent; and that of beans fell by -8.88 percent. In terms of net trade balance changes, calculations for beans, bananas, and sorghum generated error terms, due to zero trade balances before the reduction in tariffs (i.e. division by zero to determine the percentage is not possible), but their values after the tariff change are shown in the footnote of table 7.

Cross effects also occured on the export side. For example the quantity demanded for coffee decreased by a percentage change of -16.98. That of sugarcane experienced no change. For farm level supply, the supply of coffee was not affected at all but sugarcane did experience an increase of +0.62 percentage change. Net trade balance for coffee increased by +25.15 percent and that of sugarcane also increased by a percentage change of +1.89.

Simultaneous Rice and Maize Tariff Reduction

When all tariffs were reduced at one time, both retail demand for rice and maize increased respectively by +18.60 percent and +11.46 percent. Farm level supply of rice fell by -15.68 percentage; that of maize decreased by -5.43 percent. Again Retail prices for both rice and maize showed a decrease of -26.67 percent. Net trade balance for rice and maize increased respectively by +157.00 percent and +102.12 percent. Total government revenue increased by +2.3 percent.

In terms of cross effects, retail demand for beans, coffee, bananas, sugarcane and sorghum decreased respectively by -4.6, -18.86, -1.68, -0.26, and -9.25 percent. The farm level supply of beans and coffee remained the same; that of bananas, sugarcane and sorghum rose by +1.25, +0.62 and +2.83 respectively. Trade balance changes for beans, bananas and sorghum generated error terms, due to zero trade balances before the reduction in tariffs (i.e. division by zero to determine the percentage is not possible), but their values after the tariff changes are shown in the footnote of table 8. The trade balances for coffee and sugarcane increased by +27.93 percent and +2.42 percent.

Scenario #2: Reduction in Export taxes

Tables 9, 10 and 11 summarize the results found for Scenario #2. Table 9 shows the results of reducing the export tax on coffee from 50 to 20 percent. Table 10 shows the results of reducing the export tax on sugarcane from 50 to 10 percent. Table 11 shows the results of reducing coffee and sugarcane export taxes simultaneously. The Theoretically based demand elasticities of table 3 showed a cross elasticity of coffee to sugarcane of 1.40 which appears to be too high, therefore it has been replaced by that of the literature based demand elasticities of table 5 i.e., 0.10 in this scenario analysis.

Coffee Export Tax Reduction

The reduction of the export tax on coffee led to an increase in farm price from 1,036 ($/MT) to 1,658, a percentage change of +60.00. Farm level supply increased by 18.99 percent that is from 32,666 (MT) to 38,871 (MT). Coffee's trade balance increased by +64.78 percent. As expected, consumption decreased by -11.92 percent. Total government revenue decreases by a percentage change of -3.43.

In terms of cross effects, the farm level supply for rice and sorghum stayed the same while the level of beans, bananas, and sugarcane, decreased respectively by -13.15, -2.32, and -0.47 percent. On the demand side, the demand for beans and bananas remained constant. The demand for rice, maize, sugarcane, and sorghum increased respectively by +0.94, +17.44, +0.36, and +41.14 percent which translates to an increase in imports for rice and maize by +4.76 and +111.07 and a decrease in export of sugarcane by -2.16 percent. Trade balance change calculations for beans, bananas and sorghum resulted in errors because their initial balances were zero. The after tax reduction levels of trade for beans, bananas and sorghum are reported in the footnote for table 9.

Sugarcane Export Tax Reduction

The export tax reduction on sugarcane increased farm price by +80 percent from 131 ($/MT) to 235. Production increased from 3,033,000 to 3,617,880 a percentage change of +19.28. Consumption of sugar decreased by -16.17 percent. In terms of net trade balance, exports of sugar increased by +91.59 percent. Total government revenue decreases by -55.09 percent.

Cross effects showed a decrease in farm level supply for rice, coffee, maize, and sorghum respectively by -1.17, -9.51, -11.09, and -5.71 percents. The production level of beans increased by +9.22 percent; that of bananas remained constant. Retail demand for rice, beans, coffee, and sorghum increased respectively by +1.78, +.29, +6.05, and +76.23 percent. The demand for maize and bananas remained the same. As a result imports for rice, maize, and sorghum increased while the export for coffee decreased by -32.56 percent.

Combined Coffee and Sugarcane Export Tax Reduction

When both export taxes were reduced at one time, retail demand for coffee decreased by -6.59 percent and that of sugarcane decreased by -15.87 percent. Farm level supply of coffee rose by a percentage change of +7.68; that of sugarcane rose by +18.72 percent. Farm price of coffee increased by +60 percent and that of sugarcane by +80 percent. Exports of coffee increased by +28.80 and that of sugarcane increased by +89.28 percent. Total government revenue decreases by -55.4 percent.

In terms of cross effects, retail demand for rice, beans, maize, and sorghum increased respectively by +2.74, +0.29, +17.44, and +148.74 percent; that of bananas did not change. The farm level supply of rice, beans, maize, bananas, and sorghum declined by -1.17, -5.15, -11.09, -2.32 and -5.71 percent respectively. Imports of rice and maize rose respectively by +18.52 and + 170.60 percent.

Use of An Alternative Set of Demand Elasticities

With the introduction of the demand elasticities matrix found in the literature, we observed very little change or no change at all in terms of results in both scenarios under simultaneous reductions. For example under Scenario #1, the effects of the reduction in tariffs on rice remained the same. However cross effects for non traded commodities did experience some changes. Retail demand for beans decreased by -3.05 percent instead of -4.62 percent previously determined. Bananas decreased by -3.05 percent instead of -1.68. Sorghum decreased by -3.95 % instead of -9.25 percent. This set of elasticities showed minimal decreases in the quantity demanded for those commodities which is more appropriate since we would not expect some large cross effects in terms of demand.

In terms of farm level supply, bananas remained constant, that is supply did not increase by a percentage change of +1.25. Sorghum remained constant at +2.83 percentage change.

In terms of net trade balance, import for beans rose only to 1,680 (MT) instead of 4,070 (MT). Import for bananas increased to 9,336 instead of 6,344 (MT) and sorghum incerased to 7,257 (MT) instead of 12,931.

In terms of cross effects, net trade balance for coffee and sugarcane rose respectively by +0.92 and +1.89 percent compared to +27.93 and +2.42 previously derived.

Maize, for the whole part, experienced the same effects, with the reduction in tariffs, except that consumption rose by +13.55 percent instead of +11.46 percent.

Under Scenario #2, the results remained the same for coffee except for minor change in the export of sugarcane i.e., exports declined by -13.26 percent.

Sugarcane also experienced no significant changes. Retail demand for rice, beans, sorghum, maize, and bananas remained the same relative to their base year quantity values. Retail demand for coffee increased by 6.05 percent and that of sugarcane decreased by a percentage change of 16.17 percent. Exports for coffee declined by 32.56 percentage change. Thus the introduction of the new set demand elasticities matrix did not significantly change the results, except a lower cross effect under Scenario #1.

TABLE 6

RESULTS OF SCENARIO #1

FOR THE TARIFF REDUCTION ON RICE

	RETAIL DEMAND (METRIC TONS) % CHANGE	FARM SUPPLY (METRIC TONS) % CHANGE	FARM PRICE ($/MT) % CHANGE	TRADE BALANCE ($1,000) %CHANGE
RICE	+22.34	-16.46	-26.67	+178.97(I)
BEANS	-4.62	+9.75	0.00	!ERR(E)
COFFEE	-2.26	0.00	0.00	+3.35(E)
MAIZE	-6.31	+1.25	0.00	-46.88(I)
BANANAS	-1.68	0.00	0.00	*ERR(I)
SUGARCANE	-0.26	0.00	0.00	+0.53(E)
SORGHUM	-8.04	+1.56	0.00	&ERR(E)

Note, the letter I in parentheses indicates an import and the letter E in parentheses indicates an export. Also ERR means that the base period trade balance was zero so no percentage change can be calculated. But trade values were derived: !ERR = 7,908 (MT) were exported; *ERR = 3,635 (MT) were imported; and &ERR = 10,275 (MT) were exported.

TABLE 7

RESULTS OF SCENARIO #1

FOR THE TARIFF REDUCTION ON MAIZE

	RETAIL DEMAND (METRIC TONS) % CHANGE	FARM SUPPLY (METRIC TONS) % CHANGE	FARM PRICE ($/MT) % CHANGE	TRADE BALANCE ($1,000) %CHANGE
RICE	-3.05	+0.93	0.00	-19.16(I)
BEANS	0.00	-8.88	0.00	!ERR(I)
COFFEE	-16.98	0.00	0.00	+25.15(E)
MAIZE	+18.97	-6.60	-26.67	+156.17(I)
BANANAS	0.00	+1.25	0.00	*ERR(E)
SUGARCANE	0.00	+0.62	0.00	+1.89(E)
SORGHUM	-1.32	+1.25	0.00	&ERR(E)

Note, the letter I in parentheses indicates an import and the letter E in parentheses indicates an export. Also ERR means that the base period trade balance was zero so no percentage change can be calculated. But trade values were derived: !ERR = 4,887 (MT) were imported; *ERR = 2,709 (MT) were exported; and &ERR = 2,749 (MT) were exported.

TABLE 8

RESULTS OF SCENARIO #1

WHEN ALL TARIFFS WERE REDUCED AT ONE TIME

	RETAIL DEMAND (METRIC TONS) % CHANGE	FARM SUPPLY (METRIC TONS) % CHANGE	FARM PRICE ($/MT) % CHANGE	TRADE BALANCE ($1,000) %CHANGE
RICE	+18.60	-15.68	-26.67	+157.09(E)
BEANS	-4.62	0.00	0.00	!ERR(E)
COFFEE	-18.86	0.00	0.00	+27.93(E)
MAIZE	+11.46	-5.43	-26.67	+102.12(I)
BANANAS	-1.68	+1.25	0.00	*ERR(E)
SUGARCANE	-0.26	+0.62	0.00	-2.42(E)
SORGHUM	-9.25	+2.83	0.00	&ERR(E)

Note, the letter I in parentheses indicates an import and the letter E in parentheses indicates an export. Also ERR means that the base period trade balance was zero so no percentage change can be calculated. But trade values were derived: !ERR = 2,542 (MT) were exported; *ERR = 6,344 (MT) were exported; and &ERR = 12,931 (MT) were exported.

TABLE 9

RESULTS OF SCENARIO #2

FOR THE TAX REDUCTION ON COFFEE

	RETAIL DEMAND (METRIC TONS) % CHANGE	FARM SUPPLY (METRIC TONS) % CHANGE	FARM PRICE ($/MT) % CHANGE	TRADE BALANCE ($1,000) %CHANGE
RICE	+0.94	0.00	0.00	+4.76(I)
BEANS	0.00	-13.15	0.00	!ERR(I)
COFFEE	-11.92	+18.99	+60.00	+64.78(E)
MAIZE	+17.44	0.00	0.00	+111.07(I)
BANANAS	0.00	-2.32	0.00	*ERR(I)
SUGARCANE	-0.36	-0.47	0.00	-2.16(E)
SORGHUM	+41.14	0.00	0.00	&ERR(I)

Note, the letter I in parentheses indicates an import and the letter E in parentheses indicates an export. Also ERR means that the base period trade balance was zero so no percentage change can be calculated. But trade values were derived: !ERR = 7,233 (MT) were imported; *ERR = 5,040 (MT) were imported; and &ERR = 44,025 (MT) were imported.

TABLE 10

RESULTS OF SCENARIO #2

FOR THE TAX REDUCTION ON SUGARCANE

	RETAIL DEMAND (METRIC TONS) % CHANGE	FARM SUPPLY (METRIC TONS) % CHANGE	FARM PRICE ($/MT) % CHANGE	TRADE BALANCE ($1,000) %CHANGE
RICE	+1.78	-1.17	0.00	+13.68(I)
BEANS	+0.29	+9.22	0.00	!ERR(E)
COFFEE	+6.05	-9.51	0.00	-32.56(E)
MAIZE	0.00	-11.09	0.00	+59.53(I)
BANANAS	0.00	0.00	0.00	0.00
SUGARCANE	-16.17	+19.28	+80.00	+91.59(E)
SORGHUM	+76.23	-5.71	0.00	&ERR(I)

Note, the letter I in parentheses indicates an import and the letter E in parentheses indicates an export. Also ERR means that the base period trade balance was zero so no percentage change can be calculated. But trade values were derived: !ERR = 4,912 (MT) were exported; and &ERR = 87,672 (MT) were imported.

TABLE 11

RESULTS OF SCENARIO #2

WHEN ALL TAXES WERE REDUCED AT ONE TIME

	RETAIL DEMAND (METRIC TONS) % CHANGE	FARM SUPPLY (METRIC TONS) % CHANGE	FARM PRICE ($/MT) % CHANGE	TRADE BALANCE ($1,000) %CHANGE
RICE	+2.74	-1.17	0.00	+18.52(I)
BEANS	+0.29	-5.15	0.00	!ERR(I)
COFFEE	-6.59	+7.68	+60.00	+28.80(E)
MAIZE	+17.44	-11.09	0.00	+170.60(I)
BANANAS	0.00	-2.32	0.00	*ERR(I)
SUGARCANE	-15.87	+18.72	+80.00	+89.28(E)
SORGHUM	+148.74	-5.71	0.00	&ERR(I)

Note, the letter I in parentheses indicates an import and the letter E in parentheses indicates an export. Also ERR means that the base period trade balance was zero so no percentage change can be calculated. But trade values were derived: !ERR = 2,988 (MT) were imported; *ERR = 5,040 (MT) were imported; and &ERR = 165,256 (MT) were imported.

CHAPTER VI

Introduction

SUMMARY, CONCLUSION, LIMITATIONS, AND RECOMMENDATIONS

Summary and Conclusions

A wide body of literature reviewed on agricultural price policy for developing countries confirmed that government interventions in agriculture has often discriminated against the agricultural sector due to a lack of analysis of their effects on producers, consumers, and government. It has been suggested that it is imperative for developing countries to carefully evaluate their interventions and to pay more attention to the agricultural sector.

A generalyzed econometric spread sheet model (GESS) was used to evaluate the impacts of two scenarios or policy alternatives on production, consumption, farm and retail prices, and net trade balance.

The first scenario consisted of a reduction in import tariffs on rice and maize from 50 to 10 percent. Results, of these tariffs reductions on both rice and maize, showed a decrease in retail and farm prices. Consumption and imports of rice and maize were increased. There were also some cross effects on commodities that were not subjected to the reduction in the import tariffs. The cross effects were reflected in terms of changes in consumption, production, and net trade balance.

The second scenario consisted of a reduction in export taxes on coffee from 50 to 20 percent and on sugarcane from 50 to 10 percent. As a result, both farm and retail prices for coffee and sugarcane increased, exports and production also rose, and consumption for both coffee and sugarcane declined. Cross effects led to an increase in the import of other commodities. Note that when the export tax reduction was restricted to coffee by itself, export of sugarcane decreased.

A new set of demand elasticities was introduced to see if any major changes in results would occur. This set of elasticities was derived from literature reviewed and the matrix of own and cross elasticities derived was not checked for theoretical consistancy. The results obtained using these elasticities were compared with the base set of elasticities which were theoretical consistent. It appeared that the results were quite similar except for generally lower cross effects under scenario #1. Above all the results were consistent with conventional wisdom of reductions in both import tariffs and export taxes.

Limitations and Recommendations

The **GESS** model used for this study, to scrutinize agricultural pricing policy in Haiti, is based on the partial equilibrium concept which is compatible to past studies found in the literature review. One of the short comings of the **GESS** model is that it is only capable of analyzing marginal changes in policy for one to five years into the future. Long run policy analysis can not be adequately analyzed by the model. There also was some skepticisms about the accuracy of demand and supply elasticities matrices; but sensitivity results showed consistency over a reasonable range of alternative elasticities.

The study can be extended to make the **GESS** model stochastic, with a stochastic model, ranges of expected outcomes can be determined and the impact of allowing open markets with unstable prices can be analyzed. Finally since coffee and sugarcane are labor intensive, the government should harmonize its tax policies, in agriculture, to boost production and as a result exports and foreign exchange earnings will increase.

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