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**Effects of Trade Liberalization on  
Agriculture in the Philippines:  
Commodity Aspects**

**Minda C. Mangabat**

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**WORKING PAPER 51**

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# Abbreviations

AFMA	-	Agriculture and Fisheries Modernization Act
AFTA	-	ASEAN Free Trade Area
AMS	-	Aggregate measures of support
APEC	-	Asia Pacific Economic Cooperation
APRAAP	-	Agricultural Policy Research and Advocacy Assistance Program
ARMM	-	Autonomous Region for Muslim Mindanao
ASAP	-	Agribusiness System Assistance Program
ASEAN	-	Association of South East Asian Nations
BAS	-	Bureau of Agricultural Statistics
CAR	-	Cordillera Autonomous Region
CEPT	-	Common Effective Preferential Tariff
CGPRT	-	Coarse grains, pulses, roots and tubers crops
cif	-	Cost of insurance and freight
CIS	-	Communal irrigation systems
CPDS	-	Center for Policy and Development Studies
C.V.	-	Coefficient of variation
CY	-	Crop year
DA	-	Department of Agriculture
EPR	-	Effective protective rate
ERD	-	Exchange rate distortion
FAO	-	Food and Agricultural Organization
fob	-	Free on board
GAP	-	Gintong Ani Program
GATT-WTO	-	General Agreement on Tariffs and Trade-World Trade Organization
GPEP	-	Grains Production and Enhancement Program
GVA	-	Gross value added
HYV	-	High yielding variety
IRR	-	Irrigated
MakaMASA	-	ProPOOR
MAV	-	Minimum access volume
MC	-	Moisture content
MINA	-	Marketing Information Needs Assessment
NEPR	-	Net effective protective rate
NFA	-	National Food Authority
NGA	-	National Grains Administration
NIS	-	National irrigation systems
NPR	-	Nominal protection rate
NSCB	-	National Statistical Coordination Board
OLS	-	Ordinary least squares
OPV	-	Open pollinated variety
PAS, DA	-	Policy Analysis Service of the Department of Agriculture
PATAAS	-	Policy Analysis, Technical Assistance and Advocacy Services
QR	-	Quantitative restriction
RAP	-	Rice Action Program
R & D	-	Research and development

RFD	-	Rainfed
RICOB	-	Rice Industry and Corn Board
SAPI	-	Strengthening Agricultural Policy Initiative
SPS	-	Sanitary and phytosanitary standards
SWIPS	-	Shallow well impounding projects
TradeLib	-	Trade liberalization
UP	-	University of the Philippines
UR	-	Uruguay Round

# Foreword

Responding to the growing concern for the effects of trade liberalization on regional agriculture, the CGPRT Centre has implemented a three-year research project “Effects of Trade Liberalization on Agriculture in Selected Asian Countries with Special Focus on CGPRT Crops (TradeLib)” since March 1997, in collaboration with partners from ten countries: China, India, Indonesia, Japan, Malaysia, Pakistan, the Philippines, the Republic of Korea, Thailand and Viet Nam. In all these countries, important issues regarding trade liberalization were investigated with an identical research framework by national experts.

The investigation covers major crops which might receive either favorable or unfavorable effects of trade liberalization both in export and import. I believe that the project will provide broad and practical knowledge on various aspects of the effects of trade liberalization; moreover, the information will be useful for researchers and policy planners not only in participating countries but also in other countries in the region. However, I would like to note that, since this project was conceived and started before the current currency and economic crisis began in the middle of 1997, the analysis handles basically the period before the crisis with available current information.

I am pleased to publish **Effects of Trade Liberalization on Agriculture in the Philippines: Commodity Aspects** as the report of the second phase of the country study of the Philippines. A report of the first phase of the country study, which includes institutional and structural aspects on the same subject, was published recently. I certainly hope these reports will be fully utilized for the improvement of agricultural trade and the encouragement of regional agriculture.

I thank Dr. Minda C. Mangabat of the Philippines for her intensive research and the Bureau of Agricultural Statistics for allowing her to work with us and for providing continuous support. I am very much obliged to Dr. Boonjit Titapiwatanakun for his devoted contribution to the project as the regional advisor. I would also like to express appreciation to the Government of Japan for funding the project.

Haruo Inagaki  
Director  
CGPRT Centre



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Back home, I would like to thank the management of the Bureau of Agricultural Statistics and the Bureau of Agricultural Research for supporting my participation in the second phase of the Project. I am indebted to several persons who in one way or another have contributed to the completion of this report. Dr. Achilles Costales of the University of the Philippines at Los Baños took time to read this report and made valuable comments and suggestions. Ms. Connie Gomez and Antonette Natividad willingly responded to my data needs. Mr. Percy Manzo of the Policy Analysis Service of the Department of Agriculture updated me on the WTO and AFTA. Mr. Roberto D. Dalag and the provincial staff of the Bureau of Agricultural Statistics in Pampanga and Nueva Ecija provinces coordinated and facilitated farmer interviews. Ms. Nora Carambas and Mr. Ed Sanguyo provided technical support. Ms. Maricris Ilagan, Fe Punzalan, Elena Rochar and Joy Ragpa assisted the research. I must thank Joy also for her word-processing skills and patience in working off hours. Lastly, I thank my staff who had to bear with me during the preparation of this report.

The views in this report are those of the author and do not necessarily represent official policies of the Bureau of Agricultural Statistics and the Department of Agriculture.

Quezon City, Philippines  
14 October 1999

Minda C. Mangabat



# Executive Summary

This study is a follow-up to the first phase of the agricultural trade liberalization study in the Philippines, which dealt with structural and institutional aspects. The present study has the following components. It identifies and discusses crucial policies and issues on production, marketing and international trade for two of the most important agricultural commodities in the country - rice and corn (with focus on yellow corn). With this backdrop, the study proceeds with its major objective of providing a quantitative assessment of the effects of trade liberalization at national, regional and farm levels of the rice and corn sectors. The trade liberalization in this study is confined to tariff reforms.

Regression analysis, covering the data from 1980 to 1997, is the major framework in assessing the impact of tariff reforms at the national and regional levels. The elasticities of supply and demand and elasticities of price linkage transmissions for wholesale and farm prices are used to quantify the effects of tariff reforms on production, demand and, hence, on the welfare effects through the concepts of producer and consumer surpluses using the average price and quantities for 1997 as the base year. Whenever appropriate, secondary data on supply and demand elasticities are adopted. A partial budget analysis complements the regression analysis whereby the effects of tariff reforms in agricultural inputs such as fertilizer and agricultural machinery are determined. In addition, the changes in farm prices as a result of tariff reforms are used to simulate the changes in costs and returns of producing rice and yellow corn. The impact analysis at the farm level is confined to partial budget analysis. Also, it determines the effects of tariff reforms on production inputs such as fertilizer and agricultural machinery.

The regional and farm level assessments are concentrated in Central Luzon region. A small cross section of rice farmers in a village in Nueva Ecija province in the region served as a source of data for the partial farm budget analysis. A yellow corn producer in a village in Pampanga province also in Central Luzon was selected.

## The rice sector

Under the GATT-WTO, the Philippines sought to postpone rice tariffication for ten years until the year 2004. Philippine rice has also been excluded temporarily in the AFTA-CEPT scheme. These trade policy measures are designed to cushion the domestic rice farmers from any imbalances that may arise as a result of trade liberalization. In the next WTO round of negotiations policy makers are faced with the decision of whether to seek an extension of the special treatment for rice or to replace the quantitative restrictions (QRs) for rice with tariffs and if so, at what rate.

The declining rice output in the country in recent years due to adverse weather conditions has resulted in substantial rice imports. For a long period, the government through the National Food Authority (NFA), the central marketing agency for grains, had the exclusive authority to import rice free of duty. In 1999 the private sector was allowed rice imports of the minimum access volume (MAV).

In this study, the assessment of trade reforms in rice accounts for the following tariff scenarios. The first scenario is a change from a duty free or zero tariff to 50%. This mimics the recent move by the government in 1999 to partially deregulate NFA's monopoly on rice imports by allowing private sector participation of the MAV whereby the 50% tariff applies. This is on

the premise that the NFA Council will allow continuous participation of private traders in rice importation. Second, rice will be tariffed at the rate of 200% after the year 2004 or earlier. In order to make analysis feasible, it is assumed that the tariff will be applied to all rice imports. Moreover, to compare the impacts of different tariffs, the following rates are used: from 0 to 50% and from 0 to 200%.

#### *National level analysis*

The effects of the assumed scaling up of rice tariffs will result in increases in domestic prices and production, decrease in demand, producer surpluses but consumer losses. The 1997 average wholesale price will rise by 3.15% at the 50% tariff and 12.60% at 200% tariff. These changes, in turn, will cause corresponding decreases in the 1997 national rice demand by 0.90% and 3.53%, respectively, at 50% and 200% tariff rates. Prices received by farmers will increase by 1.80% at 50% tariff and 7.19% at 200% tariff. Increases in farm prices will induce paddy production to rise minimally by less than 1% (0.59) at 50% tariff and by 2.37% at 200% tariff.

The welfare effects will be producer surpluses but consumer losses. The latter, however, exceed the former, resulting in welfare net losses by 2.59 billion pesos at 50% tariff and 10.1 billion pesos at 200% tariff.

Tariff reforms in agricultural inputs such as fertilizer and agricultural machinery, whereby tariff decreases, respectively, by 2% and 10%, in addition to increases in farm prices for paddy resulting from rice tariffication, were applied simultaneously with the 1997 average cost and returns data for paddy. The results show that on a per hectare basis, the net profit-cost ratios will increase by 9.5% with the 50% tariff and 42.86% with the 200% tariff.

#### *Regional level analysis*

Following the same procedure in the national level analysis, the increases in rice tariff will result in corresponding increases in wholesale prices (5.25 and 21.0%), farm prices (5.04 and 20.16%) and in production (2.12 and 8.47%); decreases in consumption (-2.05 and -8.21%); surpluses to producers but surplus losses to consumers. In contrast with the national level analysis, the percentage changes in wholesale prices are only slightly above the percentage changes in farm prices; producer gains exceed consumer losses which will result in net welfare to the region by 131.22 million pesos at 50% and 0.73 billion pesos at the high tariff of 200%. The reason for this is that Central Luzon is a rice surplus region.

#### *Farm level analysis*

The combined impacts of tariff reforms in fertilizer and agricultural machinery and rice tariffication were determined on the costs and returns of a small cross section of paddy farmers in a village in Nueva Ecija province in Central Luzon region. The analysis indicated increases in the net returns per one cropping, per hectare of irrigated paddy farms, by about 21% at 50% tariff and 77% at 200% tariff.

In the partial budget analysis for the region, tariff reductions for fertilizer and agricultural machinery reduce cost only minimally; the additional effects of tariffs for rice through farm price increases result in higher net profit-cost ratios, by almost twice from 0.08 to 0.14 at 50% tariff and nearly four times from 0.08 to 0.30 at 200% tariff.

### **The corn sector**

As a result of R & D breakthrough in open pollinated varieties (OPVs), the national output of yellow corn improved substantially beginning in 1986. National average yields

reached 2 metric tons per hectare in 1993. In spite of substantial gains in output and yield for yellow corn, average yield for the country is still below that of major producers such as Thailand (3mt/ha.), Argentina (4 mt/ha.) and U.S. (almost 8 mt/ha.). Yellow corn accounts for about two-thirds of the country's livestock feed formulation. The rapid growth in the domestic livestock industry has put pressure on corn supply such that shortfalls in yellow corn output especially during the dry season result in reliance on imports. The inefficient domestic marketing system for yellow corn also contributes to the supply problem. The long distance and highly dispersed geographic location of the production areas (Mindanao island) and consumption areas (feedmillers and major livestock producers are located in Luzon island), the weak infrastructure links and monopoly in inter-island shipping result in high marketing costs of corn in the Philippines. On average, the cost of marketing and distribution of corn in the Philippines is two-thirds higher than in Thailand.

Unlike rice, the quantitative restrictions (QRs) for corn have been replaced by tariffs under the GATT-WTO. The in-quota tariff of the MAV is 35% until the year 2004. The out-quota tariff was set initially at 100% in 1995 and will be reduced gradually to 50% in 2004.

In determining the effects of corn tariff reforms in the next WTO negotiations, the current 35% under the MVA serves as the basis for analysis. The first assumption for tariff reduction will be from 35% to 20% to be followed by another reduction to 5%. The latter scaling down of the corn tariff is consistent with the objective of AFTA-CEPT to reduce tariffs in ASEAN member countries within the range 0% to 5% by the year 2010. For comparative purposes, the analysis will consider the following tariff rates: from 35 to 20% and from 35 to 5%.

#### *National level analysis*

An import demand function was estimated for yellow corn in order to determine the effects of tariff reductions. This was not undertaken for rice due to data limitations. Based on the results, the 1997 average import volume of yellow corn of 302.96 thousand tons will increase by almost 3% at 20% tariff and by almost 6% at 5% tariff. The other effects of reduced tariff rates are as follows. The 1997 average wholesale price of yellow corn will diminish by 2.86% and 5.73%, respectively, at the 20% tariff and 5% tariff. These changes in turn will cause demand for yellow corn to increase by less than 1% (0.74%) at 20% tariff and by 1.49% at 5% tariff. Farm prices will also decrease 2.78% and 5.58% and reduction in yellow corn production will be by 1.97% and 3.96%.

The overall impact will be positive consumer surpluses but producer's surplus losses. The former, however, exceed the latter, resulting in net welfare benefits of 330.53 million pesos and 663 million pesos, respectively, at the 20% and 5% tariff.

In the partial farm budget analysis, in spite of the reduction of fertilizer cost (tariff reduction for agricultural machinery was not applied due to the absence of this cost in the farm budget data), net profit per hectare decreases by 7.7% and 15.9% due to lower farm prices as a result of the lowering of the tariff for yellow corn.

#### *Regional level analysis*

The overall effects of tariff reductions of yellow corn in Central Luzon follow the same pattern as with the national level, i.e. decreases in wholesale prices (-8.61 and -16.41%) and prices received by farmers (-8.29 and -15.80%); higher demand by 2.08% and 3.95%; and production reduced by 9.85% and 18.77%. Consumer surpluses will more than offset producer losses, which will result in net benefits of 381.14 million pesos and 737.17 million pesos, respectively, at the 20% and 5% tariff.

In the partial farm budget analysis in the region, the combined effects of the tariff reform in fertiliser and the depressed farm price effects of reforms in yellow corn tariff will lead to net

profits lower by 16.22% at 20% tariff and 31.54% at 5% tariff. The impact of the tariff reduction in agricultural machinery was not included in the analysis due to the absence of cost in machinery rental in the regional data.

#### *Farm level analysis*

Tariff reforms in fertilizer and agricultural machinery reduce the cash cost of producing one cropping of an irrigated hectare of yellow corn of one sample farmer in a village in Pampanga province, also in Central Luzon region. This leads to a less than 1% (0.67%) increase in net returns. However, this gain is offset by the decreasing effect on output farm prices of reduced tariffs of yellow corn, by 6.6% from 35 to 20% tariff and 18.8% from 35 to 5% tariff. This situation may result in shifting back to paddy cultivation which the sample farmer was engaged in previously.

It should be emphasized that the above results of the impacts of tariff reforms in rice and yellow corn are good only as far as the assumptions of this study and limitations of the data would allow. The quantified impacts of tariff reforms should be interpreted as the probable directions of supply, demand, domestic prices, producer and consumer surpluses for the rice and corn sectors.

# 1. Introduction

One of the major policies affecting the Philippine agriculture sector is the adoption of an open market policy following the multilateral terms of the GATT-WTO and regional trading agreements such as the AFTA. In the pursuit of an agricultural free trade policy the government assumes two related responsibilities. The country's acceptance to the UR Agreement of Agriculture of the GATT-WTO includes a commitment to the country's trading partners that trade reforms in agriculture will be instituted. Concomitantly, the government is responsible for providing safety net measures such as productivity-enhancing services to the agricultural sector as farm producers face increasing external competition.

Under the UR Agreement on Agriculture, the Philippines is committed mainly to the provision of market access through the tariffication of quantitative restrictions (QRs) and adoption of sanitary and phytosanitary standards (SPS). The tariffication of QRs was legislated through Republic Act 8178 in the second half of 1995. Related to this, the country has also set preferential tariffs on agricultural commodities coming from other ASEAN member countries as part of the Common Effective Preferential Tariff (CEPT) of the AFTA.

## 1.1 Major studies in agricultural trade liberalization

Compliance with the country's agricultural trade reform commitments involves several institutional and policy issues. Numerous studies have addressed these issues (Appendix Table 1). The major literature is the output of consulting groups tapped by the Department of Agriculture (DA) to conduct trade policy research studies as well as to provide technical assistance to the DA<sup>1</sup>, as for example, on the tariffication of agricultural quotas; reduction of agricultural tariffs; impact of GATT on agricultural commodities; Philippine commitments in agriculture to the WTO, AFTA and APEC. Most of the institutional and policy issues that emerge from the literature relate to market access and SPS provisions. One of the major issues on market access is the treatment of rice after the year 2004, when its exemption from tariffication will have terminated. On SPS related issues, foremost is the country's lack or inadequate standards for the majority of its agricultural products (see the studies of Manuel 1996; Guerrero III 1996; Azanza 1996; and De Leon 1996). As a result, traded agricultural products become less competitive in the world market mainly because of the inability to conform to international standards.

The agricultural trade reforms that have been instituted as a result of the country's commitments may benefit some sectors and may place at risk some sectors. Earlier studies (DA 1994 and Bacani 1995) indicate varying effects of the WTO - neutral for rice farmers, favourable for coconut and banana farmers, but unfavourable for maize and sugarcane farmers. An assessment of the impact of trade reforms in agriculture is important in preparation for the next round of WTO negotiations in late 1999. It would aid policy planners and decision-makers in identifying further measures that would maximize the country's gain from continued participation in the WTO.

---

<sup>1</sup> The four major research programs have been instrumental in the conduct of trade policy related studies for the DA. These are the Agribusiness System Assistance Program (ASAP), Agricultural Policy Research and Advocacy Assistance Program (APRAAP), the Strengthening Agricultural Policy Initiative (SAPI) and the Policy Analysis, Technical Assistance and Advocacy Services (PATAAS) Project.

## **1.2 The Asian financial crisis**

It is worthwhile to note that as the Philippines continues to adjust to the global free trade environment, the economy has struggled with the combined effects of the Asian financial crisis in the latter part of 1997, the economic disturbance in 1998 resulting from this crisis, and adverse weather conditions. These events, especially the financial crisis, have affected the country's economy as a whole and may have implications on agricultural trade liberalization.

The Asian currency crisis had varying effects on the economy. First, the depreciation of the peso rendered Philippine products more price competitive in the world market resulting in improved merchandise exports. The NSCB (1999) reports that in 1997, although the level of Philippine merchandise exports was way below that of ASEAN countries, its 22.1% growth (in US currency) had outpaced the performance of its neighboring countries such as Indonesia (6.1%), Thailand (1.6%), Malaysia (1.5%), and Singapore (-0.4%). A second effect of the Asian currency crisis is a contraction in the country's merchandise imports. The higher growth in exports vis-à-vis imports improved the trade deficit of the country. Third, growth in real investment also declined to 10%, which in combination with prudent monetary policy has, to some extent, cushioned the Philippine economy against a bigger fall from the financial crisis compared to some economies in the Asian region. Although the Philippines was not as badly hit as some of its Asian neighbors, the economic disturbance in the region as an offshoot of the financial crisis had, nevertheless, contracted the country's economic growth by -0.5% in 1998 (Appendix Table 2). The agriculture and fishery sector suffered the most (-6.56%), but this contraction was caused primarily by the El Nino and typhoons during the last quarter of the year, not the financial crisis (Canlas 1998). Many of the trading partners of the Philippines have been hit by the financial crisis, which also affected the country's exports earnings. Nevertheless, due to a higher decline in imports compared to exports, the trade deficit in 1998 was less than half the 9.9% registered in 1997. Higher export prices compared to import prices resulted in better terms of trade index of 112.6% for 1998 vis-a-vis the 101.2% in 1997 (NSCB 1999). Another effect of the continuing Asian financial crisis in 1998 is the closure and retrenchment of 962 manufacturing firms which contributed to lower employment opportunities as shown by labor force surveys (Appendix Table 3). Exporting companies that were affected by the financial crisis resorted to either laying-off of workers, cutting down of the number of working hours, or forced vacation leave (Lamberte et al. 1998).

## **1.3 Objectives of this study**

This study is the second of two studies on agricultural trade liberalization in the Philippines with emphasis on CGPRT crops and other selected commodities. The first study focused on the structural and institutional aspects of agricultural trade liberalization in the country. The present study is an assessment of the effects of trade liberalization on selected crops.

Specifically, the present study aims to:

- Provide a brief review of the major studies on agricultural trade liberalization;
- Discuss the crucial production, marketing and international trade policies and issues on selected crops at national and sub-national levels;
- Determine and analyze the effects of trade liberalization both at the national and sub-national levels on the selected crops; and
- Discuss the prospects and strategies of agricultural trade liberalization given the findings in the first and second phases of this study.

#### **1.4 Scope and limitations of this study**

In the present study, the assessment of the effects of agricultural trade liberalization is focused on two of the most important agricultural commodities in the country – rice and corn. These crops were selected based on their importance to the national economy and the agricultural sector in particular. Rice is the staple food of the country and is a major source of livelihood of small farmers and agricultural landless households. Yellow corn or maize is a major source of feed and white corn is the staple food in some regions of the country. In addition to domestic production, the country's supply of rice and yellow corn is supplemented by imports.

The analysis of the effects of trade liberalization is confined to tariff reforms for rice and corn with focus on yellow corn. While this study recognizes the importance of SPS measures, on this topic was not analyzed.

#### **1.5 Organization of this study**

This report is organized into four chapters. Chapters 2 and 3, respectively, are devoted to the discussions on rice and corn. Each of these chapters incorporates the policies and issues on production, demand, marketing and international trade of the two selected crops. A major feature of each chapter is a quantification of the impact of trade liberalization on each of the selected commodities at the national level as well as at the sub-national level. Chapter 4 concludes the study with a discussion on the prospects and strategies for agricultural trade liberalization for the two selected crops as well as in the agriculture sector as a whole.

## 2. The Rice Sector

This chapter is divided into three major parts. The first part discusses the policies and issues on rice production, marketing and international trade. The discussion is aimed at providing a better understanding of the results of the quantitative analysis of the effects of trade liberalization on rice at the national level in the second part and sub-national level in the third part.

Rice remains the most important agricultural crop in the Philippines. It contributes about one-fourth to gross value added (GVA) in agricultural crops or 15% to total GVA in agriculture. As the staple food it accounts for about 21 to 23% of total expenditure among low income rural households; about 35% of the population's calorie intake on average or as high as 60 to 65% among the lowest income quartile (Fabiosa 1995). Area planted to rice is 2.3 million hectares representing one-fourth of the country's total arable land. Most small farmers and agricultural landless workers depend on rice as their major source of livelihood.

### 2.1 Production, marketing and international trade policies and issues

Because of its economic significance in the agricultural sector, as well as in the political economy of the country as a whole, the rice sector has been the focus of several government agricultural policies. These are aimed at achieving several often conflicting objectives of price stabilization, increased producer incomes, low consumer prices, and self-sufficiency with a view to attaining food security (David and Balisacan 1995).

The government has intervened heavily in the rice sector through public expenditure policies that have direct impact on rice production such as irrigation and research and development. Current domestic rice production policy interventions also serve as safety net measures for domestic rice producers from foreign competition resulting from trade liberalization. In the domestic marketing and international trade for rice, intervention comes in the form of pricing policies and import monopoly. These intervention policies are continuing, although their levels and nature and the relative importance of policy objectives have been tailored to changes in the domestic and international economic environment for rice.

#### 2.1.1 Rice production

Several rice production programs have been implemented based on an integrated frame of agricultural policies designed to increase productivity in the pursuit of self-sufficiency. Foremost of these programs was the *Masagana 99* (1973-1979) which included a package of improved technology involving modern or high yielding varieties (HYVs), fertilizer application, subsidies for seeds and fertilizer, infrastructure support primarily irrigation facilities, farm to market roads, and access to agricultural credit. The Masagana 99 Program was succeeded by the Rice Action Program (RAP) and subsequently the Grains Enhancement Productivity Program (GPEP) of 1991-1994; Gintong Ani Program (GAP) for 1995-1997 and recently, the Rice *MakaMASA\** Program (1998-present). Except for the latter, these programs have provided for seed and fertilizer subsidies and the dissemination of postharvest facilities such as cemented dryers and small mechanical dryers. Under GAP, imported fertilizer used for

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\* MakaMASA literally means pro-masses.

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purposes of the program has enjoyed free prepayment of customs duties and other charges (DA 1997a).

Rice productivity augured well during the 1976-1980 period as a result of the increased cropping intensity and use of HYVs suited to both irrigated and non-irrigated areas. During the period, investment in irrigation shared 40% of agricultural public expenditures, which was in response to the higher world prices for rice (David and Balisacan 1995). Yields increased by almost 5% annually on average in both irrigated and non-irrigated farms, although output increases were contributed largely by irrigated farms. Since the 1980s, the share of irrigated paddy production to total production has been increasing (Table 2.1). For some years, the country exported rice although at modest amounts. In the 1990s irrigated areas contributed one-third to total paddy production and three-fifths to area harvested. Output increases continued up to the 1990s but at a decreasing rate. Irrigation investment slowed down and the focus shifted from large national irrigation to smaller communal irrigation systems. This change in policy direction has been attributed to several factors - lower world prices of rice, foreign debt problems, and budgetary constraints.

**Table 2.1 Paddy production and area harvested, the Philippines, 1980-1998.**

Year	Production ('000 mt)			Area Harvested ('000 hectares)			Yield (mt/ha)		
	IRR	RFD	Total	IRR	RFD	Total	IRR	RFD	Total
1980	4,507	3,140	7,646	1,609	1,862	3,470	2.80	1.69	2.20
1981	4,788	3,122	7,911	1,656	1,763	3,419	2.89	1.77	2.31
1982	5,344	2,990	8,334	1,741	1,610	3,351	3.07	1.86	2.49
1983	4,884	2,406	7,295	1,668	1,386	3,054	2.93	1.74	2.39
1984	5,135	2,693	7,829	1,755	1,408	3,162	2.93	1.91	2.48
1985	5,821	2,985	8,805	1,838	1,469	3,306	3.17	2.03	2.66
1986	5,980	3,267	9,247	1,878	1,586	3,464	3.18	2.06	2.67
1987	5,809	2,731	8,540	1,852	1,404	3,256	3.14	1.94	2.62
1988	6,106	2,865	8,971	1,956	1,437	3,393	3.12	1.99	2.64
1989	6,592	2,867	9,459	2,064	1,434	3,497	3.19	2.00	2.70
1990	6,605	2,714	9,319	2,010	1,309	3,319	3.29	2.07	2.81
1991	6,382	2,842	9,673	2,060	1,365	3,425	3.32	2.08	2.82
1992	6,612	2,517	9,129	1,980	1,218	3,198	3.34	2.07	2.85
1993	6,730	2,705	9,434	2,017	1,265	3,282	3.34	2.14	2.87
1994	7,511	3,027	10,538	2,219	1,432	3,652	3.38	2.11	2.89
1995	7,599	2,942	10,541	2,334	1,424	3,759	3.26	2.07	2.80
1996	8,234	3,050	11,284	2,484	1,467	3,951	3.31	2.08	2.86
1997	8,476	2,793	11,269	2,497	1,345	3,842	3.39	2.08	2.93
1998	6,681	1,874	8,555	2,182	989	3,170	3.06	1.90	2.70

IRR = irrigated; RFD = rainfed.

Source: Bureau of Agricultural Statistics.

Due to land conversion, partitioning of rice farms, and the land frontier coming to a close, rice area expansion becomes limited. Also, recurrent adverse weather conditions resulted in shortfalls of rice supply in the 1990s. The deficiency years have been associated with adverse weather conditions, while the self-sufficiency years occurred during periods of favourable weather.

### 2.1.2 Demand for rice

More than 90% of domestic rice is used as food. The rate of population growth is closing in with growth in rice production. In the 1980-1997 period, rice production grew annually at a compounded rate of 2.18% while population growth was 2.20%. The other factors affecting the demand for rice are income, own price of rice, prices of substitutes, and urban-rural ratio (David and Balisacan 1995; Duff 1991). Before the 1980s, increasing average per capita income induced increases in rice per capita consumption even with increases in rice prices and in the urban-rural ratio. In 1980, rice per capita decreased slightly relative to population growth.

This was attributed to a decline in per capita income and substitution of wheat for rice as a result of liberalization of wheat imports.

Historically, the Philippines is a net importer of rice, with Viet Nam and Thailand, in that order constituting the country's major trading partners for rice in more recent years. The annual level of import differed with expected domestic rice production and considerations of producer and consumer interests, government storage costs, and political implications. For most of the 1980–1998 period, the country suffered from deficits largely due to the effects of dry spells, typhoons and floods (Table 2.2). Generally, deficiencies in output lead to large drawdowns of stocks and hence, imports. The period 1996 to 1998 is characterized by large imports as rice output fell short of food and buffer stock requirements. For some years deficiencies in rice supply were absorbed by the food sector as shown by decreases in per capita consumption. Current buffer stock policies are a 30-day operational reserve during the lean months, typically in the month of July, and a 15-day emergency reserve for food security during rice shortages arising from natural or artificial forces.

**Table 2.2 Rice surplus (deficit), imports and per capita consumption, the Philippines, 1980-1998.**

Year	Surplus (Deficit) (mt)	Imports (mt)	Per Capita Consumption (kg)
1980	25,237	2.5	92.19
1981	59,708	12.7	92.68
1982	256,884	0.1	91.82
1983	(335,796)	6.5	89.51
1984	(532,638)	189,718	97.48
1985	66,561	538,102	95.04
1986	256,978	2,058	94.14
1987	(331,102)	32	94.97
1988	(239,150)	119,187	95.58
1989	(31,538)	195,179	94.97
1990	(412,267)	592,727	97.66
1991	226,315	59	88.55
1992	(395,397)	639	91.13
1993	(458,551)	201,605	91.57
1994	58,636	164	92.89
1995	(330,239)	263,251	95.84
1996	(530,113)	862,385	102.93
1997	(552,642)	722,398	100.78
1998	(1,770,919)	2,170,834	93.11

Note: Surplus (deficit) is the difference between domestic production and total use, e.g. food, seed and waste.

Sources: Bureau of Agricultural Statistics for surplus (deficit) and National Statistics Office for imports.

### **2.1.3 Marketing**

#### *Marketing channels*

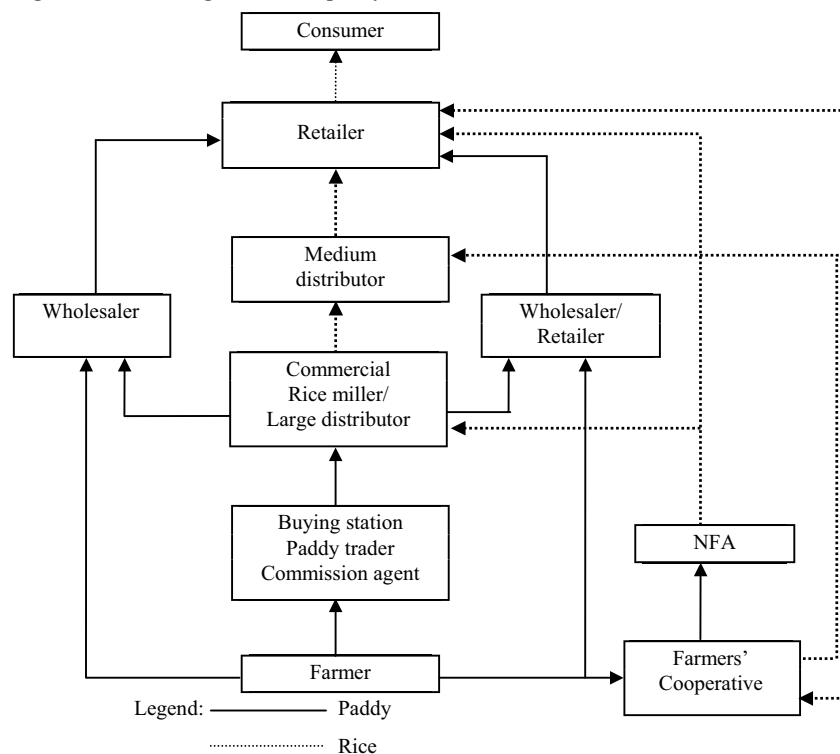
Rice marketing in the Philippines is undertaken by both the private and public sectors, the latter through its grain marketing arm, the National Food Authority (NFA). The NFA was reconstituted in January 1981 from the National Grains Authority (NGA) which in turn evolved in 1972 from the Rice and Corn Administration (RCA) whose predecessor was the RICOB (Rice Industry and Corn Board). The NFA has been under the supervision of several agencies: first, under the Office of the President, then under the Ministry of Human Settlement in July 1981, moving to the Department of Agriculture in 1987. In mid 1998 NFA was transferred back to the Office of the President.

The role of the private sector is primarily in the distribution of paddy and rice from the farm to the final consumers. This involves numerous market intermediaries such as local assemblers, assembler-wholesalers, millers, wholesalers, wholesalers-retailers, and retailers (Librero and Tidon 1996). In 1995, NFA registered a total number of 4,873 grain wholesalers, 63,218 retailers and 14,367 wholesaler/retailers. Figure 2.1 depicts the hierarchical flow of

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paddy and rice from the farm to the final consumer. Paddy traders and commission agents establish assembly points and buying stations in areas where large millers purchase palay. Rice millers perform drying, storage, and milling services and distribute rice to wholesalers and retailers. Wholesalers deliver milled rice to major trading centers in Manila (for Luzon island), Cebu (for Visayas island), and Davao (for Mindanao island). Wholesalers may also sell to other wholesalers and retailers and the latter supply rice to final consumers.

**Figure 2.1 Marketing channels of paddy/rice.**



Source: Based on Marketing Information Needs Assessment (MINA) Report, BAS (1995) and Fabiosa (1995).

### Price margins

Using yearly average prices at the farm, wholesale and retail levels for the period 1980 to 1998, a simple price margin analysis for farm-to-wholesale and for wholesale-to-retail shows that price margins or mark-up of wholesalers exceed those of retailers (Figure 2.2). An earlier study by Umali (1990) indicates a higher bound profit mark-up rate of rice millers compared to those of paddy traders and rice retailers, although a negative lower bound mark-up was reported by rice millers (Table 2.3). On the other hand, Fabiosa (1995) found that on a per unit basis, farmers' price mark-up is 2 to 3 times bigger than wholesaler's mark-up and 3-7 times more than the mark-up of retailers. However, wholesalers or traders maximize their profits at larger volumes; their mark-up is 30 to 64 times bigger than farmers' total mark-up. Retailers' total mark-up is 4 to 10 times bigger. A more recent study by Fabiosa (1996a) on rice prices covering the period 1970 to 1990 reveals more frequent changes in monthly farm prices. Monthly farm price changed 163 times compared to wholesale prices (15 times) and retail prices (149 times). On the other hand, farm prices decreased only 85 times, less than the decreases in wholesale prices (100 times) and retail prices (98 times). According to this study, wholesale prices adjust equally to increases and decreases in farm prices and similarly, retail

prices to increases and decreases in wholesale prices. At the wholesale and retail levels, price increases are, however, transmitted faster than price decreases.

Figure 2.2 Rice price margins, the Philippines, 1980-1998.

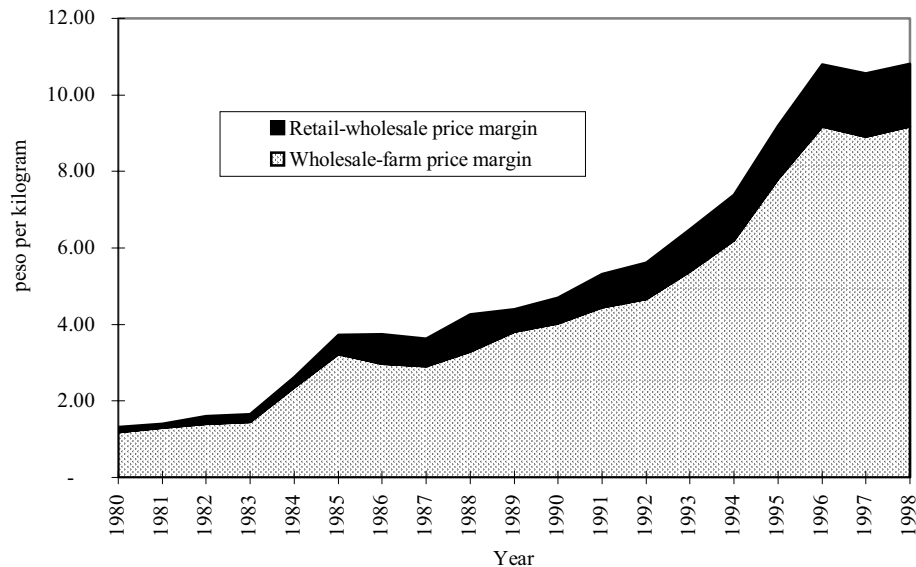


Table 2.3 Price mark-up of rice traders, the Philippines, 1990.

	Mark-up Range (%)
1. Paddy trader	1.67 to 2.25
2. Rice miller	- 1.54 to 8.48
3. Retailer	0.72 to 4.70

Source: Umali 1990 in Fabiosa 1995.

### Pricing policies

Government influence on rice marketing is manifest in its price intervention policies through NFA's paddy procurement and rice distribution programs (Table 2.4). These are largely motivated by the two opposing objectives of controlling prices at the farm and consumer levels, that is, keeping farm prices high enough to encourage paddy production, while making rice prices low and affordable to consumers.

**Table 2.4 NFA paddy procurements and rice injections, the Philippines, 1980-1995.**

Year	Paddy Procurements (mt)	Share to Total Paddy Production (%)	Rice Injections (mt)	Share to Total Rice Supply (%)
1980	551,089	7.21	279,739	4.08
1981	580,641	7.34	304,252	4.48
1982	649,193	7.79	244,101	3.47
1983	533,952	7.32	798,785	12.05
1984	297,980	3.81	504,746	13.26
1985	401,252	4.56	364,902	4.89
1986	422,296	4.57	112,513	1.44
1987	572,047	6.70	466,542	6.13
1988	264,419	2.95	405,207	5.31
1989	207,990	2.20	472,135	5.95
1990	572,174	6.14	666,512	7.91
1991	555,119	5.74	158,171	1.92
1992	419,677	4.60	520,562	6.42
1993	155,098	1.64	489,478	6.05
1994	60,735	0.58	112,155	1.34
1995	7,796	0.07	256,685	2.97

Source: National Food Authority.

NFA procurement involves direct purchases of paddy from farmers and rice imports. Due to budgetary constraints, NFA can handle only a small portion of traded paddy and the volume of paddy purchase has been decreasing. This activity is governed by a support price, which is adjusted based on the cost of producing paddy. In some years, the support price has undergone changes two to four times a year, but change may also occur after several years as in 1990, 1996 and 1999 (Table 2.5).

Importation of rice is warranted when there is an impending shortage. For a long period, the NFA and its predecessors held the monopoly to import rice. Specifically, the NFA was vested with the exclusive authority to import rice subject to the approval of the President by Executive Order No. 1028 in 1985. In response to public pressure, starting May 1999 the private sector is allowed a share in rice imports, although the bigger share is still accounted for by NFA. Rice imported by NFA will continue to be duty free, while private sector imports will carry a 50% in-quota tariff under the Minimum Access Volume (MAV).

NFA rice distribution or injection into the domestic market depends upon the supply situation of rice. It sells to its accredited wholesalers and retailers, institutional buyers, and directly to final consumers during the lean periods from July to September of each year. The NFA also sets rice ceiling prices. Before January 8, 1985 ceiling prices were 80% above farm support prices. Thereafter, the price gap narrowed (Table 2.5).

Assessments of government rice pricing policies are provided in the literature (for example, in Intal and Nelson 1987; Lantican and Unnevehr 1987; Umali 1988; and Pabuayon and Sumalde 1992) and summarized in Librero and Tidon (1996). These studies found that the government pricing policy has been biased towards the consumer sector. That is, average paddy farm prices have been kept below the support prices, but average retail prices have approximated the ceiling prices. There are several reasons for these observations. First, due to limited budget for paddy procurement, the NFA has failed to induce a general increase in farm price levels. Procurement has been concentrated in major rice producing regions – Central Luzon, Cagayan Valley, Southern Tagalog and Western Visayas. Second, farmers are unable to take advantage of the price premium for good quality paddy. Most farmers do not dry their paddy properly; they sell above the maximum requirement of 14% moisture content (MC) especially during the wet season. The high MC of paddy can be attributed partly to inadequate

drying facilities at the farm level. Under the Gintong Ani Program (GAP), drying pavements were constructed and small mechanical dryers distributed to several farmers' cooperatives, but the adoption rate for the latter remains to be low.

**Table 2.5 Support and ceiling prices (pesos per kilogram) of paddy and rice, the Philippines, 1974-1999.**

Paddy		Rice	
Effective Date	Support Price	Effective Date	Ceiling Price
28 Nov. 1974	1.00	18 Jan. 1974	1.90
29 May 1976	1.10	29 May 1974	2.10
01 Apr. 1979	1.30	01 Apr. 1979	2.45
01 Jul. 1980	1.40	19 Aug. 1980	2.60
21 Oct. 1980	1.45	-	-
17 Jun. 1981	1.55	20 Jun. 1981	2.85
21 May 1982	1.70	17 Jun. 1982	3.10
01 Oct. 1983	1.80	01 Oct. 1983	3.30
28 Nov. 1983	2.10	28 Nov. 1983	3.80
26 May 1984	2.35	26 May 1984	4.25
09 Jun. 1984	2.65	09 Jun. 1984	4.85
19 Oct. 1984	2.90	19 Oct. 1984	5.35
08 Dec. 1984	3.35	18 Jan. 1985	5.65 <sup>a</sup>
06 Jun. 1985	3.50	-	6.00 <sup>b</sup>
01 Oct. 1989	4.50	-	6.20 <sup>c</sup>
01 Nov. 1989	5.00	01 Oct. 1985	Lifted
11 Oct. 1990	6.00	29 Sep. 1989	6.50
01 Feb. 1996	8.00	03 Jun. 1990	7.50
	+0.50*	1991	9.00
			10.25
		Feb. 1996	
		Retailer/Wholesaler	13.00 <sup>b</sup>
			14.00 <sup>c</sup>
		Consumer	14.00 <sup>b</sup>
01 Feb. 1999	Dry 10.00		
	+ 0.50*		
	Wet 9.00		15.00 <sup>c</sup>
	+ 0.50*		

a - Under milled      b - Regular milled      c - Well milled

\* Additional 50 cents per kilogram to the buying price for paddy is given as incentive to farmers if they sell to cooperatives.

Source: Compiled by the Bureau of Agricultural Statistics (1999) based on data from the National Food Authority.

Bouis (1993) has observed that the floor price for paddy and the ceiling price for rice are not seasonally adjusted for inflation. The difference in the official retail ceiling and farm floor prices appears to cover only milling and marketing costs but not all expenses incurred by the NFA. As such, government price interventions reduce the profitability of private marketing and storage of rice, which tends to rationalize government participation in a large share of domestic marketing.

Ineffective management of government imports and buffer stock operations contributes to large seasonal price fluctuations of rice. Untimely arrivals, usually late shipments received during the latter part of the lean season just before the harvest of the wet season crop result in depressed rice prices. Early shipments entail large storage costs, too.

Price policy interventions have been used primarily to protect the domestic market from extreme price fluctuations. A study of David and Balisacan (1995) found increasing NPR for rice which suggests either a growing protectionism or simply a means to insulate rice farmers from low world prices (Table 2.6). NPR measures the effect of commodity specific policies on their domestic prices. EPR measures the combined effects of output and input price policies on the value added of rice production. NEPR reflects the effect of exchange rate distortions (ERD) on rice value added. Although domestic prices of rice are more stable than world prices, they

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have generally followed trends in world prices. The same study also reveals higher protection rates for agricultural inputs such as fertilizer, pesticides and farm machinery, which result in mostly low or negative EPR. The trade reforms in the 1980s resulted in declining negative NPRs for these inputs, leading to a small positive effective protective rate (EPR) for rice in the early 1990s. Distortion in the exchange rate as shown by the negative NEPRs for rice was found to be another major source of bias against incentives to increase rice production

**Table 2.6 Nominal protection rates (NPR) of rice output and inputs, degree of exchange rate distortion (ERD), and effective (EPR) and net effective protection rates (NEPR), the Philippines, 1970- 1994 (%)**

	1970-1974	1975-1979	1980-1984	1985-1989	1990-1994
NPR <sup>a</sup>					
Rice	-1	-11	-8	11	25
Urea	-13	28	21	11	16
Pesticides	29	35	35	20	12
Tractors					
2 wheel	21	46	46	30	28
4 wheel	21	24	24	10	10
Threshers	24	24	24	30	28
EPR	-3	-18	-15	-10	6
EDR	-20	-27	-27	-27	-36
NEPR	-23	-45	-42	-37	-30

<sup>a</sup> For rice, NPR is the percentage difference between domestic wholesale price and Thai 35% broken FOB Bangkok raised by 20% to adjust for cost of insurance and freight; for urea this is the percentage difference between the ex-warehouse price and CIF import unit value raised by 5% to adjust for domestic transport cost. NPRs for other inputs are based on book tariff rates; from 1970-1984 this also includes an advance sales tax (10% and 25% mark-up that was abolished in 1986).

Source: Adopted from David and Balisacan 1995.

### 2.1.4 International trade of rice

As mentioned in the first report, the Philippines has temporarily excluded rice under AFTA's Common Effective Preferential Tariff Scheme (CEPT). Under the terms of the WTO the Philippines has postponed tariffication of import quotas for rice for 10 years until 2004. The minimum import quotas for rice under the MAV have been set at levels below the normal import volume of the Philippines. In the initial year of implementation, the minimum quota is equivalent to only 1% of the country's average annual rice consumption during the 1986–1988 period (Table 2.7). Under the MAV the tariff for rice is 50%. However, before the private sector was allowed to participate in rice imports in early 1999 the 50% tariff became inoperative for the reason that the NFA had the exclusive right to import rice at zero tariff. For food security reasons, NFA can also import in excess of the MAV quota also free of duty.

**Table 2.7 MAV for rice under the WTO, the Philippines, 1995-2004.**

Period	Tariff (%)	Initial Quota ('000 mt)	Final Quota ('000mt)
1995 - 1999	50%	59.73	119.46
2000 - 2004	50%	119.46	238.94

Source: Department of Agriculture 1994.

The country is also not committed to the reduction of domestic subsidies because the aggregate measures of support (AMS) for government expenditures on fertilizer subsidy, certified seeds and planting materials, and price support for rice, corn, coconut and sugar fall below the maximum allowable level of 10% of the total value of production for developing countries.

The delay in rice tariffication under the WTO and AFTA serves as a protection for rice farmers against any structural imbalance that may result during the adjustment period of a free

trade environment. This trade policy has also been rationalized on the policy objective of food security. Accordingly, trade liberalization in rice subjects the domestic market to supply and price volatility in the world market. Fabiosa (1996b) found that for the period 1970 to 1990, the coefficient of variation (C.V.) for the world price of rice was almost twice the C.V. of the domestic wholesale price, which shows increasing volatility. Another apprehension about liberalizing the domestic rice market is the limited volume of rice traded in the world market. According to FAO data in 1992/1993, only 3.79% of rice production was supplied in the world market. The ratio of the world stock and use for rice has fallen below 17-18% which is considered by FAO as the minimum food security level for rice.

The major policy measures and issues related to production, marketing and international trade in the Philippine rice sector are summarized in Table 2.8.

**Table 2.8 Policy measures and issues on paddy/rice, the Philippines.**

Policy measures	Issues
<b>A. Production</b>	
1. Productivity programs	
1.1 Input subsidies under GPEP for qualified farmers	
a. Certified seed subsidy of one bag of 40 kg/ha for CY 1993-1995	Effect of lifting of subsidies on small farmers.
b. Fertilizer subsidy exempting imported fertilizer grades from 5% duty for CY 1993-1998	
c. Special credit assistance in the form of reduced rates on production loans of at least 25% less than prevailing market rates for CY 1993-1998	
1.2 Infrastructure	
a. Construction of new and rehabilitation of existing shallow well impounding projects (SWIPS), national and communal irrigation systems (NIS, CIS), shallow tubewell and diversion dams	Limited coverage due to budgetary constraints.
b. Construction of farm-to-market roads	Delayed due to budgetary constraints
1.3 Public investment in R&D	R&D investment remains low
<b>B. Marketing</b>	
1. Government trading/pricing interventions	
a. NFA involved in paddy procurement and rice distribution to stabilize prices	Limited coverage, in defending consumer price ceiling than farm floor prices.
b. NFA sets paddy support price and rice ceiling price	Increased private sector participation.
c. NFA import monopoly	Untimely import shipment lead to increased storage costs and seasonal price fluctuations.
2. Buffer stock policy. Maintenance of 30-day operational reserve and 15-day emergency reserve.	
<b>C. International trade</b>	
1. Postponement of rice tariffication until year 2004 under the GATT-WTO to protect rice farmers	Postpone further tariffication beyond 2004 or tariffify rice QR earlier.
2. Inclusion of rice under the AFTA-CEPT	Beginning and ending rates.

Source: DA 1993 and PAS, DA 1999.

## 2.2 Effects of tariff reforms on rice, national level

The quantitative assessment of the impact of tariff reforms at the national and regional levels uses regression analysis. At the farm level, partial budget analysis is the main procedure in determining the impact of trade reforms. This method can also be applied in the national regional analysis as the data are sufficient.

### 2.2.1 Framework for national impact analysis

The Philippines is now preparing for the next round of WTO negotiations in late 1999. One of the major policy concerns of the Philippines is rice tariffication. There are two options facing policy decision-makers. The first is to maintain the special treatment for rice that is to continue exempting rice from tariffication. The second is lifting the quantitative restriction and tariffing rice imports initially at a high rate in year 2005 or earlier, since ten-year special treatment for Philippine rice under the UR agreement is due to end in 2004. The latter follows the decision made earlier this year by Japan, one of four Asian countries (the others being the Philippines, Republic of Korea and Israel). Japan has already replaced its QRs on rice with an extremely high tariff. There is no official pronouncement yet of the Philippine stand on the issue of rice tariffication, although there are some indications of a high tariff should the QRs on rice be lifted. This study considers the removal of rice import quotas and replacement with an initial tariff of 200%, four times the current in-quota tariff of 50% under the MAV.

The analysis of the effects of tariff reforms in rice includes two scenarios. The first is from zero to 50% depicting the period whereby NFA had the monopoly to import rice free of duty until 1999 when the private sector was allowed to import the minimum access volume at 50% tariff. Of the initial 95 thousand tons of rice imports in 1999, 75 thousand tons of ordinary rice will be tendered to the private sector. The balance of 25 thousand tons of special rice and rice flour will be imported by the NFA. Assuming that the NFA Council will continue to allow private sector participation in rice imports, the 50% tariff will be enforced until 2004, which is the end of the ten-year postponement of rice tariffication. So far, there is no fixed import allocation between NFA and the private sector. In this study, in order to make analysis feasible it is assumed that the 50% tariff applies to all imports.

The second scenario of rice tariff reform is the assumption of an increase in the tariff rate from 0 to 200%. This is in consideration of the option of lifting the rice tariff exemption in the second round of the WTO negotiations. This scenario simulates the period from 2005 or earlier when rice tariffication would have started. While the scaling up of tariff is from 0 to 50% to 200%, for comparative purposes the computations of the tariff effects will be as follows: 0 to 5% and 0 to 200%.

Following the procedure of Titapiwatanakun (1994), the impact of rice tariffication under the WTO is determined through regression analysis of supply, demand and price linkages. This procedure draws upon the elasticities of supply and demand and price transmission in quantifying the effects of trade reform. Also, the welfare effects of tariff reforms are measured through the changes in producer surplus (PS) and consumer surplus (CS) using the following simple algebraic equations.

$$PS = (FP_r - FP'_r) [QS'_r + 0.5 (QS_r - QS'_r)] \quad \text{Equation (1) 2.1}$$

$$CS = (WSP_r - WSP'_r) [QD_r + 0.5 (QD'_r - QD_r)] \quad \text{Equation (2) 2.2}$$

$WSP'_r$ ,  $FP'_r$ ,  $QS'_r$ , and  $QD'_r$  are the new values for prices and quantities accounting for the effect of tariff reforms.

The national model consists of four behavioral relationships either in linear or log form. The data used in the regression cover the period 1980 to 1997 (Table 2.9).

**Table 2.9 Data used in rice regression analysis, the Philippines, 1980-1997.**

Year	QS <sub>r</sub> ( <sup>0</sup> 000 mt)	QD <sub>r</sub> ( <sup>0</sup> 000 mt)	AREA <sub>r</sub> ( <sup>0</sup> 000 ha)	FP <sub>r</sub> * (pesos/mt)	WSP <sub>r</sub> (pesos/mt)	MP <sub>r</sub> (US\$/mt)	WP <sub>r</sub> (US\$/mt)	RGNP (pesos)
1979				1,040				
1980	7,646	4,453	3,741	1,150	2,330	1,720.00	433.67	608,600
1981	7,911	4,852	3,419	1,300	2,610	1,181.00	482.83	628,335
1982	8,334	4,645	3,351	1,360	2,760	1,000.00	293.38	646,174
1983	7,295	4,633	3,054	1,530	2,990	3,661.54	276.83	652,097
1984	7,829	5,164	3,162	2,470	4,820	233.94	252.25	592,694
1985	8,805	5,153	3,306	3,280	6,510	229.38	217.42	551,428
1986	9,247	5,224	3,464	2,820	5,790	199.22	210.17	571,492
1987	8,540	5,394	3,256	2,980	5,880	468.75	229.75	600,907
1988	8,971	5,558	3,393	3,230	6,520	399.29	301.50	644,229
1989	9,459	5,644	3,497	4,010	4,820	279.22	320.33	684,231
1990	9,319	5,948	3,319	4,740	8,770	215.39	287.17	716,929
1991	9,673	5,519	3,425	4,650	9,100	915.25	312.58	720,218
1992	9,129	5,822	3,198	4,810	9,470	501.58	267.67	731,396
1993	9,434	5,977	3,282	5,400	10,780	184.24	237.25	746,921
1994	10,538	6,204	3,652	5,910	12,110	4,158.54	269.46	786,136
1995	10,541	6,551	3,759	7,270	15,070	314.24	320.80	825,164
1996	11,269	7,199	3,951	8,200	17,380	358.20	338.06	884,226
1997	8,555	7,210	3,842	7,980	16,890	318.42	303.50	931,118
Average	9,028	5,619	3,448	4,060	8,033	907.68	297.48	695,583

\* The 1979 FP data were utilized in specifying the 1980 farm price variable lagged for one year (FP<sub>t-1</sub>). The computed average is from 1980 to 1997.

Source: Bureau of Agricultural Statistics, National Statistics Office and World Bank Commodity Price Data.

In Table 2.9 the annual per unit import prices (MP<sub>r</sub>) were derived simply by dividing the total value of imports by the total volume. Unusually high prices were observed for the period 1980 to 1983, 1991 and 1994. As the foreign trade statistics for rice show, in those years the Philippines imported small volumes of rice but the values, in cif terms, are relatively high. For example, in 1980 it was recorded that the country imported a total of 2.5 tons of rice from the US and Japan with a total value of US\$ 4.3 thousand, cif, an average of US\$ 1,720 per ton. In 1981, the total volume of imports from the US and Switzerland was 12.7 tons with total value of US\$15 thousand, cif, or US\$ 1,181 per ton, on average.

In generalized form the final functions are given below. The specifications of the variables were based on economic theory and a series of preliminary regression analyses.

1. Rice supply: QS<sub>r</sub> = f<sub>1</sub> (FP<sub>t-1</sub>, AREA<sub>r</sub>)

2. Rice demand: QD<sub>r</sub> = f<sub>2</sub> (MP<sub>r</sub>, RGNP, T)

Price linkages

3. Wholesale price: WSP<sub>r</sub> = f<sub>4</sub> (WPr/MP<sub>r</sub>, T)

4. Farm price: FP<sub>r</sub> = f<sub>3</sub> (WSP<sub>r</sub>, T)

where

QS <sub>r</sub>	=	Domestic paddy production (metric tons)
QD <sub>r</sub>	=	Domestic food demand for rice (metric tons)
AREA <sub>r</sub>	=	Area harvested for paddy (hectares)
FP <sub>r</sub>	=	Domestic farm price of paddy (pesos per metric ton)
FP <sub>r-1</sub>	=	Domestic farm price of paddy lagged one year (pesos per metric ton)
WSP <sub>r</sub>	=	Domestic wholesale price of rice (pesos per metric ton)
WPr	=	World price of rice (US\$ per metric ton), Thai rice 5% broken
MP <sub>r</sub>	=	Import price of rice, cif (US\$ per metric ton)
WPr/MP <sub>r</sub>	=	Ratio of world and import prices for rice

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RGNP = Gross national product in real terms (billion pesos)  
T = Time trend

### 2.2.2 Regression results and impact assessment of tariff reforms

The structural parameters of the behavioral equations were estimated using ordinary least squares (OLS). In general, the estimates of the structural parameters exhibited the correct signs which are consistent with postulated behavior and theoretical expectations. The complete results of the final regression analysis are provided in Appendix Table 4. Also, several of the preliminary regressions especially for the supply and demand functions appear in Appendix Table 5.

#### *Estimated supply function for rice*

$$\ln QS_r = 3.098 + 0.159 \ln FP_{r-1} + 0.530 \ln AREA_r \quad (\text{Equation 2.3})$$

(3.984) (14.516) (5.3011)

$$R^2 = 0.964; D.W. = 2.098; \text{Adj. } R^2 = 0.959; n = 18 \text{ (1980-1997)}$$

The elasticity of supply of rice ( $ES_r$ ) with respect to prices received by farmers ( $FP_r$ ) is estimated at 0.159, the coefficient of  $\ln FP_{r-1}$ . This value falls within the range of the estimates of a previous study by Mangahas but lower than the estimates of the CPDS and Evenson (Table 2.10).

**Table 2.10 Previous estimates of supply elasticity of rice in the Philippines.**

Author/Year	Period of Data Covered	Supply Elasticity
1. Mangahas (1965)	1947–1963	0.13 to 0.62
2. Center for Policy and Development Studies (CPDS), UP at Los Baños (1982)	1958–1978	0.35
3. Evenson (1991)	1970–1984	0.33

Source: Estrada and Bantilan 1991.

#### *Estimated demand function for rice*

$$\ln QDr = 5.371 - 0.026 \ln MP_r + 0.241 \ln RGNP + 0.0181 T \quad (\text{Equation 2.4})$$

(3.234) (-2.535) (1.881) (4.824)

$$R^2 = 0.952; D.W. = 1.879; \text{Adj. } R^2 = 0.942; n = 18 \text{ (1980-1997)}$$

The above demand elasticity of rice ( $ED_r$ ) with respect to the import price ( $MP_r$ ) is very inelastic, -0.026, which suggests that domestic consumers are not responsive to changes in the import price since rice is the staple crop. This is also the result of NFA intervention wherein imported rice is sold in the domestic market at lower prices.

The absolute value of demand elasticity in this study is below the values from earlier studies (Table 2.11). This low value may be attributed to the very wide fluctuations of the import price for rice ( $MP_r$ ) as shown in Table 2.9. Also, government intervention in the domestic rice market as discussed in earlier sections contributes to the difficulty in estimating a reasonable demand function. In the preliminary regressions, when retail and wholesale prices were used as explanatory variables, their coefficients showed the wrong signs. Some of the preliminary regressions used in estimating the demand function for rice are included in Appendix Table 5. Nevertheless, the result of the final demand function in equation (2.4) reflects the inelastic nature of the demand for rice as in most of the previous studies.

#### *Price linkage equations*

- **Wholesale price**

$$\ln WSP_r = 7.771 + 0.063 \ln (WP_r/MP_r) + 0.113 T \quad (\text{Equation 2.5})$$

(84.665) (1.412) (14.903)

$$R^2 = 0.944; D.W. = 1.641; Adj. R^2 = 0.937; n = 18 \text{ (1980-1997)}$$

In specifying the variables for the wholesale price transmission equation, the ratio of world price and import price ( $WP_r/MP_r$ ) came out with the correct sign and also resulted in the best fit. When the import price (MP<sub>r</sub>) was used as an explanatory variable, the result showed the wrong sign and the t-statistic was not significant, as was the case of world price ( $WP_r$ ), and retail price.

The elasticity of wholesale price with respect to the ratio of world price and import price is 0.063.

- **Farm price**

$$\ln FPr = 2.654 + 0.571 \ln WSP_r + 0.048T \quad (\text{Equation } 2.6)$$

(2.067) (3.428) (2.415)

$$R^2 = 0.973; D.W. = 1.252; Adj. R^2 = 0.969; n = 18 \text{ (1980-1997)}$$

The elasticity of price received by farmers ( $FP_r$ ) with respect to the wholesale price is 0.571.

**Table 2.11 Previous estimates of demand elasticity of rice in the Philippines.**

Author/Year	Period of Data Covered	Demand Elasticity
Ferrer-Guldager	1970-1973	-0.528
Kunkel et al. (1978)	1970-1973	
	Manila	-0.530
	Urban	-0.630
	Rural	-0.310
San Juan (1978)	1974-1976	-0.402
Snell (1980)	1970-1976	-0.450
Bouis (1982)	1973-1976	-0.630
Belarmino (1983)	1973-1976	
(By income stratum)	I	-2.18*
	II	-1.92*
	III	1.72*
	IV	1.72*
Regalado (1984)	1973-1976	
(By income stratum)	I	-2.48
	II	-2.64
	III	-2.19
	IV	-1.91
Quisumbing (1986)	1978	
(By income stratum)	I	-1.45*
	II	-1.95*
	III	-1.20*
	IV	-1.00*
Department of Agriculture, Integrated Agricultural Production and Marketing Project (1980)	Mixed time series of cross section data	-0.37
Evenson (1991)	1970-1984	-0.285

Source: Estrada and Bantilan 1991.

### *Effects on prices of rice*

The domestic wholesale price of rice ( $WSP_r$ ) is assumed to be an average of domestic and imported rice which subsume costs of marketing services and margins. The wholesale price data, which are sourced from the Bureau of Agricultural Statistics, are the results of regular price monitoring that includes ex-warehouse prices of large traders, among others.

- **Import price (MP<sub>r</sub>)**

Zero tariff to 50% tariff: With the zero tariff import price of rice ( $MP_r$ ) in 1997 as base data (US\$318.42 per ton), at 50% tariff the increment in  $MP_r$  will be US\$159.21 per ton (US\$318.42 x 0.50). Import price of rice ( $MP_r$ ) will increase to US\$477.63 per ton.

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Zero tariff to 200% tariff: Increasing the tariff rate from zero to 200% will increase the 1997 import price ( $MP_r$ ) from US\$318.42 per ton to US\$955.26 per ton, thrice the 1997 import price or an increment of US\$636.84 per ton ( $US\$318.42 \times 2$ ).

### *Wholesale price (WSP<sub>r</sub>)*

Based on equation 2.5, the elasticity of price transmission of the wholesale price of rice ( $WSP_r$ ) to the ratio of import price to wholesale price ( $WP_r/MP_r$ ) is 0.063. This implies that a 1% increase in  $WP_r/MP_r$  will increase the wholesale price by 0.063. Therefore the increase in  $WP_r/MP_r$  due to a 50% tariff will increase the 1997  $WSP_r$  from 16,890 pesos to 17,422 pesos per ton ( $0.063 \times 0.50 \times 16,890$ ), an increment of 532.04 pesos or 3.15%.

Following the same procedure, an increase in  $WP_r/MP_r$  due to the increase in tariff from zero to 200% will increase the  $WSP_r$  from 16,890 pesos per ton to 19,018 pesos per ton, an increment of 2,128 pesos ( $0.063 \times 2 \times 16,890$ ) or 12.60%.

### *Farm price (FPr)*

The elasticity of price transmission of farmgate to wholesale price (equation 2.6) is 0.571. In the preceding section, it was shown that using the 1997 wholesale price of rice ( $WSP_r$ ) as the base year, a 50% tariff causes a 3.15% increase in  $WSP_r$ . In turn, this will cause the 1997 farmgate price of paddy ( $FP_r$ ) to rise from 7,980 pesos per ton to 8,124 pesos or an increment of 143.53 pesos per ton ( $0.571 \times 0.0315 \times 7,980$ ) or 1.80% increase.

An increase in the tariff of rice from zero to 200% will have the effect of increasing the farmgate price from 7,980 pesos per ton to 8,554 pesos, an additional 574.13 pesos per ton ( $0.571 \times 0.126 \times 7,980$ ) or 7.19%.

### *Effects on domestic supply (Q<sub>Sr</sub>)*

The supply elasticity of paddy rice with respect to farmgate price is 0.159 (equation 2.3). While this value is consistent with the lower bound estimate (0.13 to 0.62) of Mangahas in 1965 (Estrada and Bantilan 1991), it is believed that over time due to technological change the price elasticity of supply for paddy rice has a higher value. Hence, the supply elasticity estimate (0.33) of Evenson in 1991 (Estrada and Bantilan 1991) will be used instead.

As can be gleaned from the preceding discussions, raising the import tariff of rice induces an increase in the prices received by farmers, by 1.80% from zero tariff to 50% tariff and by 7.19% at 200% tariff. At 50% tariff, the increase in farm prices will induce the 1997 paddy production of 8,555 thousand tons to rise to 8,606 thousand tons, an addition of 50.82 thousand tons ( $0.33 \times 0.018 \times 8,555$ ) or 0.59%. Increasing the tariff to 200% will also lead to a further increase of paddy production to 8,758 thousand tons, an increment of 202.98 thousand tons ( $0.33 \times 0.0719 \times 8,555$ ) or 2.37%. The increases in paddy output and farmgate prices will result in producer surpluses of 1.23 billion pesos at 50% tariff and 4.97 billion pesos at 200% tariff.

### *Effects on domestic demand (Q<sub>Dr</sub>)*

Based on equation 2.4, the demand elasticity for rice with respect to the import price of rice ( $MP_r$ ) is -0.026\*. This means that a 1% increase in  $MP_r$  will cause a 0.045% fall in the demand for rice. Partly due to the wide fluctuation of the import price as noted in Table 2.9, the absolute value for the demand elasticity is rather low compared to the estimate of -0.285 by Evenson in 1991 (Estrada and Bantilan 1991) which will be adopted instead. With 50% tariff the domestic wholesale price ( $WSP_r$ ) will increase by 3.15% and at 200% tariff  $WSP_r$  will rise by 12.60%. This implies that at 50% tariff, the 1997 domestic demand for rice at 7,210 thousand tons will decrease to 7,145 thousand tons, 64.73 thousand tons less ( $-0.285 \times 0.0315 \times 7,210$ ) or a minimal decrease by 0.90%. Raising the tariff to 200% will reduce domestic

demand from 7,210 to 6,951 thousand tons, a drop of 258.91 thousand tons ( $-0.285 \times 0.1260 \times 7,210$ ) or a decrease by 3.59%. Increases in prices and decreases in demand result in consumer losses of 3.82 billion pesos at 50% tariff and 15.07 billion pesos at 200% tariff.

In summary, it can be discerned from Table 2.12 that imposing a high tariff rate for rice would result in further increases of domestic prices of rice. This trend follows the current pattern in domestic prices, which are observed to be above world prices (Mangabat 1998). Also, this would indicate a growing protection to domestic producers (for example see David and Balisacan 1995). The percentage changes of wholesale prices are greater than those of farm prices. The results of the welfare analysis show that domestic producers would benefit while consumers would lose, which may suggest a bias against the latter group. However, the consumer losses are greater than producer benefits. This implies that on aggregate, the net effect would be a welfare loss to the economy of 2.59 billion pesos at 50% tariff and 10.1 billion pesos at 200% tariff. Nevertheless, the results of the impact analysis of lifting the quantitative restrictions for rice and replacing these with tariffs should be interpreted merely as indicative of the expected directions of the domestic prices, supply and demand for rice under current global trade liberalization.

**Table 2.12 Summary of impacts of rice tariffication, the Philippines.**

Parameter	1997 Value	Tariff			
		0 to 50% Increase* (Decrease)	% Change	0 to 200% Increase* (Decrease)	% Change
1. WSP <sub>r</sub>	P16,890/ton	P532.04/ton	3.15	P2,128/ton	12.60
2. FP <sub>r</sub>	P7,980/ton	P143.53/ton	1.80	P574.13/ton	7.19
3. QS <sub>r</sub>	8.555 M tons	0.051 M tons	0.59	0.203 M tons	2.37
4. QD <sub>r</sub>	7.210 M tons	(0.065 M tons)	(0.90)	(0.259 M tons)	(3.59)
5. PS <sub>r</sub>		P1.23 B		P4.97 B	
6. CS <sub>r</sub>		(P3.82 B)		(P15.07 B)	

PS – Producer surplus M – million B – billion

CS – Consumer surplus P – Philippine peso

( ) – Negative values of CS<sub>r</sub> indicate consumer losses.

\* Increase (decrease) from the 1997 value of the parameter.

### Effects on costs and returns

Government intervention is also present on tradable agricultural inputs in the form of tariffs on fertilizer, pesticides and machinery. Quantitative restrictions for fertilizer imports and advance sales tax on the other farm inputs were abolished in 1986. In 1990, the tariff for urea fertilizer was already 5% and was reduced further to 3% in 1991 until the WTO period (Appendix Table 6). For agricultural machinery, a two-wheel tractor has a tariff rate of 30% in the pre-WTO period and it was reduced to 20% in 1995 and 1996. It declined further to 10% beginning 1997 (Appendix Table 7). Threshing machinery other than the combined harvester-thresher has a tariff of 30% from 1990 to 1993. It was reduced to 20% in 1994 to 1996 and decreased further to 10% for the 1997-1999 period.

In 1997, about 42% of total cost in paddy production is accounted for by cash cost (Table 2.13). Hired labor constitutes the largest share of 59% followed by the share of fertilizer expense, 15%. Cost of machine rental accounts for 30% of total rental costs. Given an average yield per hectare of 2.97 metric tons and average farm price of 7.98 pesos per kilogram or 7,980 pesos per ton, the resulting gross return is 23,708 pesos per hectare. Returns above cash cost would be 15,447 pesos and net profit cost ratio is 0.21.

The 2% tariff reduction of fertilizer is applied to the selling price net of marketing costs and margins, which is assumed to be 15% of the selling price. Adopting as base data the national average cost of fertilizer in paddy production in 1997, the fertilizer cost would be reduced by 21 pesos ( $1,228 \times 0.85 \times 0.02 = 21$ ). In addition, for simplicity purposes if the 10% tariff reduction of a 2-wheel tractor is applied directly to rental for this agricultural input, the

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rental cost would decrease by 9 pesos ( $91 \times 0.10 = 9$ ). The combined effect of input tariff reforms is a reduction by 0.36% of the cash costs in producing one hectare of paddy, on average. If yield per hectare is valued by the farm price effects from zero to 50% tariff and from zero to 200% tariff, gross returns per hectare will increase, respectively, by 1.75% and 7.14%. The net profit-cost ratio increases by about 9.5% at 50% tariff and 42.86% at 200% tariff.

**Table 2.13 Effects of trade liberalization on paddy production costs and returns (pesos per hectare), the Philippines.**

Item	1997	Tariff	
		0-50%	0-200%
<b>CASH COST</b>	8,261	8,231	8,231
Seeds/planting materials	330	330	330
Fertilizers	1,228	1,207	1,207
Pesticides	503	503	503
Hired labor	4,891	4,891	4,891
Irrigation fee	209	209	209
Land tax	83	83	83
Rentals:			
Tools and equipment	15	15	15
Machine	91	82	82
Animal	39	39	39
Land	156	156	156
Fuel and oil	160	160	160
Interest payment on crop loan	218	218	218
Food expense	274	274	274
Transport expense	64	64	64
<b>NON-CASH COST</b>	5,248	5,248	5,248
Seeds/planting materials	680	680	680
Landlord's share	1,235	1,235	1,235
Harvester's share	1,284	1,284	1,284
Thresher's share	911	911	911
Hired labor paid in kind	204	204	204
Lease rental	687	687	687
Irrigation fee	211	211	211
Fuel and oil	36	36	36
<b>IMPUTED COST</b>	6,110	6,110	6,110
Operator/family labor	2,974	2,974	2,974
Exchange labor	126	126	126
Depreciation	977	977	977
Interest on operating capital	1,112	1,112	1,112
Rental value of owned land	921	921	921
<b>ALL COSTS</b>	19,619	19,584	19,584
<b>GROSS RETURNS</b>	23,708	24,124	25,402
<b>RETURNS ABOVE CASH COST</b>	15,447	15,893	17,171
<b>RETURNS ABOVE CASH AND NON-CASH COSTS</b>	10,200	10,646	11,924
<b>RETURNS ABOVE ALL COSTS (NET RETURNS)</b>	4,089	4,536	5,814
<b>NET PROFIT-COST RATIO</b>	0.21	0.23	0.30
Cost per kilogram (pesos)	6.60	6.59	6.59
Yield per hectare (kg)	2,971	2,971	2,971
Value per kilogram (pesos)	7.98	8.12	8.55

Source of Basic data: Bureau of Agricultural Statistics 1998.

## 2.3 Regional and farm level analyses

This section is an assessment of the effects of rice trade liberalization at regional and farm levels. The study areas are Central Luzon for the region and a village in Nueva Ecija province also in Central Luzon for the farm level analysis.

### 2.3.1 Regional analysis

#### *The study area*

Similar to the national level, smallholding farms predominate in Central Luzon region. Results of three censuses (1971, 1980, 1991) show that modal farms are those from one hectare to less than three hectares (Table 2.14). The number of farms below three hectares is increasing, while farms from three hectares and above are decreasing. This pattern can be attributed largely to the partitioning of farms as an offshoot of a fast growing population.

Central Luzon leads the other regions of the Philippines in rice production. In 1998, this region produced 1.3 million tons of paddy from 429 thousand hectares of harvested area, comprising respectively, 15.3% of the country's aggregate paddy production and 13.5% of total harvest area (Table 2.15). It is one among the five regions whose average yield per hectare exceeds 3 metric tons and is above the national average yield of 2.70 metric tons. Central Luzon is a rice surplus producing region, and its total rice requirement (food, feed, and waste) accounts, on average, for two-thirds of total production (Table 2.16). In more recent years, the regional requirement has been increasing largely due to food needs of an increasing population. Over the 1980-1997 period, rice output grew at an annual compounded rate of 2.45% while population is catching up at an annual increase of 2.26%. Per capita food consumption is rising at an annual compounded rate of 0.35%. The rice surplus is marketed mostly in Metro Manila, but part is held as stocks in households, commercial warehouses, and NFA warehouses in the region.

**Table 2.14 Number of farms (thousands) by size, Central Luzon, the Philippines, 1971, 1980, 1991 censuses.**

Size of farms	Philippines			Central Luzon		
	1971	1980	1991	1971	1980	1991
All farms	2,354	3,420	4,160	168	235	335
< 1.00 ha	319	776	1,685	13	46	116
1.00 - 2.99 ha	1,118	1,578	1,968	87	136	164
3.00 - 4.99 ha	538	588	523	49	41	39
≥ 5 - 9.99 ha	243	360	325	16	11	14
10.00 ha	115	118	96	3	2	2

Source: National Statistics Office 1980, 1991.

**Table 2.15 Paddy production by region, the Philippines, 1998.**

Region	Production ('000 mt)	Area Harvested ('000 ha)	Yield (mt/ha)
Philippines	8,554.82	3,170.04	2.70
Cordillera Autonomous Region (CAR)	169.96	71.03	2.39
Ilocos Region	854.12	302.10	2.83
Cagayan Valley	1,109.37	357.64	3.10
Central Luzon	1,309.16	428.63	3.05
Southern Tagalog	889.34	353.64	2.51
Bicol Region	493.49	228.72	2.16
Western Visayas	1,044.46	413.70	2.52
Central Visayas	116.44	52.67	2.21
Eastern Visayas	362.01	185.33	1.95
Western Mindanao	264.43	100.64	2.63
Northern Mindanao	274.70	82.26	3.34
Southern Mindanao	560.69	172.37	3.25
Central Mindanao	644.09	208.84	3.08
Autonomous Region for Muslim Mindanao (ARMM)	222.61	117.56	1.89
Caraga Region	239.95	94.91	2.53

Source: Bureau of Agricultural Statistics.

**Table 2.16 Rice supply situation in Central Luzon region, the Philippines, 1980-1998.**

Year	Production (‘000 mt)	Surplus (‘000mt)	Supply (kg/capita)	Population (‘000 persons)
1980	844	271	102.55	4,827
1981	1,018	418	102.95	4,955
1982	1,165	542	102.74	5,083
1983	930	319	101.22	5,215
1984	801	142	109.72	5,350
1985	931	261	106.85	5,488
1986	1,051	365	105.35	5,628
1987	1,007	305	106.29	5,771
1988	831	121	107.00	5,918
1989	1,102	375	103.91	6,068
1990	1,250	459	109.88	6,220
1991	1,144	414	99.22	6,351
1992	1,135	367	103.59	6,485
1993	1,043	287	100.34	6,622
1994	1,227	442	100.44	6,763
1995	1,142	320	104.37	6,907
1996	1,227	328	112.27	7,065
1997	1,306	405	109.29	7,223
1998	851	30	100.97	7,381

Source: Bureau of Agricultural Statistics.

*Regression functions*

The regional regression also comprises four behavioral relationships. The variables in the final functions follow economic theory and are chosen from a series of preliminary regression analyses. The general form of the final functions is as follows:

- (1) Rice supply  $QS_{rCL} = f_1 (FP_{rCL-1}, FP_{CCL})$
- (2) Rice demand  $QD_{rCL} = f_2 (MP_r, POPNCL)$
- Price linkage
- (3) Wholesale price  $WSP_{rCL} = f_3 (MP_{r-1}, Dummy, T)$
- (4) Farm price  $FP_{rCL} = f_4 (WSP_{rCL})$

where

- $QS_{rCL}$  = Paddy production, Central Luzon, metric tons  
 $QD_{rCL}$  = Domestic demand for rice, Central Luzon, metric tons  
 $FP_{rCL}; FP_{rCL-1}$  = Farm price of paddy; lagged one year, Central Luzon, pesos per metric ton  
 $FP_{CCL}$  = Farm price of yellow corn, Central Luzon, pesos per metric ton  
 $WSP_{rCL}$  = Wholesale price of rice, Central Luzon, pesos per metric ton  
 $MP_r; MP_{r-1}$  = Import price of paddy; lagged one year, Central Luzon, US\$ per metric ton  
 $POPNCL$  = Population, Central Luzon, no. of persons  
 $Dummy$  = 1 for 1983, 1984, 1991, 1997; 0 otherwise  
The dummy (1) accounts for the period when the peso was devalued.  
 $T$  = Time trend (1980 = 1)

The data used in the regression analysis pertain to the period 1980-1997 (Table 2.17).

*Results and impact assessment*

The estimated functions of the above four behavioral relationships are described below. The full regression results are given in Appendix Table 8. The other regression functions tried for the regional rice supply and demand functions are provided in Appendix Table 9.

**Table 2.17 Data used in rice regression analysis for Central Luzon region, the Philippines, 1980-1997.**

Year	QS <sub>CL</sub> (‘000 mt)	QD <sub>CL</sub> (‘000 mt)	FP <sub>CL</sub> (pesos/mt)	WSP <sub>CL</sub> (pesos/mt)	WSP <sub>CL</sub> (US\$/mt)	MP <sub>r</sub> * (US\$/mt)	FP <sub>CCL</sub> (pesos/mt)	POP <sub>NCL</sub> (‘000 persons)
1979			1,070			706.36		
1980	1,298.53	573.08	1,250	2,280	303.60	1,720.00	1,300	4,827
1981	1,565.95	599.78	1,460	2,570	325.32	1,181.10	1,470	4,954
1982	1,791.92	622.77	1,490	2,700	316.16	1,000.00	1,520	5,083
1983	1,426.59	611.01	1,700	2,900	261.03	3,661.54	1,560	5,215
1984	1,225.19	658.77	2,810	4,990	298.80	233.94	2,680	5,350
1985	1,423.13	669.69	3,660	6,790	364.86	229.38	3,310	5,488
1986	1,607.08	685.56	3,050	6,450	316.33	199.22	3,070	5,628
1987	1,540.24	702.64	3,040	5,980	290.71	468.75	3,370	5,771
1988	1,270.84	710.04	3,400	6,810	322.90	399.29	3,210	5,918
1989	1,684.95	727.42	4,450	8,060	370.74	279.22	4,570	6,068
1990	1,910.93	790.33	5,120	8,540	380.57	215.39	4,920	6,220
1991	1,748.49	728.97	4,860	9,000	327.51	915.25	4,030	6,351
1992	1,735.94	768.70	4,990	9,480	371.62	501.58	5,530	6,485
1993	1,604.34	755.90	6,110	11,760	462.08	184.24	6,060	6,622
1994	1,886.75	784.85	6,600	12,500	473.13	4,158.54	5,470	6,763
1995	1,757.43	821.82	7,560	15,430	604.86	314.24	7,010	6,907
1996	1,888.08	899.39	8,960	17,250	657.89	358.20	6,560	7,065
1997	2,008.88	900.71	8,470	15,710	533.08	318.42	7,060	7,223
Average	1,631.96	722.86	4,388	8,289	387.84	908.00	4,039	5,997

Note: The 1979 data for FP<sub>CL</sub> and MP<sub>r</sub> were used in specifying the 1980 lagged for one year values for FP<sub>CL-1</sub> and MP<sub>r-1</sub>. The computed averages refer to the 1980-1997 period.

\* The high unit import prices in cif terms in some years correspond to small volume but large cif values of imports as explained in Table 2.9.

Sources: Bureau of Agricultural Statistics and National Statistics Office.

- Estimated rice regional supply function**

$$\ln Q_{SrCL} = 6.445 + 0.371 \ln FP_{rCL-1} - 0.253 \ln FP_{CCL} \quad (\text{Equation 2.7})$$

(16.465) (2.549) (-1.520)

R<sup>2</sup> = 0.550; D.W. = 1.788; Adj. R<sup>2</sup> = 0.489; n = 18 (1980-1997)

Based on the above regional rice supply function, the supply elasticity with respect to farm price lagged one year (FP<sub>rCL-1</sub>) is 0.371, which is more inelastic compared to the previous estimates (Table 2.18). Following the estimates, it can be observed that the regional supply response to changes in farm prices is becoming more inelastic as shown by the estimates of this study and earlier studies.

**Table 2.18 Previous estimates of supply elasticity of rice, Central Luzon region, the Philippines.**

Author/Year	Period of Data Covered	Supply elasticity
1. Center for Policy and Development Studies (CPDS), UP at Los Baños (1982)	1958-1978	0.66
2. Bantilan (1988)	1965-1984	0.42

Source: Estrada and Bantilan 1991.

- Estimated rice regional demand function**

$$\ln Q_{DrCL} = -1.149 - 0.015 \ln MP_r + 0.966 \ln POP_{NCL} \quad (\text{Equation 2.8})$$

(-1.578) (-1.932) (16.246)

R<sup>2</sup> = 0.955; D.W. = 1.819; Adj R<sup>2</sup> = 0.949; n = 18 (1980-1997)

The value of the regional demand elasticity with respect to the import price of rice (MP<sub>r</sub>) is -0.015. Using data for the period 1973-1976 and the domestic rice price as one of the explanatory variables, Rodriguez in 1980 (Estrada and Bantilan 1991) also found the demand for rice in Central Luzon as price inelastic although at a higher value (-0.391).

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### Price linkage equations

- **Wholesale price (WSP<sub>rCL</sub>)\***

$$\ln \text{WSP}_{rCL} = 7.849 + 0.105 \ln \text{WPC} / \text{MPC} + 0.112T \quad (\text{Equation 2.9})$$

(103.562) (2.861) (17.811)

R<sup>2</sup> = 0.962; D.W. = 1.112; Adj R<sup>2</sup> = 0.957; n = 18 (1980-1997)

The elasticity of wholesale price with respect to the ratio of world price and import price of rice is 0.105.

- **Farm price (FPr<sub>rCL</sub>)**

$$\ln \text{FPr}_{rCL} = -0.267 + 0.960 \ln \text{WSP}_{rCL} \quad (\text{Equation 2.10})$$

(-1.406) (44.822)

R<sup>2</sup> = 0.992 ; D.W. = 1.362; Adj. R<sup>2</sup> = 0.991; n = 18(1980-1997)

The elasticity of farm price with respect to wholesale price (WSP<sub>rCL</sub>) is 0.960.

### Effects on regional prices

- **Wholesale price (WSP<sub>rCL</sub>)**

The elasticity of price transmission of the wholesale price of rice in Central Luzon region with respect to the ratio of the world price and import price of rice (WP<sub>C</sub> / MP<sub>C</sub>) is 0.105 (equation 2.9). This indicates that a 1% increase in the price ratio transmits a 0.105% increase in the region's rice wholesale price. From zero to 50% tariff causes the 1997 regional wholesale price of 15,710 pesos per ton to rise to 16,535 pesos, an increment of 824.78 pesos per ton (0.105 x 0.50 x 15,710) or 5.25%. An increase of the tariff of rice from 0 to 200% results in an additional 3,299 pesos per ton (0.105 x 2 x 15,710) or 21%. The new wholesale price will be 19,909 pesos. This is the estimated wholesale price of rice after year 2004 or earlier if rice is tariffed at the assumed rate of 200 percent.

- **Farm price (FPr<sub>rCL</sub>)**

From equation 2.10, the price elasticity of transmission of the regional farm price with respect to wholesale price is 0.960. As discussed above, the regional wholesale price would increase by 5.25% and 21%, respectively, from 0 to 50% tariff and from 0% to 200% tariff. Therefore, the 1997 regional farm price will increase from 8,470 pesos per ton to 8,897 pesos, an additional 426.89 pesos per ton (0.960 x 0.0525 x 8,470) or 5.04% at 50% tariff. A rise in rice tariff from 0 to 200% will cause the farm price to increase further from 8,470 pesos per ton to 10,178 pesos, which is higher by 1,708 pesos per ton (0.960 x 0.21 x 8,470) or 20.16%.

### Effects on regional domestic supply (QS<sub>rCL</sub>)

In assessing the effects of rice tariffication at the national level, secondary data on the supply elasticity of rice (0.42) from Bantilan (1988) in Estrada and Bantilan (1991) will be adopted for the following reasons. First, it has a higher value compared to the estimate of the regression analysis in the present study (0.371). Second, due to technological change that has occurred, it is believed that the value of the supply elasticity for rice is higher than the estimated 0.371. Hence, the effects on farm prices through the farm price linkage equation are as follows. The regional rice supply of 2,008.88 thousand tons in 1997 will increase to 2,051 thousand tons, an increase of 42.52 thousand tons (0.42 x 0.0504 x 2,008.88) or 2.12% from zero to 50% tariff. At 200% tariff, the new domestic supply level will be 2,179 thousand tons, an additional 170.10 thousand tons (0.42 x 0.2016 x 2,008.88) or 8.47% increase. These increases translate to producer surpluses of 866.48 million pesos at the lower bound tariff rate of 50% and 3.58 billion pesos at the higher bound tariff rate of 200%.

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\* The dollar values of the wholesale prices are used in this equation.

*Effects on regional domestic demand ( $QD_{rCL}$ )*

Due to the small absolute value of the estimated demand elasticity with respect to the import price of rice (-0.015), the previous estimate of (-0.391) by Rodriguez in 1980 (Estrada and Bantilan 1991) will be used in determining the effect of rice tariffication in the region. Given this demand elasticity and the increases in wholesale price resulting from the price linkage equation, the 50% tariff will cause the 1997 regional demand of 900.71 thousand tons to decrease to 882.22 thousand tons, a drop by 18.49 thousand metric tons  $(-0.391 \times 0.0525 \times 900.71)$  or 2.05%. Increasing the tariff from 0 to 200% will diminish further the regional demand to 826.75 thousand tons, lower by 73.96 thousand tons  $(-0.391 \times 0.21 \times 900.71)$  or 8.21%. As a result, rice consumer loss in the region will be 735.26 million pesos at 50% tariff and 2.85 billion pesos at 200% tariff.

The results of the assessment of the impact of rice tariffication in Central Luzon region are summarized in Table 2.19. It can be observed that percentage changes in wholesale prices are slightly above the changes in farm prices. This follows the same pattern with the national level results wherein changes in wholesale prices are also greater. Similarly with the national level, rice producers would gain while rice consumers would lose. However, unlike in the national level analysis, the regional results show that producer gains exceed consumer losses. Overall, the net gain will be 131.22 million pesos at 50% tariff and 0.73 billion pesos at 200% tariff.

**Table 2.19 Summary of impacts of rice tariffication, Central Luzon region, the Philippines.**

Parameter	1997 Value	Tariff			
		0 to 50%		0 to 200%	
		Increase* (Decrease)	% Change	Increase* (Decrease)	% Change
1. $WSP_{rCL}$	P15,710/ton	P824.78/ton	5.25	P3,299/ton	21.00
2. $FP_{rCL}$	P8,470/ton	P426.89/ton	5.04	P1,708/ton	20.16
3. $QS_{rCL}$	2.009 M tons	0.042 M tons	2.12	0.170 M tons	8.47
4. $QD_{rCL}$	0.901M tons	(0.018 M tons)	(2.05)	(0.074 M tons)	(8.47)
5. $PS_{CL}$		P866.48 M		P3.58 B	
6. $CS_{CL}$		(P735.26 M)		(P2.85 B)	

PS – Producer surplus      M – million      B – billion

CS – Consumer surplus      P – Philippine peso

( ) – Negative values of  $CS_{CL}$  indicate losses.

\* Increase (decrease) compared to the 1997 value of the parameter.

*Effects on costs and returns*

Following the national level procedure, the effects of tariff reductions of fertilizer and machinery (2-wheel tractor) are also determined through partial budget data. It is assumed that reductions of fertilizer tariff by 2% and agricultural machinery by 10% are translated into prices of these inputs (rental in the case of a 2-wheel tractor) at the regional level. As Table 2.20 shows the per hectare costs of fertilizer will decrease by 30 pesos  $(1,773 \times 0.85 \times 0.02)$  and machinery rental by 36 pesos  $(361 \times 0.10)$ . As a result, the cash cost of producing a hectare of paddy in the region is reduced by less than 1% (0.47). Although the cost reductions are minimal, the additional effects of tariffs through increased farmgate prices (from Table 2.19) result in increases in net profit cost ratios. The 1997 net profit-cost ratio will increase nearly two-fold from 0.08 to 0.14 at 50% tariff, and almost four times from 0.08 to 0.30 if tariff is increased to 200%.

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**Table 2.20 Effects of trade liberalization on paddy production costs and returns (pesos per hectare), Central Luzon region, the Philippines, 1997.**

Item	1997	Tariff	
		0-50%	0-200%
CASH COST	14,173	14,107	14,107
Seeds/planting materials	920	920	920
Fertilizers	1,773	1,743	1,743
Pesticides	553	553	553
Hired labor	7,639	7,639	7,639
Irrigation fee	334	334	334
Land tax	253	253	253
Rentals:			
Tools and equipment	19	19	19
Machine	361	325	325
Animal	53	53	53
Land	505	505	505
Fuel and oil	411	411	411
Interest payment on crop loan	879	879	879
Food expense	407	407	407
Transport expense	65	65	65
NON-CASH COST	8,396	8,396	8,396
Seeds/planting materials	956	956	956
Landlord's share	1,633	1,633	1,633
Harvester's share	2,348	2,348	2,348
Threshers' share	1,466	1,466	1,466
Lease rental	1,623	1,623	1,623
Irrigation fee	367	367	367
IMPUTED COST	6,885	6,885	6,885
Operator/family labor	2,035	2,035	2,035
Exchange labor	106	106	106
Depreciation	1,538	1,538	1,538
Interest on operating capital	1,742	1,742	1,742
Rental value of owned land	1,464	1,464	1,464
ALL COSTS	29,454	29,388	29,388
GROSS RETURNS	31,830	33,446	38,256
RETURNS ABOVE CASH COST	17,657	19,339	24,149
RETURNS ABOVE CASH AND NON-CASH COSTS	9,261	10,943	15,753
RETURNS ABOVE ALL COSTS (NET RETURNS)	2,376	4,058	8,868
NET PROFIT-COST RATIO	0.08	0.14	0.30
Cost (pesos per kilogram)	7.84	7.82	7.82
Yield (kg per hectare)	3,758	3,758	3,758
Value (pesos per kilogram)	8.47	8.90	10.18

Source of basic data: Bureau of Agricultural Statistics 1998.

### 2.3.2 Farm level analysis

To complement the national and regional level analyses, the effect of trade reforms in the rice sector is analyzed at a cross section of farms in Nueva Ecija province, Central Luzon region.

#### *The study area*

Nueva Ecija province has been dubbed the rice granary of the country. Until 1995, paddy output from this province accounted for half of the region's total and about 9% of the national output (Table 2.21). These output shares, however, have been decreasing beginning in 1996. Annual average yields were above the regional average in some years in spite of the

prevalence of small-sized farms in the province (Table 2.22). This has been made possible by irrigation programs implemented in the province (Table 2.23) and use of high yielding varieties.

**Table 2.21 Paddy production, area harvested and yield, Nueva Ecija, Central Luzon region, the Philippines 1991-1998.**

Year	Philippines			Central Luzon			Nueva Ecija		
	Prod. (‘000 mt)	Area (‘000 ha)	Yield (mt/ha)	Prod. (‘000 mt)	Area (‘000 ha)	Yield (mt/ha)	Prod. (‘000 mt)	Area (‘000 ha)	Yield (mt/ha)
1991	9,674	3,425	2.82	1,748	500	3.50	921	32.40	3.36
1992	9,129	3,198	2.85	1,736	471	3.68	866	31.88	3.53
1993	8,935	3,282	2.72	1,604	477	3.36	817	29.38	3.92
1994	10,538	3,651	2.89	1,886	534	3.53	966	40.50	3.50
1995	10,541	3,758	2.80	1,758	548	3.21	878	44.59	3.49
1996	11,284	3,951	2.86	1,888	542	3.48	894	45.38	3.23
1997	11,269	3,842	2.93	2,108	543	3.88	830	45.28	3.35
1998	8,655	3,171	2.73	1,309	429	3.05	646	45.26	3.19

Source: Bureau of Agricultural Statistics.

**Table 2.22 Number of farms by size of farm, Nueva Ecija province, the Philippines, 1991 census.**

Size of Farm	No. of Parcels Reported	% share
All farms	132,918	100
< 0.500 ha	19,441	14.6
0.500 – 0.999 ha	24,743	18.6
1.000 – 1.999 ha	44,855	33.8
2.000 – 2.999 ha	22,799	17.2
3.000 – 4.999 ha	15,426	11.6
5.000 – 7.000 ha	3,545	2.7
7.001 – 9.999 ha	1,110	0.8
10.000 – 24.999 ha	858	0.6
≥25.000 ha	140	0.1

Source: National Statistics Office 1991.

**Table 2.23 Irrigation program implementation (hectares), Nueva Ecija province, the Philippines, 1990-1998.**

Year	Total	Communal Irrigation Project	Small Water Impounding Management Project	National Irrigation Project	Pump Irrigation Project
1990	1,020	300	600	0	120
1991	3,540	1,350	2,130	0	60
1992	2,300	1,050	1,150	0	100
1993	2,360	1,700	600	0	60
1994	1,510	750	650	0	110
1995	13,132	70	950	11,982	130
1996	16,172	200	420	15,492	60
1997	16,427	315	500	15,492	120
1998	16,054	0	500	15,494	60

Source: National Irrigation Administration.

### *Effects on costs and returns*

One rice farming village in Sta. Rosa, Nueva Ecija province was visited and a small cross section of farmers was interviewed. Some of these farmers are engaged in non-farming activities in order to augment their farm incomes. For example, one of them bought a jeepney\* which his family hires out as public transport.

The average costs and returns of producing a hectare of irrigated paddy by these sample farmers in the village are presented in Table 2.24. Fertilizer costs comprise the largest share, 24% of total cash cost in producing a hectare of irrigated paddy. Rental cost of machinery for

\* Jeepney is a popular public transport vehicle in the urban and rural sectors of the Philippines.

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plowing and threshing accounts for 22% of cash cost. Using a similar procedure in determining the effects of a tariff reduction of fertilizer as in previous sections, the cost of 5 bags of fertilizer will decrease from 3,750 pesos to 3,675 pesos ( $3,750 \times 0.85 \times 0.02 = 64$ ) with a reduction of fertilizer tariff from 5% to 3%. The cost of renting machinery for plowing and threshing will decrease from 3,300 pesos to 2,970 pesos ( $3,300 \times 0.10$ ). On a per hectare basis, the net effect will be a reduction in cash costs of producing one hectare of irrigated paddy per cropping season by 2.64% and in the cost of producing one kilogram of paddy by 1.59%. The profit-cost ratio will increase by 1.59%.

The cost reducing effects of input tariff reforms when combined with the output price increasing effects of rice tariffication in the region – 8.90 peso per kilogram at 50% tariff and 10.18 pesos per kilogram at 200% tariff – will cause the net returns at the farm level of 9,050 pesos per hectare to rise, respectively, by about 21% and 77% at the lower and higher tariff rates.

**Table 2.24 Effects of trade liberalization on production cost and returns (pesos per hectare, per cropping) of irrigated paddy, selected farms, Nueva Ecija province, the Philippines, 1998.**

Item	Quantity	Value	Tariff	
			0-50%	0-200%
CASH COST		15,320	14,926	14,926
Seeds/planting materials	4 bags of 40 kg	3,000	3,000	3,000
Fertilizer		3,750	3,686	3,686
	5 bags of urea,	2,000		
	50 kg each			
	5 bags (16-20)	1,750		
Chemical		1,470	1,470	1,470
Weedicide	1 liter	635		
	1 liter	835		
Hired Labor		2,950	2,950	2,950
Planting	15 mandays	2,550		
	2 mandays	400		
	(including carabao)			
Irrigation fee	1.5 bags of paddy/ha	600		
Rentals		3,300	2,970	2,970
Machinery				
Machine for plowing	1 machine day	800		
	1 machine day	2,500		
Fuel and oil		250	250	250
Crude oil, diesel oil		250		
NON-CASH COSTS		5,750	5,750	5,750
(peso value of shares in kind from paddy harvests given as payment for hired labor)				
IMPUTED COSTS		4,000	4,000	4,000
(peso value of farmer and other household labor)				
ALL COSTS		25,070	24,676	24,676
GROSS RETURNS		34,120	35,600	40,720
RETURNS ABOVE CASH COST		18,800	20,674	25,794
RETURNS ABOVE CASH AND NON-CASH COSTS		13,050	14,924	20,044
RETURNS ABOVE ALL COSTS (NET RETURNS)		9,050	10,924	16,044
NET PROFIT-COST RATIO		0.36	0.44	0.65
Cost per kilogram		6.27	6.17	6.17
Yield (kg per hectare)		4,000	4,000	4,000
Value (pesos per kilogram)		8.53	8.90	10.18

### 3. The Corn Sector

Corn accounts for the third largest contribution to gross value added in agriculture, next to rice and coconut. White corn is used mainly for food and yellow corn or maize is a major feed ingredient. Some 600 thousand farm households depend on corn as their major source of livelihood (DA 1998). Transport services, traders, processors and input suppliers also benefit directly from the domestic corn industry. This chapter discusses the major production, marketing and international trade policies and issues for corn with focus on yellow corn. The effect of the current trade liberalization on yellow corn is also analyzed at the national and sub-regional levels.

**Table 3.1 Production, area harvested and yield, white and yellow corn, the Philippines, 1980-1998.**

Year	Production (’000 mt)			Area harvested (’000 ha)			Yield (mt/ha)		
	White	Yellow	Total	White	Yellow	Total	White	Yellow	Total
1980	2,718	332	3,050	2,850	349	3,199	0.95	0.95	0.95
1981	2,711	585	3,296	2,683	611	3,295	1.01	0.96	1.00
1982	2,776	628	3,404	2,812	571	3,383	0.99	1.10	1.01
1983	2,356	778	3,134	2,544	588	3,132	0.93	1.32	1.00
1984	2,288	962	3,250	2,538	689	3,227	0.90	1.40	1.01
1985	2,978	885	3,863	2,843	667	3,511	1.05	1.33	1.10
1986	2,925	1,165	4,091	2,763	832	3,595	1.06	1.40	1.14
1987	2,765	1,513	4,278	2,693	990	3,683	1.03	1.53	1.16
1988	2,859	1,569	4,428	2,745	1,000	3,745	1.04	1.57	1.18
1989	2,923	1,599	4,522	2,702	987	3,689	1.08	1.62	1.23
1990	2,966	1,888	4,854	2,738	1,081	3,820	1.08	1.75	1.27
1991	2,906	1,749	4,655	2,583	1,006	3,589	1.12	1.74	1.30
1992	2,700	1,919	4,619	2,351	980	3,331	1.15	1.96	1.39
1993	2,627	2,171	4,798	2,098	1,051	3,149	1.25	2.07	1.52
1994	2,090	2,429	4,519	1,866	1,140	3,006	1.12	2.13	1.50
1995	1,862	2,266	4,128	1,670	1,022	2,692	1.12	2.22	1.53
1996	1,883	2,268	4,151	1,696	1,040	2,736	1.11	2.18	1.52
1997	1,879	2,453	4,332	1,699	1,027	2,726	1.11	2.39	1.59
1998	1,620	2,203	3,823	1,451	903	2,354	1.12	2.44	1.62

Source: Bureau of Agricultural Statistics.

#### 3.1 Production, marketing, international trade policies and issues

##### 3.1.1 Production

Until 1995, corn production in the Philippines was dominated by yellow corn. In 1998, yellow corn harvests comprised about 58% of total corn output (Table 3.1). Before this period, white corn output accounted from 60 to 95% of total corn production. The shift in focus can be attributed to the concentration of recent corn production programs on yellow corn with the objective of attaining self-sufficiency in the major feeds for livestock. Several corn programs have also been implemented by the Department of Agriculture with the aim of attaining self-sufficiency. Similar to the *Masagana 99* program for rice, the *Masagana* is one of the major programs for corn, which consists of a package of technology of HYVs, fertilization, irrigation, and credit support. This program has resulted in increased productivity for both white and yellow corn. A major breakthrough in yellow corn R&D is the development of open pollinated varieties (OPV). As in rice, under the Grains Production Enhancement Program (GPEP), corn farmer participants were given either a subsidy of a 20 kg bag of certified OPV corn seed or an

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18 kg bag of hybrid corn seed. This subsidy prevailed until 1995. The current *Agrikulturang MakaMASA* Corn program does not include this subsidy component.

From 1994, total corn output followed a decreasing trend partly due to the prolonged dry season and typhoons that hit the country during the period and decreasing area harvested for white corn. In the last five years, average yield of white corn stood at about 1.12 metric tons per hectare and yellow corn at 2.27 metric tons, considered low compared to corn yields in major corn producing countries such as Thailand (3.15 mt/ha), Argentina (4.04 mt/ha) and the U.S. (7.97 mt/ha) (DA 1988).

#### *Demand and supply of corn*

White corn is mostly used for human consumption while yellow corn is primarily for feeds. In the various feeds used in the domestic livestock industry, yellow corn is the major ingredient, accounting for almost two-thirds of livestock feed formulation. Corn comprises 22.5% of the cost of broiler chickens and 27.5% of the cost of hogs (Teh, Jr. and Yorobe, Jr. 1993).

The yellow corn-livestock linkage has put pressure on both corn and livestock producers and feedmillers due to the rapid growth in the livestock industry. From the mid-1980s growth in the poultry and hog sub-sectors has outpaced the growth in yellow corn output. Shortfalls in domestic supply relative to the livestock requirements are experienced especially during the dry season. As a result, the country has relied on imports to fill the gap between demand and supply. Over the period 1980-1998, on average, the annual supply and demand gap for yellow corn was 1.13 million tons (Table 3.2).

**Table 3.2 Yellow corn deficit and imports (metric tons), the Philippines, 1980-1998.**

Year	(Deficit)	Import
1980	1,663,031	249,937
1981	1,631,680	253,024
1982	1,755,891	340,908
1983	1,556,274	528,440
1984	1,334,470	182,358
1985	1,599,930	281,164
1986	1,755,874	122
1987	789,296	55,777
1988	781,229	25,092
1989	965,006	153,943
1990	712,663	342,987
1991	928,252	314
1992	908,080	604
1993	783,995	648
1994	576,574	893
1995	918,601	208,024
1996	1,085,005	402,345
1997	1,033,874	302,957
1998	1,307,466	469,000

Sources: Bureau of Agricultural Statistics for data on deficit and National Statistics Office for imports.

#### **3.1.2 Marketing**

The bulk of corn output comes from Mindanao in the southern part of the Philippines. In 1998, the Bureau of Agricultural Statistics (BAS) reported that about 66% of total corn output was accounted for by harvests in the Mindanao region (Table 3.3) where 63% of the total area harvested is located. Feed mills and large livestock producers, however, are found in Luzon (Metro Manila, Southern Tagalog, Central Luzon region) and in Cebu in the Central Visayas region.

The dispersed geographic locations of the production and consumption areas coupled with weak infrastructure links and monopoly in inter-island shipping result in high marketing costs of corn in the Philippines. These factors contribute to the high cost of corn shipment from Cagayan de Oro in Mindanao in the south to the port in Manila in Luzon compared to the cost of shipping corn from Thailand. On average, the cost of marketing and distribution of corn in the Philippines is two-thirds higher than that in Thailand. Bulk handling of corn, which is not practiced in the Philippines, contributes to the competitive position in marketing and distribution of corn in Thailand (Rosegrant and Gonzales 1991).

**Table 3.3 Regional distribution of corn production and area, the Philippines, 1998.**

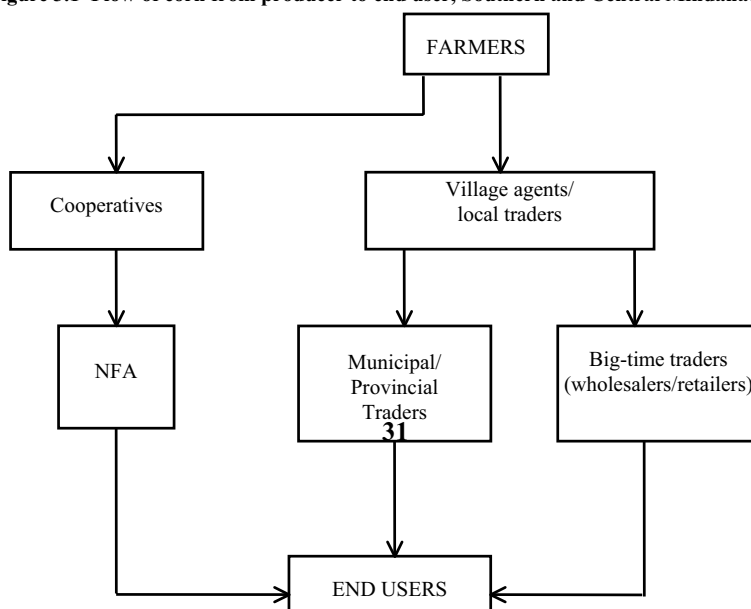
Region	Production ( <sup>'000</sup> mt)	Area Harvested (hectares)	Yield (mt/ha)
Philippines	3,957.83	2,364.23	1.67
Cordillera Autonomous Region (CAR)	40.48	22.95	1.76
Ilocos	214.62	69.90	3.07
Cagayan Valley	582.90	241.03	2.42
Central Luzon	117.74	33.22	3.54
Southern Tagalog	66.90	59.16	1.13
Bicol	77.28	101.81	0.76
Western Visayas	77.52	66.23	1.17
Central Visayas	140.84	222.82	0.63
Eastern Visayas	33.77	53.32	0.63
Western Mindanao	207.65	220.62	0.94
Northern Mindanao	626.35	255.79	2.45
Southern Mindanao	617.98	381.30	1.62
Central Mindanao	615.93	323.67	1.90
Autonomous Region for Muslim Mindanao (ARMM)	465.66	259.12	1.80
Caraga	72.22	53.29	1.36

Source: Bureau of Agricultural Statistics.

The geographic factors in the Philippine corn industry also explain the presence of numerous middlemen or traders (wholesalers, wholesaler-traders, brokers or commission agents) at different layers of the distribution chain for corn from the major producing areas to the major wholesale markets such as Cebu and Manila. Figure 3.1 illustrates the flow of corn from the producer to the end-user in two of the Mindanao regions.

The flow of corn from the farm to market centers is constrained by poor farm-to-market-roads and inadequate transportation facilities. These factors also contribute to the high cost of transporting corn. Also, the road conditions largely affect the cost of transporting grains such as corn from the farm to the market centers (Table 3.4).

**Figure 3.1 Flow of corn from producer to end user, Southern and Central Mindanao.**



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Source: Based on Domingo et al. 1996.

**Table 3.4 Comparative transport costs for grains in selected provinces, the Philippines, 1987.**

Province	Distance (km)	Average Transport Cost (peso/mt/km)	Type of Road
Luzon			
North Cagayan	30	2.00-3.00	50% rough roads
South Cagayan	30	0.80	Relatively good but unpaved roads
Mindanao			
South Cotabato	10	5.00	59% rough roads
Sultan Kudarat	10	7.50	97% rough roads

Source: Adapted from Serrano 1992 in Librero and Tidon 1996.

#### *Import policy*

Unlike rice, the government does not have a buffer stock for corn. Imports of corn as for rice depend primarily on the stock situation in commercial warehouses and holdings of the National Food Authority (NFA) from their procurement program. In most of the period when the country imported corn, stocks were at low levels. Previous to the GATT-WTO, corn imports were regulated through import licensing by the government. Under the current trade liberalization, import licensing has been lifted and replaced with an out-quota tariff as high as 100% which will be reduced over a period of 10 years. An inter-agency committee for corn from the DA including the NFA determines the amount to be imported based on its assessment of the stock situation, production, prices, and needs of the feedmillers. The NFA holds the first right to import corn under the Minimum Access Volume (MAV). The private sector participates in corn imports, unlike in the rice sector where the government had the monopoly to import for a long period of time.

#### *Price and pricing policy*

The domestic prices of corn (farmgate and wholesale) continue to be above world prices. This indicates the protection to domestic corn producers as well as the inefficiency of the marketing system due to the high transport cost. Similar to rice, the NFA intervenes in the domestic market through its procurement and distribution activities (Table 3.5) and sets support and ceiling prices for corn and corn grits (Table 3.6). This intervention system has limited impact in raising farm prices at least at the support price level, due to the limited volume covered. Based on data from 1990 to 1984, on average, ceiling prices are kept at 64% above support prices. In the market, average retail prices of corn are more than twice the average farm prices.

**Table 3.5 NFA corn procurements and corn injections (metric tons), the Philippines, 1980-1996.**

Year	Corn Procurements	Corn Injections
1980	12,653	161,588
1981	62,145	307,761
1982	68,059	351,732
1983	120,088	511,941
1984	14,941	300,797
1985	110,072	162,459
1986	34,084	121,119
1987	26,951	112,730
1988	122,280	65,810
1989	14	106,261
1990	319,910	54,741
1991	98,146	186,923
1992	5,908	166,246
1993	8,563	7,412
1994	6,966	10,701
1995	-	704
1996	11,685	756

Source: National Food Authority.

**Table 3.6 Historical support and ceiling prices (pesos per kilogram) of corn and corn grits, 1974-1999.**

Corn		Corn grits	
Effective Date	Support Price	Effective Date	Ceiling Price
29 May 1976	0.50	20 Feb. 1974	1.45
24 Sep. 1979	1.00	-	-
21 Jul. 1980	1.10	29 May 1976	1.60
29 Dec. 1980	1.20	-	-
17 Jun. 1981	1.30	04 Feb. 1980	1.75
01 Sep. 1983	1.40	19 Aug. 1980	1.90
01 Dec. 1983	1.65	17 Jun. 1981	2.15
26 May 1984	2.00	01 Sep. 1983	2.30
09 Jun. 1984	2.30	01 Dec. 1983	2.70
19 Oct. 1984	2.50	26 May 1984	3.25
30 May 1985	2.90	09 Jun. 1984	3.85
01 Oct. 1989	3.90		
26 Jul. 1990	4.00		
17 Sep. 1990	4.50		
01 Jul. 1996	6.00		
	+ 0.50*		

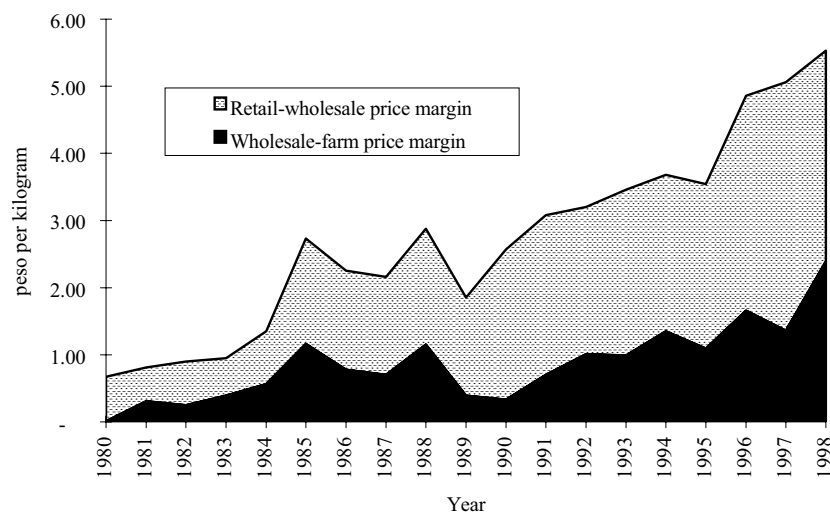
\* Additional 50 cents per kilogram to the buying price for corn is given as incentive to farmers if they sell to cooperatives.

Source: National Food Authority, compiled by the Bureau of Agricultural Statistics.

### Price margins

The wide gap between retail and farm prices of corn indicates that retailers extract a larger price margin than wholesalers. This is illustrated in Figure 3.2 wherein the retail-wholesale price margins of yellow corn are greater than the wholesale-farm price margins. The retail-wholesale price margins are also increasing. Considering the period 1980 to 1998, on average, the retail-wholesale margin was 2.73 pesos per kilogram and for the wholesale-farm margin, 1.32 pesos per kilogram.

Figure 3.2 Yellow corn price margins, the Philippines, 1980-1998.



### 3.1.3 International trade

Prior to global trade liberalization under the GATT-WTO, corn tariffs underwent several changes as a means of protecting farmers and assisting users such as the feedmillers (Table 3.7). The tariff rates apply to both white and yellow corn. However, the country imports mainly yellow corn. Under the UR Agreement on Agriculture of the GATT-WTO, in 1995 the quantitative restrictions on corn were replaced with tariffs. Part of the tariff agreement under the GATT-WTO is the setting up of a tariff quota system or minimum access volume (MAV) for agricultural commodities concerned. For corn, the country is allowed an MAV that is equivalent to 3% of total corn consumption or imports subject to 35% tariff until the year 2004. Imports over and above the MAV or out-quota volumes are subject to an initial high tariff at 100% (Table 3.8). Because of the high out-quota tariff protection, a Minimum Access Plus Scheme was established as a means of addressing domestic corn shortages. This Scheme allows expanded corn imports in order to meet expected corn shortages.

**Table 3.7 Corn tariffs, the Philippines, 1972-2004.**

Period	Tariff Rate (%)
1972-1980	70
1980-1985	50
1986-1994	20
1995-2004	35

Sources: Librero and Tidon 1996 for 1972-1980 data and Philippine Tariff Commission for data onwards.

**Table 3.8 Tariff bindings for corn under the MAV, the Philippines, 1972-2004.**

Year	MAV ('000 mt)	MAV Tariff (%)	
		In-quota	Out-quota
1995	130.16	35	100
1996	134.98	35	100
1997	144.62	35	80
1998	154.27	35	80
1999	163.91	35	80
2000	173.55	35	65
2001	183.19	35	65
2002	192.83	35	65
2003	202.48	35	50
2004	212.12	35	50

Source: WTO Agreement 1994. Schedule LXXV (Philippines).

From the preceding discussions, a summary of some of the major policies and issues related to production, marketing and international trade on the Philippine corn sector is provided in Table 3.9.

**Table 3.9 Policy measures and issues on corn, the Philippines.**

Policy Measures	Issues
<b>A. Production</b>	
1. Productivity programs	
1.1 Input subsidies under GPEP For CY 1993-1995	Effect of subsidy removal on small farmers.
a. 20 kg bag of certified OPV corn seed, or	
b. 18 kg bag of hybrid corn seed	
c. exempting imported fertilizer grades from 5% duty free for CY 1993-1998	
d. reduced rates on production loan of at least 25% less than prevailing market rates for CY 1993-1998	
1.2 Infrastructure	
a. Construction and rehabilitation of irrigation systems.	Limited due to budgetary constraints.
b. Construction of farm-to-market roads	Delayed due to budgetary constraints.
1.3 Public investment in R & D	Declining public investment in R & D.
<b>B. Marketing</b>	
1. Government trading/interventions through NFA procurement and distribution, corn support and ceiling prices with the aim of stabilizing prices.	Limited impact due to limited coverage.
	Inefficient marketing and distribution system due to high marketing costs in turn attributed to dispersed geographic locations of production and consumption areas, weak infrastructure links, and monopoly in interisland shipping.
<b>C. International trade</b>	
1. Corn tariffication WTO	
a. In-quota tariff, 35%	Rate of tariff in the next WTO negotiations.
b. Out-quota tariff, from 100% to 50% in year 2004.	
AFTA –CEPT	
C. Corn is among the 48 sensitive farm products that will be integrated into CEPT. Tariff will be reduced eventually to 5% by 2010.	

## 3.2 Effects of tariff reforms at the national level

### 3.2.1 Framework for analysis

Assessment of the impact of trade liberalization is confined to yellow corn since the country imports mainly yellow corn. The national and regional impact assessments, as in the previous chapter on rice, apply regression analysis. Through the derived elasticities of imports, supply, demand, wholesale and farm price transmissions, the effects of trade reforms for corn are determined. Partial budget analysis complements the regression analysis and serves as the main approach in assessing the effects of trade liberalization on corn at the farm location specific setting. The benefits to producers and consumers of corn are determined through the economic surplus approach, which uses the notion of producer and consumer surpluses. The algebraic equations for quantifying these surpluses are given in equations 2.1 and 2.2 of the chapter on rice in this study.

In this study, the impact analysis takes into account further tariff reductions in the next round of WTO negotiations. The current 35% in-quota tariff under the MVA for corn serves as the starting point of analysis. Similarly with rice, policy discussions are underway regarding the country's stand on tariff rates on corn imports after the year 2004. One of the options, which the present study adopts for purposes of analysis, is reducing the current MAV in-quota tariff of 35% to 20% and subsequently to 5%. This scaling down of corn tariffs in the next round of WTO negotiations would be in harmony with the AFTA-CEPT's aim of reducing tariff rates in the ASEAN region within the range zero to 5% by the year 2010.

#### *Generalized forms of regression functions*

The generalized form of the final functions from preliminary regression analysis is provided in the following sections. There are five functions, including an import demand function which specifies the specific tariff rate for corn as one of the explanatory variables. A similar function was not developed in the rice analysis. The main reason for this is the free import duty accorded NFA rice imports.

- Import quantity:  $QMC = f_1 (TR_C, QM_w, QMC, POPNCK, Dummy1, T)$
- Domestic supply:  $QSC = f_2 (FPC, AREAC)$
- Domestic demand:  $QDC = f_3 (WPC, RatRCWC, POPNCK, T)$
- Price linkages
  - Wholesale price:  $WSP_C = f_4 (WP_C/MP_C, TR_C, Dummy, T)$
  - Farm price:  $FP_C = f_5 (WSP_C)$

where

$QM_C$	=	Imports of yellow corn (in metric tons)
$QM_w$	=	Imports of wheat (in metric tons)
$QM_w/QM_C$	=	Ratio of volume of wheat and yellow corn inputs (%)
$QSC$	=	Domestic production of yellow corn (in metric tons)
$QDC$	=	Domestic feed consumption of yellow corn (in metric tons)
$AREAC$	=	Area harvested for yellow corn (in hectares)
$TR_C$	=	Specific import tariff for yellow corn (US\$ per metric ton)
$MP_C$	=	Import price of yellow corn, (cif, US\$ per metric ton)
$WPC$	=	World price of No. 2 yellow corn (fob, US Gulf ports, US\$ per metric ton)
$WPC/MP_C$	=	Ratio of world price and import cif price for corn (%)
$WSP_C$	=	Wholesale price of yellow corn (US\$ per metric ton)

WSPC	=	Wholesale price of yellow corn (pesos per metric ton)
FPC	=	Farm price of yellow corn (pesos per metric ton)
RatRCWC	=	Ratio of domestic retail and wholesale prices of yellow corn (%)
POPNC	=	Chicken population (no. of birds)
Dummy	=	1 for 1983, 1984, 1991, 1997; 0 otherwise
		The dummy(1) accounts for the period when the peso was devalued.
Dummy1	=	0 for 1986 and 1991-1994; 1 otherwise. The Dummy1 (0) accounts for low value of yellow corn imports.
T	=	Time trend (1980 = 1)

The data used in the corn regression analysis are provided in Table 3.10 and complete results of the regressions are found in Appendix Table 10. The results of preliminary regressions for the supply and demand functions are also given in Appendix Table 11.

### 3.2.2 Results of regression analysis

#### *Estimated yellow corn import quantity function*

$$\ln QMC = -3.866 - 0.180 \ln MPC - 0.912 \ln QM_w QM_C \quad (\text{Equation 3.1})$$

$$(-1.292) \quad (-2.646) \quad (-43.061)$$

$$+ 1.644 \ln POPNC + 0.205 \text{Dummy1} - 0.022T$$

$$(5.559) \quad (1.818) \quad (-1.274)$$

$$R^2 = 0.999; \quad D.W. = 1.829; \quad \text{Adj. } R^2 = 0.999; \quad n = 18 \quad (1980-1997)$$

The elasticity of quantity demand for yellow corn with respect to its specific tariff (-0.180). A 1% change in the specific tariff for yellow corn would result in 0.180% change in the quantity of yellow corn imports.

#### *Estimated yellow corn supply function*

$$\ln QSC = 3.470 + 0.383 \ln FPC + 1.127 \ln AREAC \quad (\text{Equation 3.2})$$

$$(6.009) \quad (4.494) \quad (6.987)$$

$$R^2 = 0.975; \quad D.W. = 1.471; \quad \text{Adj. } R^2 = 0.971; \quad n = 18 \quad (1980-1997)$$

Based on the coefficient of  $\ln FP_C$  which is the elasticity of yellow corn supply with respect to its farm price, a 1% change in prices received by farmers induces a 0.383% change in quantity supplied. The value of supply elasticity for corn in this study falls within the range of estimates in previous studies (Table 3.11). These studies have accounted for both white and yellow corn.

#### *Estimated yellow corn demand function*

$$\ln QDC = 10.001 - 0.133 \ln WPC - 0.291 \ln RatRCWC + 0.493 \ln POPNC \quad (\text{Equation 3.3})$$

$$(14.582) \quad (-1.766) \quad (-1.378) \quad (11.578)$$

$$R^2 = 0.920; \quad D.W. = 1.427; \quad \text{Adj. } R^2 = 0.903; \quad n = 18 \quad (1980-1997)$$

The demand elasticity for yellow corn with respect to the world price ( $WP_C$ ) suggests that a 1% increase in  $WP_C$  causes a 0.133% decrease in quantity demanded. Most of the studies on the elasticities of domestic corn demand adopt domestic prices as explanatory variables. In this study, the demand elasticity for yellow corn with respect to the ratio of domestic retail and wholesale prices ( $RatRCWC$ ) is -0.291. Estimates from previous studies using own price of corn as an independent variable range from -0.013 to -2.48 (Table 3.12).

Table 3.10 Data used in yellow corn regression analysis, the Philippines.

Year	QM <sub>c</sub> (mt)	QS <sub>c</sub> (mt)	QD <sub>c</sub> (mt)	QD <sub>w</sub> (mt)	AREA <sub>c</sub> (mt)	TR <sub>c</sub> US\$/mt	MP <sub>c</sub> US\$/mt	WP <sub>c</sub> (US\$/mt)	WSP <sub>cs</sub> (US\$/mt)	WSP <sub>c</sub> (pesos/mt)	FP <sub>c</sub> (pesos/mt)	RatR <sub>c</sub> W <sub>c</sub> (%)	POP <sub>NCK</sub> (‘000 birds)
1980	249,937	332,415	1,995,446	785.72	349.00	89,382	178.76	173.00	151.80	1,140	1,130	1.579	52,568
1981	253,024	585,055	2,216,735	796.43	611.48	99,410	198.82	166.00	202.53	1,600	1,290	1.312	57,724
1982	340,908	628,040	2,383,931	924.10	571.18	72,278	144.55	125.00	186.18	1,590	1,340	1.409	59,718
1983	528,440	778,560	2,334,834	797.17	588.06	75,897	151.79	134.00	160.22	1,780	1,390	1.315	62,253
1984	182,358	961,767	2,296,237	766.10	689.30	88,074	176.15	158.00	174.85	2,920	2,360	1.270	59,161
1985	281,164	885,028	2,484,958	662.71	667.45	67,974	135.95	119.00	191.83	3,570	2,410	1.431	52,399
1986	122	1,165,606	2,341,190	959.68	832.26	106.56	532.79	117.00	170.67	3,480	2,700	1.422	53,007
1987	55,777	1,513,409	2,302,705	971.70	989.98	21,934	109.67	115.00	177.93	3,660	2,960	1.399	53,248
1988	25,092	1,569,073	2,350,302	671.70	1,000.22	25,546	127.73	112.00	185.87	3,920	2,770	1.441	60,321
1989	153,943	1,599,282	2,564,288	1,074.84	986.85	29,187	145.94	112.00	205.61	4,470	4,080	1.327	70,016
1990	342,987	1,888,334	2,600,997	1,184.40	1,081.02	33,929	169.64	109.00	214.35	4,810	4,480	1.466	81,303
1991	314	1,749,335	2,677,587	1,449.70	1,006.09	87,261	436.30	107.00	160.12	4,400	3,700	1.540	78,240
1992	604	1,919,265	2,827,345	1,527.50	980.52	82,781	413.91	102.00	234.81	5,990	4,980	1.366	81,525
1993	648	2,170,928	2,954,923	1,705.50	1,050.97	121,914	609.57	108.00	220.04	5,600	4,610	1.441	87,157
1994	893	2,429,341	3,005,915	1,748.00	1,139.95	122,732	613.66	124.00	234.67	6,200	4,850	1.376	93,109
1995	208,024	2,266,087	3,184,688	2,088.60	1,022.01	36,714	183.57	166.00	292.43	7,460	6,370	1.328	96,215
1996	402,345	2,268,245	3,353,250	2,039.00	1,040.11	86,726	247.79	117.00	292.91	7,680	6,020	1.417	115,782
1997	302,957	2,453,208	3,487,082	1,891.90	1,026.91	73,574	210.12	111.00	251.10	7,400	6,040	1.500	134,963
Average	184,974	1,509,054	2,631,245	2,398.90	868.52	73,437	265.93	126.00	206.00	4,315	3,527	1.408	74,928

Source: Bureau of Agricultural Statistics, National Food Authority and World Bank Price Commodity Data.

**Table 3.11 Previous estimates of supply elasticity of corn, the Philippines**

Author/Year	Period of Data Covered	Supply Elasticity
1. Mangahas (1965)	1947-1963	0.42
2. Center for Policy and Dev. Studies (CPDS), UP Los Baños (1982)	1958-1978	1.03
3. Corpuz in Bantilan (1988)	1977	0.24-0.70
4. Perez (1988)	1960-1986	0.93
5. Costales (1990)	1982-1989 (quarterly)	0.71-0.79
6. Evenson (1991)	1970-1984	0.30

Source: Perez 1988, Costales 1990, Estrada and Bantilan 1991.

**Table 3.12 Previous estimates of demand elasticity of corn, the Philippines.**

Author/Year	Period of Data Covered	Demand Elasticity
San Juan (1978)	1974-1976	-0.0688
Snell (1980)	1970-1976	-1.14
Department of Agriculture, Integrated Agricultural Production and Marketing Project (1980)	Mixed time series of cross section data	-0.40
Regalado (1984)	1973-1976	
(By income stratum)	I	-2.48
	II	-1.02
	III	-0.78
	IV	-0.48
Costales (1990)	1982-1989 (quarterly)	-0.24 to -0.26
Evenson (1991)	1970-1984	-0.013

Source: Costales 1990, Estrada and Bantilan 1991.

### Price linkage equations

- Wholesale price**

$$\ln WSPC\$ = 4.272 + 0.227 \ln WPC/MPC + 0.191 \ln TRC$$

$$(22.604) (5.148) (4.266)$$

$$- 0.201 \text{Dummy} + 0.044T$$

$$(-4.873) (10.415)$$

(Equation 3.4)

$$R^2 = 0.906; D.W. = 2.364; \text{Adj. } R^2 = 0.878; n = 18 (1980-1997)$$

The elasticity of price transmission of yellow corn wholesale price with respect to the tariff ( $TR_C$ ) is 0.191. This means that a 1% change in the corn import tariff will result in 0.191% change in the domestic wholesale price of yellow corn.

- Farm price**

$$\ln FPC = -0.165 + 0.973 \ln WSPC$$

$$(-3.012) (25.503)$$

(Equation 3.5)

$$R^2 = 0.976; D.W. = 1.628; \text{Adj. } R^2 = 0.974; n = 18 (1980-1997)$$

The yellow corn farm price elasticity of transmission with respect to its wholesale price suggests that a 1% increase in the wholesale price of yellow corn will cause a 0.973% increase in the prices received by yellow corn farmers. It should be noted that, while the elasticities of transmission of both wholesale and farm prices are both inelastic, the former is more price inelastic. This indicates that wholesale yellow corn prices respond less to changes in the import tariff than the response of farm prices to changes in the wholesale price.

### 3.2.3 Impact assessment

#### *Effects on yellow corn imports ( $QM_C$ )*

From the yellow corn import elasticity with respect to specific tariff ( $TR_C$ ) derived from equation (3.1), the effect of tariff reduction from 35% to 20% on the 1997 yellow corn imports of 302.96 thousand tons will be an increase to 311.14 thousand tons, or an additional 8.18 thousand tons ( $0.180 \times 0.15 \times 302.96$ ) or 2.70%. A subsequent reduction of the tariff to 5% will

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increase imports to 319.86 thousand tons, higher by 5.58% or an increment of 16.90 thousand tons ( $0.180 \times 0.30 \times 302.96$ ).

#### *Effects on domestic prices*

- **Wholesale price (WSP<sub>C</sub>):** Based on the elasticity of price transmission of the yellow corn wholesale price with respect to import tariff (0.191) in equation 3.4, reducing the tariff from 35% to 20% will cause a decrease in the 1997 wholesale price from 7,400 pesos per ton to 7,188 pesos, a decrease by 2.86% or 212.01 pesos per ton ( $0.191 \times 0.15 \times 7,400$ ). Lowering the tariff to 5% will result in an even lower wholesale price, to 6,976 pesos per ton, 5.73% decrease or down by 424.02 pesos ( $0.191 \times 0.30 \times 7,400$ ).
- **Farm price (FPC):** Given a 0.973 price elasticity with respect to wholesale price and a decrease in wholesale price by 2.86% due to tariff reduction from 35% to 20%, the 1997 base year yellow corn farm price of 6,040 pesos per ton will decrease to 5,872 pesos, or a fall by 2.78% equivalent to 168.08 pesos per ton ( $0.973 \times 0.0286 \times 6,040$ ). A further decrease of tariff to 5% causes the yellow corn farm price to fall to 5,703 pesos per ton, or 5.58% decrease equivalent to 336.75 pesos ( $0.973 \times 0.0573 \times 6,040$ ).

#### *Effects on domestic supply (QS<sub>C</sub>)*

While the estimated supply price elasticity of yellow corn in the present study (0.383, equation 3.2) falls within the range of the estimates of some of the previous studies, a higher estimate (0.71) by Costales in 1990 is used instead (refer back to Table 3.11). The lower bound estimate of supply price elasticity for corn of 0.71 by Costales (1990) was chosen instead of the higher bound estimate of 0.79 upon suggestion by the author himself. The latter estimate was the result of adjustment for first order auto correlation. Given a decrease of 2.78% in farmgate prices resulting from a corn tariff of 20%, domestic yellow corn production will decrease by 48.42 thousand tons ( $0.71 \times 0.0278 \times 2,453.2$ ) or 1.97% from the 1997 production of 2,453.20 thousand tons. The resulting total production will be 2,405 thousand tons. The output production results in an estimated 408.28 million pesos loss of surpluses to domestic yellow corn farmers.

The impact of tariff reduction to 5% will be a decrease of 97.19 thousand tons ( $0.71 \times 0.0558 \times 2,453.2$ ) or 3.96%. Total yellow corn output will decrease further to 2,356 thousand tons. This implies a loss of 809.75 million pesos to domestic yellow corn farmers.

#### *Effects on domestic demand (QD<sub>C</sub>)*

Instead of the estimated price demand elasticity for yellow corn (-0.133) in the present study, a higher value of elasticity (-0.26) from a study of Costales (1990) is adopted in the welfare analysis. Of the secondary sources on demand elasticity for corn consulted in the present study, the data used by Costales (1990) in his estimation were the most recent, 1982-1989 (refer back to Table 3.12). This in combination with a decrease in wholesale price by 2.86% at 20% tariff will cause the 1997 domestic demand for yellow corn at 3,487 thousand tons to increase by 25.93 thousand tons or 0.74% ( $0.26 \times 0.0286 \times 3,487$ ). The new domestic demand level will be 3,513 thousand tons. Domestic consumers will have a surplus gain estimated at 742.04 million pesos.

A reduction in yellow corn wholesale price by 5.73% at 5% tariff will result in an increase of yellow corn domestic demand level by 51.95 thousand tons or 1.49% ( $0.26 \times 0.0573 \times 3,487$ ) for a new demand of 3,539 thousand tons. This means welfare benefits of 1.49 billion pesos to domestic consumers of yellow corn.

In summary, the overall effects of the assumed reductions in corn tariff are reduced domestic prices and output, increases in corn imports and demand, consumer gains but producer

losses (Table 3.13). In reducing the tariff from 35% to 20% and to 5%, respectively, consumer gains would be 742.04 million and 1.49 billion. Consumer gains would more than offset producer losses, resulting in net surplus of about 333.76 million pesos from 35% to 20% tariff and 680.25 million pesos from 35% to 5%.

### Effects on costs and returns

The average costs of producing one hectare of yellow corn at the national level comprise cash costs of 44%, non-cash costs of 16% and imputed cost of 40% (Table 3.14). The bulk of the cash cost is accounted for by hired labor, 40% and fertilizer cost (31%). Rental costs of various inputs comprise only 2.7%, more than half in land rent and one-fifth is rent for agricultural machinery. Payment in kind to harvesters is two-fifths of non-cash cost. The imputed value of the farmer labor and that of his family members is 60% of total imputed cost.

**Table 3.13 Summary of impacts of corn trade reforms, the Philippines.**

Parameters	1997 Value	Tariff			
		35 to 20% Increase* (Decrease)	% Change	35 to 5% Increase* (Decrease)	% Change
1. $QM_C$	0.303 M tons	0.008 M tons	6.70	0.017 M tons	5.58
2. $WSP_C$	P7,400/ton	(P212.01/ton)	(2.86)	(P424.02/ton)	(5.73)
3. $FP_C$	P6,040/ton	(P168.08/ton)	(2.78)	(P336.75/ton)	(5.58)
4. $QS_C$	2.453 M tons	(0.048 M tons)	(1.97)	(0.097M tons)	(3.96)
5. $QD_C$	3.487M tons	0. 026 M tons	0.74	0. 052 M tons	1.49
6. $PS_C$		(P408.28 M)		(P809.75 M)	
7. $CS_C$		P742.04 M		P1.49 B	

PS – Producer surplus

CS – Consumer surplus

( ) – Negative values of  $PS_C$  indicate producer losses.

\* Increase (decrease) compared to the 1997 value of the parameter.

M – million

B – billion

P – Philippine peso

Using the 1997 cost and returns data for one hectare of yellow corn, the impact of tariff reductions on fertilizer and agricultural machinery, and the changes in farm prices resulting from the tariff reductions of corn will be determined. Assuming that the marketing costs and margins for fertilizer are 15% of the selling price, using the 1997 national average fertilizer expense for one hectare yellow corn, the fertilizer cost will decrease by 22 pesos ( $1,306 \times 0.85 \times 0.02$ ) from 1,306 pesos to 1,284 pesos. The tariff reduction of a 2-wheel tractor from 20% to 10%, when applied directly to rental cost ( $19 \times 0.10$ ) will result in a decrease of rent from 19 pesos to 17 pesos per hectare. Based on previous discussions, tariff reduction from 35% to 20% will cause a decrease in farm price of yellow corn from 6.04 pesos to 5.87 pesos per kilogram and from 35% to 5% tariff, from 6.04 pesos to 5.70 pesos per kilogram. The overall impact of these changes will be a very minimal per unit cost reduction from 3.96 pesos to 3.95 pesos. Net returns per hectare will also diminish by 7.7% if the tariff reduces from 35% to 20% and 15.9% from 35% to 5% tariff.

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**Table 3.14 Effects of trade liberalization on production costs and returns (pesos per hectare) of yellow corn, the Philippines.**

Item	1997	Tariff	
		35-20%	35-5%
CASH COST	4,199	4,175	4,175
Seeds/planting materials	552	552	552
Fertilizers	1,306	1,284	1,284
Pesticides	145	145	145
Hired labor	1,663	1,663	1,663
Irrigation fee	1	1	1
Land tax	113	113	113
Rentals:			
Tools and equipment	12	12	12
Machine	19	17	17
Animal	23	23	23
Land	59	59	59
Fuel and oil	97	97	97
Interest payment on crop loan	13	13	13
Food expense	136	136	136
Transport expense	60	60	60
NON-CASH COST	1,531	1,531	1,531
Seeds/planting materials	92	92	92
Landlord's share	395	395	395
Sheller's share	101	101	101
Harvester's share	634	634	634
Hired labor paid in kind	249	249	249
Lease rental	58	58	58
Fuel and oil	2	2	2
IMPUTED COST	3,740	3,740	3,740
Operator/family labor	2,253	2,253	2,253
Exchange labor	127	127	127
Depreciation	554	554	554
Interest on operating capital	587	587	587
Rental value of owned land	219	219	219
ALL COSTS	9,470	9,446	9,446
GROSS RETURNS	14,436	14,029	13,623
RETURNS ABOVE CASH COST	10,237	9,854	9,448
RETURNS ABOVE CASH AND NON-CASH COSTS	8,706	8,323	7,917
RETURNS ABOVE ALL COSTS (NET RETURNS)	4,966	4,583	4,177
NET PROFIT-COST RATIO	0.52	0.48	0.44
Cost (pesos/kg)	3.96	3.95	3.95
Yield (kg/ha)	2,390	2,390	2,390
Value (pesos/kg)	6.04	5.87	5.70

Source of basic data: Bureau of Agricultural Statistics 1998.

## 3.3 Regional and farm level analyses

### 3.3.1 Regional analysis

The corn regional analysis is focused also in Central Luzon region and for the farm level component, a corn farming village in Pampanga province in Central Luzon is selected.

#### *The study area*

Until 1998 white corn production dominated corn area and output in Central Luzon region (Table 3.15). Before this period yellow corn cultivation was concentrated in the large producing regions of Northern, Southern and Central Mindanao. The high cost of transporting yellow corn from these major producing areas to the Luzon island where feedmillers and major

livestock producers are located brought about more intensive cultivation in some regions in Luzon island. In 1990 yellow corn output in Central Luzon was already one-third of total harvest of corn in the region, reaching 117.5 thousand tons in 1998 compared to 11.3 thousand tons in 1990 and less than 500 tons in 1980. Yellow corn production in Central Luzon is third only to Ilocos and Cagayan Valley regions in terms of output and area in the whole Luzon island (Table 3.16). In 1998, Cagayan Valley was the largest producer both in the region and the whole country. Although yellow corn production in Central Luzon is on the uptrend, it is still a deficit region for this commodity (Table 3.17). The annual regional requirement for yellow corn as feed far exceeds the annual production.

**Table 3.15 Corn production in Central Luzon region, the Philippines, 1980-1998.**

Year	Production (mt)			Area Harvested (hectares)			Yield (mt/ha)		
	White	Yellow	Total	White	Yellow	Total	White	Yellow	Total
1980	5,207	408	5,615	8,170	360	8,530	0.64	1.13	0.6
1981	4,021	699	4,720	5,950	1,150	7,100	0.68	0.61	0.66
1982	5,214	946	6,160	7,500	630	8,130	0.70	1.50	0.76
1983	3,992	2,053	6,045	6,670	1,730	8,400	0.60	1.19	0.72
1984	5,455	425	5,880	8,160	660	8,820	0.67	0.64	0.67
1985	5,759	1,851	7,610	7,940	1,840	9,780	0.73	1.01	0.78
1986	6,139	2,391	8,530	8,170	2,500	10,670	0.75	0.96	0.80
1987	5,752	3,555	9,307	7,270	2,940	10,210	0.79	1.21	0.91
1988	7,602	4,150	11,752	8,220	3,790	12,010	0.92	1.09	0.98
1989	6,067	6,821	12,888	8,120	4,900	13,020	0.75	1.39	0.99
1990	5,782	11,522	17,304	6,600	6,152	12,750	0.88	1.87	1.36
1991	5,647	13,685	19,332	6,020	6,370	12,390	0.94	2.15	1.56
1992	5,678	11,285	16,963	6,070	5,390	11,460	0.94	2.09	1.48
1993	6,060	15,595	21,655	5,570	6,080	11,650	1.09	2.56	1.86
1994	7,108	19,564	26,672	5,980	7,940	13,920	1.19	2.46	1.92
1995	4,572	32,391	36,933	5,641	11,728	17,369	0.81	2.76	2.13
1996	4,972	47,617	52,589	4,981	13,628	18,609	1.00	3.49	2.83
1997	6,735	64,005	70,740	5,574	15,882	21,456	1.20	4.03	3.30
1998	6,666	117,501	110,835	5,562	26,967	32,832	1.14	4.11	3.58

Source: Bureau of Agricultural Statistics.

**Table 3.16 Yellow corn production by region, the Philippines, 1998.**

Region	Production ('000 mt)	Area Harvested ('000 ha)	Yield (mt/ha)
Philippines	2,202.72	902.96	2.44
Cordillera Autonomous Region (CAR)	22.70	9.97	2.28
Ilocos Region	181.77	53.01	3.43
Cagayan Valley	547.34	214.23	2.55
Central Luzon	110.84	26.97	4.11
Southern Tagalog	60.35	51.74	1.17
Bicol Region	57.20	61.38	0.93
Western Visayas	49.19	1.17	1.30
Central Visayas	7.29	11.43	0.64
Eastern Visayas	1.07	1.22	0.87
Western Mindanao	3.73	3.13	1.19
Northern Mindanao	452.63	147.33	3.07
Southern Mindanao	274.18	105.82	2.59
Central Mindanao	243.45	102.66	2.37
Autonomous Region for Muslim Mindanao (ARMM)	178.72	71.12	2.51
Caraga	12.26	5.13	2.39

Source: Bureau of Agricultural Statistics.

**Table 3.17 Yellow corn feed requirement and supply situation (metric tons), Central Luzon region, the Philippines, 1980-1998.**

Year	Feed Requirement	Deficit*
1980	284,885	284,477
1981	362,958	362,659
1982	378,200	377,254
1983	323,959	321,906
1984	306,381	305,956
1985	345,253	343,402
1986	294,268	291,877
1987	312,164	308,609
1988	332,136	327,986
1989	340,323	333,502
1990	381,567	370,045
1991	401,826	388,141
1992	421,406	410,121
1993	443,624	428,029
1994	452,646	433,082
1995	482,877	450,526
1996	506,810	459,200
1997	527,038	463,033
1998	530,529	413,028

\* Production less feed requirement.

Source of basic data: Bureau of Agricultural Statistics.

### *Generalized forms of regression functions*

There are four functions for the yellow corn regional impact analysis. As in the previous analyses, these are the results of several preliminary regressions. The general forms of these functions are as follows:

Regional supply:  $QS_{CCL} = f_1 (FP_{CCL-1}, FP_{rCL}, T)$

Regional demand:  $QD_{CCL} = f_2 (RP_{CCL}/WSP_{CCL}, POPNCK, Dummy)$

Price linkages

Regional wholesale price:  $WSP_{CCL\$} = f_3 (WPC, T)$

Regional farm price:  $FP_{CCL} = f_4 (WSP_{CCL})$

where

$QS_{CCL}$  = Yellow corn production, Central Luzon (metric tons)

$QD_{CCL}$  = Yellow corn demand, Central Luzon (metric tons)

$WSP_{CCL}$ ;  $WSP_{CCL\$}$  = Wholesale price of yellow corn in Central Luzon  
(pesos per metric ton; US\$ per metric ton)

$QS_{CCL}$  = Yellow corn production, Central Luzon (metric tons)

$RPCCL/WSPCCL$  = Ratio of retail and wholesale prices of yellow corn,  
Central Luzon (%)

$FP_{CCL-1}$  = Farm price of yellow corn, lagged one year, Central Luzon  
(pesos per metric ton)

$FP_{rCL}$  = Farm price of paddy, Central Luzon (pesos per metric ton)

$WPC$  = World price of No. 2 yellow corn (US\$ metric ton, fob, Gulf ports)

$POPNCK$  = Chicken population (no. of birds)

$Dummy$  = 1 for 1983, 1984, 1991, 1997; 0 otherwise

The dummy one (1) accounts for the period when the peso was devalued.

$T$  = Time trend (1980 = 1)

The data used in the regional regression analysis for yellow corn are given in Table 3.18 and the complete regression results in Appendix Table 12. Results of some of the preliminary regression for the regional supply and demand are found in Appendix Table 13.

#### *Results of regression analysis*

- **Estimated regional supply function**

The several regression analyses tried in the present study (see Appendix Table 13) resulted in the estimated supply function with the best fit in equation 3.6. In addition to its own price, one of the significant explanatory variables is the price of paddy, which is a competitive crop for yellow corn. In the estimated supply function for paddy in Central Luzon region in Chapter 2, one of the explanatory variables is farm price of yellow corn.

$$\ln QSCCL = 4.766 + 1.188 \ln FPCCL - 1.017 \ln FPrCL + 0.266 T \quad (\text{Equation 3.6})$$

(1.160) (1.924) (-1.961) (4.142)

$$R^2 = 0.959; D.W. = 2.286; \text{Adj. } R^2 = 0.950; n = 18 \text{ (1980-1997)}$$

The elasticity of supply of yellow corn with respect to prices received by farmers in the region from the above equation means that for every 1% change in farm price, domestic production or supply will increase by 1.188%. An elastic supply of total corn in the region is consistent with the estimate of 1.16 from a previous study of the Center for Policy and Development Studies (CPDS), University of the Philippines at Los Baños in 1982 (see Estrada and Bantilan 1991) covering the period 1958 to 1978.

- **Estimated regional demand function**

$$\ln QDCCL = 5.139 - 0.241 \ln RPPCCL / WSPCCL + 0.695 \ln POPNCK$$

(7.150) (-1.549) (10.497)

$$- 0.119 \text{Dummy} \quad (\text{Equation 3.7})$$

(-2.563)

$$R^2 = 0.911; D.W. = 2.014; \text{Adj. } R^2 = 0.892; n = 18 \text{ (1980-1997)}$$

The demand elasticity of regional yellow corn with respect to the ratio of retail and wholesale prices ( $RP_{CCL}/WSP_{CCL}$ ) is -0.241. This indicates that a 1% increase in this price ratio will cause a 0.241% decrease in demand for yellow corn in Central Luzon. The demand elasticity is consistent with the result of a study of Quisumbing in 1988 (Table 3.19).

#### *Price linkage equations*

- **Wholesale price**

$$WSPCCL\$ = -543.576 + 145.385 \ln WPC + 10.027 T \quad (\text{Equation 3.8})$$

(-2.240) (2.985) (6.485)

$$R^2 = 0.737; D.W. = 2.483; \text{Adj. } R^2 = 0.702; n = 18 \text{ (1980-1997)}$$

The elasticity of price transmission of the regional wholesale price of yellow corn ( $WSP_{CCL\$}$ ) with respect to the world price ( $WP_C$ ) is  $145.385/253.18 = 0.574$ . This indicates that a 1% change in  $WP_C$  will change  $WSP_{CCL\$}$  by 0.574%.

Table 3.18 Data used in corn regression analysis, Central Luzon region, the Philippines.

Year	QSccl (mt)	QDccl (mt)	FPccl (P/mt)	FPccl (P/mt)	WSPccl (P/mt)	WSPccls (US\$/mt)	WPC (US\$/mt)	RPccl/WSPccl	POPCK (No. of birds)
1979			1,130						
1980	408	284,885	1,300	1,250	1,400	186.42	173	1.336	52,568
1981	699	362,958	1,470	1,460	1,970	249.37	166	1.142	57,724
1982	946	378,200	1,520	1,490	1,950	228.34	125	1.190	59,718
1983	2,053	323,959	1,560	1,700	2,450	220.52	134	0.943	62,253
1984	425	306,381	2,680	2,810	3,630	217.36	158	1.025	59,161
1985	1,851	345,253	3,310	3,660	4,410	236.97	119	1.088	52,399
1986	2,391	294,268	3,070	3,050	4,260	208.92	117	1.101	53,007
1987	3,555	312,164	3,370	3,040	4,000	194.46	115	1.278	53,248
1988	4,150	332,136	3,210	3,400	4,820	228.54	112	1.168	60,321
1989	6,821	340,323	4,570	4,450	4,730	217.57	112	1.374	70,016
1990	11,522	381,567	4,920	5,120	5,910	263.37	109	1.370	81,303
1991	13,865	401,826	4,030	4,860	5,410	196.87	107	1.471	78,240
1992	11,285	424,406	5,530	4,990	7,360	288.51	102	1.249	81,525
1993	15,595	443,624	6,060	6,110	6,880	270.33	108	1.536	87,157
1994	19,564	452,646	5,470	6,600	8,500	321.73	124	1.228	93,109
1995	32,391	482,877	7,010	7,560	9,170	359.47	166	1.140	96,215
1996	47,617	506,810	6,560	8,960	9,440	360.03	117	1.297	115,782
1997	64,005	527,038	7,060	8,470	9,090	308.45	111	1.430	134,963
Average	13,286	383,407	4,039**	4,388	5,299	253.18	126	1.242	74,928

\* The 1979 data for FP<sub>ccl</sub> were used in specifying the 1980 lagged for one year value for FP<sub>ccl-1</sub>.

\*\* Average for the 1980-1997 period.

Sources of data: Bureau of Agricultural Statistics and World Bank Commodity Price Data.

**Table 3.19 Previous estimates of demand elasticity for corn, Central Luzon region, the Philippines.**

Author/Year	Period of Data Covered	Demand Elasticity
1. Quisumbing (1988)	1978-1982	-0.21*
2. Rodriquez (1980)	1973-1976	-1.1521

\* For the whole of Luzon.

Source: Estrada and Bantilan 1991.

- **Farmgate price**

$$\ln \text{FP}_{\text{CCL}} = 0.045 + 0.963 \ln \text{WSP}_{\text{CCL}} \quad (\text{Equation 3.9})$$

(0.109) (19.533)

$$R^2 = 0.960; \text{D.W.} = 2.396; \text{Adj. } R^2 = 0.957; n = 18 \text{ (1980-1997)}$$

The elasticity of price of transmission of regional yellow farm prices ( $\text{FP}_{\text{CCL}}$ ) with respect to the domestic wholesale price ( $\text{WSP}_{\text{CCL}}$ ) is 0.963. It is the percentage response of  $\text{FP}_{\text{CCL}}$  to a 1% change in  $\text{WSP}_{\text{CCL}}$ .

### 3.3.2 Effects of corn tariff reforms

#### *Effects on regional yellow corn prices*

- **Wholesale price ( $\text{WSP}_{\text{CCL}}$ ):** Based on the regional wholesale price elasticity of transmission (0.574) with respect to world price, decreasing the tariff from 35% to 20% will cause a decrease of 8.61% or 782.65 pesos per ton ( $0.574 \times 0.15 \times 9,090$ ) to the 1997 wholesale price of yellow corn in Central Luzon from 9,090 pesos per ton to 8,307 pesos per ton. A further decrease of the tariff to 5% will result in a reduction of 16.41% or 1,492 pesos per ton ( $0.547 \times 0.30 \times 9,090$ ). The regional wholesale price level will decrease from 9,090 pesos to 7,598 pesos per ton.
- **Farm price ( $\text{FP}_{\text{CCL}}$ ):** Given an elasticity of farm price transmission with respect to wholesale price (0.963) in equation 3.4 and a decrease of the wholesale price by 8.61% at 20% tariff, the farm price will decrease by 8.29%. Therefore, the 1997 farmgate price of 7,060 pesos per ton will fall to 6,475 pesos per ton, or 585.37 pesos less ( $0.963 \times 0.0861 \times 7,060$ ). At 5% tariff, the farmgate price will diminish to 5,944 pesos per ton, 15.80% or 1,116 pesos less ( $0.963 \times 0.1641 \times 7,060$ ).

#### *Effects on regional domestic supply ( $Q_{\text{SCCL}}$ )*

From equation 3.6 the supply elasticity of yellow corn with respect to its lagged farm price is 1.188. The supply elasticity of yellow corn in the present study (1.188) covers the period 1980 to 1997. This is higher than the estimate of an earlier study by the CPDS (1.16) with the 1958-1978 period as reference. At 20% tariff the farm price will decrease by 8.29%. This situation will have a diminishing effect on the regional yellow corn production. Adopting the 1997 regional production of 64,005 tons as base data, the decrease in output volume will be 6,304 tons ( $1.188 \times 0.0829 \times 64,005$ ). The new level of yellow corn output will be 57,701 tons, a decrease of 9.85%. The estimated loss to yellow corn farmers in the region is 35.62 million pesos.

A further reduction of tariff to 5%, the decreasing effect on farm price by 15.80% and a supply elasticity of 1.188 will result in a lower yellow corn output of 51,991 tons, 18.77% decrease or 12,014 tons less ( $1.188 \times 0.1580 \times 64,005$ ). This implies a loss of 64.72 million pesos to the regional yellow corn farmers.

#### *Effects on regional domestic demand ( $Q_{\text{DCCL}}$ )*

Given a demand elasticity of -0.241 and the decrease in wholesale price as a result of the tariff reductions, the impact on demand for yellow corn in Central Luzon region is as follows. The demand elasticity for yellow corn in the present study (-0.241) for Central Luzon region

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covering the period 1980 to 1997 was used. This is slightly higher than an earlier estimate of Quisumbing (-0.21) for the whole island of Luzon with 1978-1982 as reference period.

At 20% tariff, the 1997 domestic demand of 527,038 tons will rise to 537,974 tons, higher by 2.08% or 10,936 tons more ( $-0.241 \times 0.0861 \times 527,038$ ). Further decrease of the tariff to 5% will cause the demand to rise further to 547,881 tons, an increment of 20,843 tons or 3.95% ( $-0.241 \times 0.1641 \times 527,038$ ). Additional surpluses or benefits will accrue to yellow corn consumers in the region, 416.76 million pesos and 801.89 million pesos, respectively, at the 20% and 5% tariff levels.

The overall effects of reducing the corn tariff in the Central Luzon region will be corresponding decreases in wholesale and farm prices as well as in yellow corn production (Table 3.20). The percentage changes in wholesale prices are slightly more than the changes in farm prices. On the other hand, as the supply of yellow corn in the region is elastic while the demand is inelastic, the percentage reductions in yellow corn output are greater than the percentage increases in demand. The above effects of tariff reforms result in benefits to users of yellow corn but losses to yellow corn growers in the region. The benefits offset the losses resulting in net benefits of 381.14 million pesos at 20% and 737.17 million pesos at 5% tariff.

#### Effects on costs and returns

The impact of tariff reduction for fertilizer inputs is determined through information on the costs of producing one hectare of yellow corn in the Central Luzon region (Table 3.21). The impact of tariff reduction for agricultural machinery was excluded due to the absence of data on this item. The reduction of the tariff on fertilizer from 5% to 3% will reduce the average 1997 fertilizer cost per hectare by 34 pesos ( $2,028 \times 0.85 \times 0.02$ ). Cash costs will decrease minimally by 0.44%. The decrease in farm prices as a result of tariff reductions also diminishes the net returns per hectare. At 20% tariff, the 1997 net returns will decrease by 16.22% and by 31.54% at 5% tariff.

**Table 3.20 Summary of impacts of corn tariff reforms, Central Luzon region, the Philippines.**

Parameters	1997 Value	Tariff			
		35% to 20%		35% to 5%	
		Increase* (Decrease)	% Change	Increase* (Decrease)	% Change
1. WSP <sub>CCL</sub>	P9,090/ ton	(P782.65/ton )	(8.61)	(P1,492/ton)	(16.41)
2. FP <sub>CCL</sub>	P7,060/ ton	(P585.37/ ton)	(8.29)	(P1,116/ton)	(15.80)
3. QS <sub>CCL</sub>	0.064 M ton	(0.0063M ton)	(9.85)	(0.012 M ton)	(18.77)
4. QD <sub>CCL</sub>	0.527 M ton	0.0109 M ton	2.08	0.0208 M ton	3.95
5. PS <sub>CCL</sub>					
6. CS <sub>CCL</sub>		(P35.62 M)		(P64.72 M)	
		P416.76 M		P801.89 M	

PS – Producer surplus M – million

B – billion

CS – Consumer surplus P – Philippine peso

( ) – Negative values of PS<sub>CCL</sub> indicate yellow corn producer losses in Central Luzon region.

\* – Increase (decrease) compared to the 1997 value of the parameter.

\* This assumes that 15% of the selling price of fertilizer is accounted for by marketing costs and margins.

**Table 3.21 Effects of trade liberalization on production costs and returns (pesos per hectare) of yellow corn, Central Luzon region, the Philippines.**

Item	Tariff		
	1997	35-20%	35-5%
CASH COST	7,761	7,727	7,727
Seeds/planting materials	1,597	1,597	1,597
Fertilizers	2,028	1,994	1,994
Pesticides	284	284	284
Hired labor	2,575	2,575	2,575
Land tax	104	104	104
Rentals:			
Animal	13	13	13
Land	308	308	308
Fuel and oil	628	628	628
Food expense	156	156	156
Transport expense	68	68	68
NON-CASH COST	247	247	247
Seeds/planting materials	44	44	44
Landlord's share	96	96	96
Sheller's share	62	62	62
Harvester's share	19	19	19
Hired labor paid in kind	26	26	26
IMPUTED COST	6,240	6,240	6,240
Operator/family labor	2,813	2,813	2,813
Exchange labor	41	41	41
Depreciation	1,641	1,641	1,641
Interest on operating capital	1,037	1,037	1,037
Rental value of owned land	708	708	708
ALL COSTS	14,248	14,214	14,214
GROSS RETURNS	28,452	26,114	23,938
RETURNS ABOVE CASH COST	20,691	18,387	16,211
RETURNS ABOVE CASH AND NON-CASH COSTS	20,444	18,140	15,964
RETURNS ABOVE ALL COSTS (NET RETURNS)	14,204	11,900	9,724
NET PROFIT-COST RATIO	1.00	0.84	0.68
Cost (pesos/kg)	3.54	3.53	3.53
Yield (kg/ha)	4,030	4,030	4,030
Value (pesos/kg)	7.06	6.48	5.94

Source of basic data: Bureau of Agricultural Statistics 1998.

### 3.3.3 Farm level analysis

The impact of corn trade reforms at the village level is examined for a sample of yellow corn farms in Arayat, Pampanga province, Central Luzon region.

#### *The study area*

Pampanga is one of six provinces comprising the Central Luzon region. It is adjacent to Nueva Ecija province. The major crops in this area are sugarcane and rice. Although Pampanga is not a major producer for yellow corn, shifting to yellow corn in several municipalities of the province has been observed. Yellow corn production and area harvested in the province is on the uptrend and more intensive cultivation started in 1993 when both output and area doubled (Table 3.22). Average yields per hectare are comparable with regional yields and above national yields. Commercial feedmillers in the nearby Bulacan province are the major markets for yellow corn output. As the 1991 agriculture census shows, a majority of the farms are below 2 hectares which is characteristic of Philippine farms (Table 3.23). As a result of several irrigation

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projects, the irrigation area has increased in the province although it is still below the irrigated area in Nueva Ecija (Table 3.24).

**Table 3.22 Yellow corn production, area harvested and yield, Pampanga province, Central Luzon region, the Philippines, 1991-1998.**

Year	Philippines			Central Luzon			Pampanga		
	Prod. (‘000 mt)	Area (‘000 ha)	Yield (mt/ha)	Prod. (‘000 mt)	Area (‘000 ha)	Yield (mt/ha)	Prod. (‘000 mt)	Area (‘000 ha)	Yield (mt/ha)
1991	1,749	1,006	1.74	13.68	6.37	2.15	1.65	0.72	2.29
1992	1,919	980	1.96	11.28	5.39	2.09	1.66	0.67	2.48
1993	2,171	1,051	2.07	15.60	6.08	2.56	3.62	1.22	2.96
1994	2,429	1,140	2.13	19.56	7.94	2.46	3.69	1.44	2.56
1995	2,266	1,022	2.22	32.39	11.73	2.76	9.09	3.30	2.75
1996	2,268	1,040	2.18	47.62	13.63	3.49	14.50	5.00	2.90
1997	2,453	1,027	2.39	64.00	15.88	4.03	21.03	5.20	4.04
1998	2,203	903	2.44	110.84	26.97	4.11	26.11	7.30	3.58

Source: Bureau of Agricultural Statistics.

**Table 3.23 Number of farms by size of farm, Pampanga province, the Philippines, 1991 Census.**

Size of farms	No. of Parcels Reporting	% share
All farms	49,627	100
< 0.500 ha	8,827	18
0.500 - 0.999 ha	6,605	13
1.000 - 1.999 ha	14,912	30
2.000 - 2.999 ha	8,735	18
3. 000 - 4.999 ha	7,358	15
5.000 - 7.000 ha	2,140	4
7.001 - 9.999 ha	676	1
10.000 - 24.999 ha	337	*
≥25.000 ha	36	*

\* Less than 1%.

Source: National Statistics Office.

**Table 3.24 Summary of irrigation program implementation (ha), Pampanga province, the Philippines, 1991-1998.**

Year	Total	Communal Irrigation Project	SRI Project	National Irrigation Project	Pump Irrigation Project
1991	771	621	0	0	150
1992	623	220	0	0	403
1993	1,003	350	350	0	303
1994	435	385	50	0	0
1995	3, 000	650	0	2,350	0
1996	6, 209	200	0	6,009	0
1997	7,050	0	0	6,900	0
1998	3,960	0	0	3,500	0

Source: National Irrigation Administration.

### *Effects on costs and returns*

A yellow corn farmer in one of the villages in the municipality of Arayat, Pampanga province in Central Luzon region was interviewed on the costs and returns of producing yellow corn. This farmer was a rice farmer and shifted to yellow corn due to higher prices for the latter crop in recent years. His total farm area is 2.4 hectares, which he plants to yellow corn. Table 3.25 gives to the average costs and returns for one hectare of yellow corn during the dry season. For this particular farmer, two-thirds of total farming costs comprise cash costs. Of the total cash costs, fertilizer accounts for the highest share of 28%, as the farmer applies fertilizer twice in a cropping season. The other major cash expenses are hired labor for harvesting and dehushing (14% total cash cost) and rental of machinery for land preparation and furrowing (12%). The value of payment in kind for the services of a machine sheller accounts for 15% of total costs. The average yield is 7.15 tons of yellow corn per hectare, which most irrigated and

well-fertilized farms produce. Yellow corn harvests are sold to traders. Accounting for the total costs, the computed net return per hectare is 31.5 thousand pesos.

Based on the above data, and assuming that 15% of the selling price of fertilizer price accounts for marketing costs and margins, the effect of a 2% reduction in fertilizer tariff will be a decrease in fertilizer expense by 61 pesos ( $3,600 \times 0.85 \times 0.02 = 61$ ). The 10% decrease in agricultural machinery tariff is also assumed to decrease machinery rental by 150 pesos ( $1,500 \times 0.10$ ). As result, net returns per hectare will increase minimally by 0.67%, from 31.522 thousand pesos to 31.733 thousand pesos. However, if the decreasing effects of tariff reductions on farm prices from the regional analysis are considered (6.48 pesos per kilogram from 35 to 20% tariff and 5.49 pesos per kilogram from 35 to 5% tariff), net returns of 31.5 thousand pesos per hectare will be reduced to, respectively, 29.4 thousand pesos or 6.6% and 25.6 thousand pesos or 18.8%. The decrease in net returns of producing yellow corn may result in shifting to rice or to high value commercial crops, although this would depend also on the prospects for these crops. Accordingly to the sample corn farmer, the increasing production of yellow corn in the nearby Cagayan Valley region and the low priced yellow corn imports have depressed farmgate prices. The farmer indicated that if the farm price of yellow corn continues to decrease, he might shift back to paddy production.

**Table 3.25 Effects of trade liberalization on production costs and returns (pesos per hectare) of yellow corn, Arayat, Pampanga province, the Philippines, 1998.**

Item	Quantity	Value	Tariff	
			35-20%	35-5%
CASH COST		12,665	12,454	12,454
Seeds	18 kg, Pioneer 1230	1,500	1,500	1,500
Fertilizer		3,600	3,539	3,539
a. 1 <sup>st</sup> application, 15 days after planting	5 bags of urea, P360/bag = P1,800			
b. 2 <sup>nd</sup> application, after 45 days from 1 <sup>st</sup> application	5 bags urea P360/bag = P1,800			
Pesticide	1 bags Furadan, granule	800	800	800
Irrigation fee	2 time irrigation, P100/irrigation	200	200	200
Diesel/motor oil for deep well	2 time irrigation, P125/irrigation	250	250	250
Hired Labor		4,815	4,815	4,815
a. Planting	3 mandays, P200/manday	600		
b. Hilling-up	2 days of man, animal labor, P200/day	400		
c. Fertilizer application	2 mandays, P75/manday	150		
d. Chemical application	One manday	125		
e. Weeding	3 mandays, P300/manday	900		
f. Harvesting, dehusking	6 mandays, for 3 days P100/manday	1,800		
g. Hauling of corn from the field	P5 per bag, 5 x 120	600		
h. Drying	3 mandays, P80/manday	240		
Rental				
Machine for land preparation and furrowing	1 day	1,500 1,500	1,350	1,350
NON-CASH COSTS		2,696	2,696	2,696
Payment in kind for machine sheller	6 bags per 100 bags	2,696		
IMPUTED COSTS		1,737	1,737	1,737
Operator family labor	7 mandays, P100	700		
Interest for operating capital		1,037		
TOTAL COSTS		17,098	16,887	16,887
GROSS RETURNS		48,620	46,332	42,471
RETURNS ABOVE CASH COST		35,955	33,878	30,017
RETURNS ABOVE CASH AND NON-CASH COSTS		33,259	31,182	27,321
RETURNS ABOVE ALL COSTS (NET RETURNS)		31,522	29,445	25,584
Cost (pesos/kg)		2.39	1.74	1.52
Yield (kg/ha)		7,150	7,150	7,150
Value (pesos/kg)		6.80	6.48	5.94

P = peso.

## **4. Conclusions and Strategies**

### **4.1 Introduction**

The conclusions here, as well as the discussion of the strategies for agricultural trade liberalization in the Philippines, include the findings in the first study on the institutional and structural aspects.

It was observed in the first study that the decreasing competitive advantage of the country's agricultural sector is partly the result of past agricultural, macroeconomic, and protective trade policies. In fact the import substitution policies, exchange rate and quantitative restrictions (QRs) on imports have contributed to the declining share of the agricultural sector in the country's gross domestic product (GDP). These policies dissipated into the agricultural commodity sectors and bore unfavorable effects. The Philippines is a net importer of rice and yellow corn. In order to protect domestic producers especially the small farmers, quantitative restrictions (QRs) were imposed. Foreign trade for rice and corn has also been placed under the monopoly of the government, and pricing policies were enforced which were aimed at stabilizing prices. These pricing policies, however, have been more successful in providing low prices to consumers rather than in raising farm prices to encourage production. Import monopoly and price interventions have been carried out by a central marketing agency for grains, the National Food Authority (NFA). Although corn imports have been deregulated, rice imports remained a government monopoly for a long period until 1999 when the private sector was given an import allocation under the Minimum Access Volume (MAV).

The above trade and pricing policies in addition to low levels of public expenditure on rural infrastructure, limited access of producers to land, credit and other production inputs, and the slow and inefficient delivery of government support services contribute to declining productivity, inefficiencies and uncompetitiveness of the rice and corn sectors. Because of the limitations and unfavorable effects of the above policies, several reforms have been sought. Trade liberalization in agriculture is one of the important components of these reforms. Under the UR Agreement in Agriculture of the GATT-WTO, the Philippines is committed to the provisions of market access through the tariff replacement of quantitative restrictions (QRs) and adoption of SPS measures.

### **4.2 Rice**

While the Philippines recognizes the long-run advantages that trade reforms can offer in terms of improved production efficiency and greater access to technology and information, it also has the responsibility of safeguarding against the short-run destabilizing effects of structural changes that accompany trade liberalization. Thus, the country sought the deferment of rice tariffication for 10 years until the year 2004, along with the temporary exclusion of rice under the AFTA-CEPT scheme whereby the country has set an initial high tariff for rice coming from its ASEAN neighbors. These measures manifest a continuing protection to domestic producers. Also, it has been observed that in the international market the volume of traded rice is small and heavy reliance on the external market may hamper the country's food security goal.

As the major staple food, rice remains the most important agricultural commodity in the country and major decisions in this sector have economic as well as political implications. Faced with external pressure to tariffify rice in the forthcoming round of WTO negotiations, the country may opt to tariffify rice at an initial rate higher than the present 50% import duty under

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the MAV. Again this will be a short run protection strategy due to the unforeseen delays in the provision of competitive enhancing measures by the government, as for example, in the utilization of the Competitive Enhancement Fund which was created from the MAV proceeds for this purpose.

The impact assessment in the present study has accounted for two scenarios. The first, the effects of deregulating partially rice imports by allowing private sector participation beginning 1999, in effect, from zero tariff to 50%. The zero tariff is the duty free import of NFA and the 50% applies to private sector imports of the MAV. The second scenario is an increase in tariff to 200% after the 10-year period of tariff deferment for rice. Using 1997 as the base period, the results of the study show that domestic prices and production will increase. However, domestic demand will decrease as a result of increases in wholesale prices. In terms of welfare effects, domestic producers will benefit while consumers will lose. The losses exceed the benefits, which will result in net losses to the economy. This implies that while the increases in tariff will protect domestic paddy producers temporarily, it is not in the best interest of the economy as this results in an overall welfare loss.

The impact of rice tariffication at the regional level was also assessed, focusing on the Central Luzon region. The directions of prices, quantities, and surpluses are similar with those in the national level analysis. In contrast, however, producer surpluses exceed consumer losses, which means a positive net welfare effect to the regional economy. Central Luzon is a rice surplus region and the Philippines is a net importer for rice. One of the implications is that the cost of protection is high where there are more inefficient producers than efficient producers.

Complementary partial budget analyses indicate that lower tariffs of fertilizer and agricultural machinery have diminishing effects on production costs leading to higher net income, although the impact is minimal on a unit basis. Unless usage of these inputs is not intensive, the effects of input tariff reforms will not be optimized.

### **4.3 Yellow corn**

The Philippines mainly imports yellow corn which is required by an expanding livestock industry. Yellow corn is grown in large amounts in the Southern part of the country. However, the high transport cost due to weak infrastructure facilities makes it cheaper to import corn rather than to bring yellow corn from the production areas in the Southern part of the country to the consuming areas in Luzon in the north, where most feedmillers and livestock raisers are located.

The previous QRs on corn were replaced with out-quota tariffs as high as 100%, which will be reduced to 50% in 2004. The MAV for corn is equivalent to 3% of total corn consumption or imports subject to 35% in-quota tariff until 2004. In quantifying the impact of further tariff reforms in corn, the following tariff reductions were adopted: a decrease of the current MAV in-quota tariff of 35% to 20% after the year 2004 and subsequent decrease to 5%. The latter reduction is in harmony with the AFTA-CEPT objective of decreasing tariff rates in the ASEAN region from zero to 5% in the year 2010. The impact of these tariff reductions will be higher imports and contractions in domestic prices and production. Due to lower wholesale prices, demand for yellow corn will rise. With more imports and lower farm prices, welfare losses accrue to domestic producers. Domestic users (feedmillers and livestock raisers) will benefit. The consumer surpluses are greater than the producer losses, hence, giving a net benefit to the economy.

The regional level assessment of yellow corn tariff reductions also focuses on Central Luzon. The impact analysis has similar directions of prices and quantities as in the national level analysis. Also, similarly with in the rice farm budget analysis, tariff reductions in fertilizer and agricultural machinery have diminishing effects on production costs, resulting in

slightly higher net profits. However, if the farm price reductions are taken into account net profits will be reduced.

The above findings of the impact assessment for yellow corn clearly indicate the unfavorable effects of tariff reductions on domestic yellow corn producers mainly due to decreases in farm prices and output. This corroborates similar findings of an earlier study by the Department of Agriculture in 1994 and by Balisacan (1994).

While the results of the impact analysis of tariff reforms in the rice and corn sectors hold true only as far as the assumptions of the study and the limitations of the data used in the analysis, the results provide some salient points. First, the results at best indicate the probable directions of domestic prices, production and demand for the two commodities. Second, tariff protection is not an efficient means of achieving higher incomes through higher prices. Third, the cost of protecting inefficient producers through tariff is high. Efficiency can be achieved through agricultural policies other than output tariffs. Fourth, there is a trade-off between producer and consumer welfare. Increasing the tariff for rice was found to be biased towards the producers, while decreasing the tariff for yellow corn benefits feedmillers and livestock raisers who are the consumers in the industry. This calls for a policy measure other than tariff that can draw a balance between producer and consumer welfare.

#### **4.4 Strategies**

Agricultural trade liberalization must be harmonized with other agricultural policies. Based on the findings of the first and second phases of the study on the effects of agricultural trade liberalization in the Philippines, the following measures or strategies are suggested. Some of these emphasize what may have already been advanced in earlier studies. Some are specific to the rice and corn sectors and some pertain to the country's agriculture sector in general.

##### *Addressing the structural bottlenecks to increasing productivity and hence, competitiveness*

This includes not only increased infrastructure investment such as farm to market roads, irrigation systems, R&D, facilities for bulk handling in the case of yellow corn, but more importantly, their efficient and timely delivery. Needless to say, these measures must run in parallel with trade reforms. The government is not lacking in formulating plans to this end as demonstrated in the passage of the Agriculture and Fisheries Modernization Act (AFMA) in 1997, which is a comprehensive plan of substantial fiscal support to infrastructure (farm to market roads, irrigation), R&D, extension, farms credit, information and marketing support services, and product standardization. These measures are designed to achieve competitiveness in light of the current trade liberalization. Budgetary constraints have, however, delayed implementation.

##### *Improvement of institutional capacity*

This include investment in human resource development and staffing pattern in agriculture in order to improve formulation of policies, implementation and extension services.

##### *Increase private sector participation by creating an improved policy regime*

An example of this is continuing private participation in rice importation through a quota system. The tariff proceeds from private sector imports can be use to finance productivity enhancing measures such as the construction of farm to market roads.

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### *Output tariff reforms*

The assumed high tariff of 200% for rice is an initial rate, which should be gradually scaled down. A reduced tariff rate, however, may disadvantage or displace small rice farmers, which may result in substitution to other crops. This should pave the way for the development of the high value crops sector to which the displaced rice farmers can transfer. On the other hand, it can be argued that subsistence rice farmers produce mainly for food purpose, they do not trade in the market and hence may not be affected by output tariffs.

Reducing further the tariff for corn depresses prices received by domestic yellow corn producers due to the likely surge of lower priced imported corn. This may result in crop shifting by the small and less competitive yellow corn farmers. An alternative is to shift to white corn cultivation, which has market prospects since it is a staple food in some parts of the country. This implies that government resources should be placed in R&D for white corn. Public investment in corn research has been focused on yellow corn with substantial investment by the private sector.

### *Inputs tariffs*

Trade reforms in major agricultural inputs should be given emphasis. As implied in the results of this study especially for yellow corn, the cost reducing effects on production costs of input trade reforms may be minimal but these to some extent offset some of the disadvantageous effects that may result from output tariffs.

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## Appendix Tables

**Appendix Table 1 Summary of some major studies of agricultural trade liberalization, the Philippines.**

Policy Group/Title of Study	Author/Year
<b>A. APRAAP</b>	
SPS on Meat and Meat Products	Manuel (1996)
SPS on Fisheries and Marine Quarantine	Guerrero III (1996)
In relation to industrial standards	
SPS on Processed Fish and Fish Products	Azanza (1996)
SPS on Processed Foods	de Leon (1996)
<b>B. ASAP</b>	
The Regional DA-Private Sector Consultation on Agricultural Tariff	DA (n.d.)
Issues: Highlights and Recommendations	
Impact of the GATT-UR on Philippine Agribusiness Competitiveness.	Gonzales (1995)
The Case of Poultry and Livestock Products	
The Uruguay Round's Implication on Philippine Agribusiness	Bacani (1995)
Competitiveness: Fruits and Vegetables	
Macro-Policy and International Trade Prospective on the Agriculture	Bautista (1993)
Sector and Feed Livestock Subsector in the Philippines	
Multisectional Consultations on Corn and Livestock Trade and Policy	DA (1993). Draft report
Policies	
Policy Options for the Philippine Corn Sector	Teh, Jr. and Yorobe Jr. (1993)
Minimum Access Volume in Agriculture: Choosing an Effective and	Clarete (1995)
Efficient Allocation Mechanism	
Policy Constraints to Higher Growth in the Corn Livestock Sector	Clarete (1995)
Beyond the Uruguay Round	
Situation and Prospects for Rice Supply and Use in the Philippines:	Clarete (1995)
Implication for Trade	
Will the Uruguay Round Increase World Trade in Rice?	Clarete (1995)
The Uruguay Round Agreement in Agriculture: Will it Immiserize the	Clarete (1995)
Filipino Farmers?	
EO 264: Reducing Tariff Protection on Agribusiness Inputs and How	ASAP (1995)
ASAP Policy Advocacy made It Happen	
Agricultural Tariff Reform Program : Key Issues and Options for Corn	ASAP (1995)
APRAAP- Agricultural Policy Research and Advocacy Assistance Program	
ASAP - Agribusiness System Assistance Program	
DA - Department of Agriculture	
n.d. - No date	

Continued .....

## Appendix

**Appendix Table 1 Summary of some major studies of agricultural trade liberalization, the Philippines (continued).**

Policy Group/Title of Study	Author/Year
<b>C. Department of Agriculture (DA), Planning Services</b>	
GATT and Its Implications on Philippine Agriculture	DA (1994)
The GATT Uruguay Round Agreement: a Boom for Philippine Agriculture	DA (1994)
Joint Executive and Legislative Consultative Caravan on GATT and Philippine Agriculture Interim progress report	DA (1994)
Strengthening and Harmonizing Philippine Phytosanitary Measures and Reducing Technical Barriers to Trade in the Crop Sector	DA (n.d.)
Intellectual Property Rights Agreement Seminar on Plant Variety Protection, Patents and the GATT	DA (1995)
Proposed Options on the Treatment of Rice in AFTA-CEPT	DA (1997b) A briefing document
Results of the Regional Consultations on the Inclusion of Rice in the ASEAN Free Trade Area - Common Effective Preferential Tariff (AFTA-CEPT) Scheme and Recommendations for the Special Treatment of Rice	DA (n.d.) Memo for the record.
<b>D. Others</b>	
GATT-UR and Philippine Agriculture: Facts and Falacies. Philippine Institute of Development Studies.	David (1994)
Impact of the GATT Uruguay Round on the Welfare of Farmers in the Philippines. UP School of Economics.	Balisacan (1994)
The Economic Effects of Trade Liberalization on Philippine Agriculture. UP School of Economics.	Clarete (1995)
Will the Uruguay Round Increase World Trade in Rice? UP School of Economics.	Clarete (1995)
The Uruguay Round Agreement in Agriculture: Will It Immeriserize the Filipino Farmers? UP School of Economics.	Clarete (n.d)
Enabling a Globally Competitive Philippine Agriculture: The Case of Reducing Tariff Rates on Agricultural Inputs. UP School of Economics.	Clarete (n.d)
APRAAP- Agricultural Policy Research and Advocacy Assistance Program	
ASAP - Agribusiness System Assistance Program	
DA - Department of Agriculture	
n.d. - No date	

**Appendix Table 2 Growth rates of gross national product (%), the Philippines, 1995-1998.**

Industry	M current prices			M constant prices		
	95-96	96-97	97-98	95-96	96-97	97-98
1. Agriculture, Fishery, Forestry	14.1	3.5	-0.6	3.1	2.8	-6.64
Agriculture and Fishery	14.5	3.6	-0.5	3.5	2.9	-6.56
Forestry	-38.3	-21.6	-19.2	-41.1	-15.2	-19.3
2. Industry Sector	14.0	11.6	7.9	6.3	5.7	-1.7
3. Services Sector	16.6	15.4	15.1	6.5	5.6	3.5
Gross Domestic Product	15.2	11.6	9.9	5.7	5.1	-0.5
Gross National Product	16.5	12.4	10.4	6.9	5.8	0.1

Source: National Statistical Coordination Board 1998, 1999.

**Appendix Table 3 Employment, unemployment, and labor force participation rates (%), the Philippines, 1997-1998.**

	January 1997	Round 1998	April 1999	Round 1998
1. Employment	92.3	91.6	89.6	86.7
2. Unemployment	7.7	8.4	10.4	13.3
3. Labor force participation	65.4	65.0	68.8	68.6

Source: January and April Labor Force Surveys, National Statistics Office in Canlas 1998.

**Appendix Table 4 Final regression results for rice, Philippines.**

Rice supply, Philippines

Dependent variable:  $\ln QS_t$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	3.0976748	0.7776067	3.9836008	0.001
$\ln FP_{t-1}$	0.1587254	0.0109341	14.516489	0.000
$\ln AREA_t$	0.5302766	0.1000308	5.3011332	0.000
R-squared	0.963550	Mean of dependent var		8.690161
Adjusted R-squared	0.958690	S.D. of dependent var		0.127517
S.E. of regression	0.025918	Sum. of squared resid		0.010076
Durbin-Watson stat	2.098077	F-statistic		198.2635
Log likelihood	41.85104			

Rice demand, Philippines

Dependent variable:  $\ln QD_t$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	5.3708739	1.6608568	3.2337971	0.006
$\ln MP_{t-1}$	-0.0261889	0.0103312	-2.5349404	0.024
$\ln RGNP$	0.2414916	0.1283790	1.8810826	0.081
T	0.0180966	0.0037512	4.8242311	0.000
R-squared	0.951995	Mean of dependent var		8.624571
Adjusted R-squared	0.941709	S.D. of dependent var		0.140342
S.E. of regression	0.033883	Sum. of squared resid		0.016073
Durbin-Watson stat	1.879414	F-statistic		92.54630
Log likelihood	37.64783			

Price linkages

a. Wholesale price

Dependent variable:  $\ln WSP_t$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	7.7712449	0.0917878	84.665314	0.000
$\ln WP_t/MP_t$	0.628380	0.0444868	1.4125086	0.178
T	0.1132757	0.0076006	14.903407	0.000
R-squared	0.944315	Mean of dependent var		8.809499
Adjusted R-squared	0.936891	S.D. of dependent var		0.640859
S.E. of regression	0.160994	Sum. of squared resid		0.388785
Durbin-Watson stat	1.641181	F-statistic		127.1873
Log likelihood	8.975023			

Price linkages

b. Farm price

Dependent variable:  $FP_t$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	2.6544384	1.2842950	2.0668448	0.056
$\ln WSP_t$	0.5708085	0.1665201	3.4278651	0.004
T	0.0482713	0.0199897	2.4148063	0.029

## Appendix

R-squared	0.972611	Mean of dependent var	8.141553
Adjusted R-squared	0.968959	S.D. of dependent var	0.627290
S.E. of regression	0.110519	Sum. of squared resid	0.183218
Durbin-Watson stat	1.251743	F-statistic	266.3289
Log likelihood	15.74616		

**Appendix Table 5 Preliminary regressions for rice supply and demand, Philippines.**

Rice supply, Philippines

Dependent variable:  $\ln QS_t$

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	9.2525858	0.9007013	10.272646	0.000
InFP <sub>r</sub>	0.2908698	0.1182639	2.4594980	0.027
InFP <sub>c</sub>	-0.1147276	0.1300345	-0.8822855	0.392
R-squared	0.862043	Mean of dependent var		8.690161
Adjusted R-squared	0.843649	S.D. of dependent var		0.127517
S.E. of regression	0.050422	Sum. of squared resid		0.038135
Durbin-Watson stat	1.670429	F-statistic		46.86486
Log likelihood	29.87196			

$FP_t$  – farm price of paddy at the national level.

$FP_c$  – farm price of corn at the national level.

Dependent variable:  $\ln QS_t$

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	10.452906	0.9385260	11.137577	0.000
lnFP <sub>r</sub>	0.4422282	0.1218154	3.6303158	0.003
lnFP <sub>c</sub>	-0.2002334	0.1194864	-1.6757835	0.116
lnPFERT <sub>(urea)</sub>	-0.1302111	0.0551943	-2.3591393	0.033
R-squared	0.901286	Mean of dependent var		8.690161
Adjusted R-squared	0.880133	S.D. of dependent var		0.127517
S.E. of regression	0.044149	Sum. of squared resid		0.027288
Durbin-Watson stat	1.919318	F-statistic		42.60790
Log likelihood	32.88437			

$PFERT_{(urea)}$  – wholesale price of fertilizer (urea) at the national level.

Dependent variable:  $\ln QS_t$

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	4.2512121	1.0342221	4.1105409	0.001
lnFP <sub>t</sub>	0.1924847	0.0267133	7.2055725	0.000
lnAREA <sub>t</sub>	0.5523742	0.1202808	4.5923714	0.000
lnPFERT <sub>(urea)</sub>	-0.0551515	0.0378119	-1.4585765	0.167
R-squared	0.952715	Mean of dependent var		8.690161
Adjusted R-squared	0.942583	S.D. of dependent var		0.127517
S.E. of regression	0.030555	Sum. of squared resid		0.013071
Durbin-Watson stat	2.116526	F-statistic		0.013071
Log likelihood	32.39508			

$AREA_t$  – area harvested of paddy at the national level.

Dependent variable:  $\ln QS_t$

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	3.0521590	0.8503228	3.5894121	0.003
$\ln FP_{t-1}$	0.1521125	0.0417291	3.6452353	0.003
$\ln AREA_t$	0.5349755	0.1073073	4.9854528	0.000

Appendix

InFP <sub>c</sub>	0.0075141	0.0456427	0.1646297	0.872
R-squared	0.963621	Mean of dependent var		8.690161
Adjusted R-squared	0.955825	S.D. of dependent var		0.127517
S.E. of regression	0.026801	Sum. of squared resid		0.010056
Durbin-Watson stat	2.098900	F-statistic		123.6118
Log likelihood	41.86845			

FP<sub>t-1</sub> – farm price of paddy at the national level, lagged one year.

Rice demand, Philippines  
Dependent variable: QD<sub>t</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-56356.430	7763.4794	-7.2591718	0.000
InWP <sub>t</sub>	-1003.2514	408.83459	-2.4539298	0.027
InRGNP	5034.0005	590.78613	8.5208508	0.000
R-squared	0.829424	Mean of dependent var		5619.444
Adjusted R-squared	0.806680	S.D. of dependent var		805.4971
S.E. of regression	354.1620	Sum. of squared resid		1881461.
Durbin-Watson stat	1.208868	F-statistic		36.46863
Log likelihood	-129.5556			

WP<sub>t</sub> – world price of paddy rice.

RGNP – real per capita income.

Dependent variable: InQD<sub>t</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-1.7952440	1.1710769	-1.5329857	0.146
InMP <sub>t</sub>	-0.0550064	0.0132873	-4.1397750	0.001
InRGNP	0.8008507	0.0868750	9.2184231	0.000
R-squared	0.872194	Mean of dependent var		8.624571
Adjusted R-squared	0.855153	S.D. of dependent var		0.140342
S.E. of regression	0.053412	Sum. of squared resid		0.042793
Durbin-Watson stat	1.674428	F-statistic		51.18267
Log likelihood	28.83487			

MP<sub>t</sub> – import price of paddy rice.

Dependent variable: InQD<sub>t</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	20.711777	8.6618930	2.3911375	0.031
InRP <sub>t</sub>	0.0260579	0.0103086	-2.5277887	0.024
InRGNP	0.5287199	0.1565424	3.3774864	0.005
InPOP <sub>N</sub>	-1.1090591	0.5948199	-1.8645291	0.083
R-squared	0.964385	Mean of dependent var		8.624571
Adjusted R-squared	0.956753	S.D. of dependent var		0.140342
S.E. of regression	0.029185	Sum. of squared resid		0.011925
Durbin-Watson stat	2.110161	F-statistic		126.3639
Log likelihood	40.33456			

Dependent variable: InQD<sub>t</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-0.5400122	5.9242366	-0.0911531	0.929
InWSP <sub>t</sub>	0.1155802	0.0658973	1.7539447	0.101
InPOP <sub>N</sub>	0.3012364	0.4349882	0.6925162	0.500
InRGNP	0.2051253	0.1411031	1.4537260	0.168
R-squared	0.943034	Mean of dependent var		8.624571

## Appendix

Adjusted R-squared	0.930827	S.D. of dependent var	0.140342
S.E. of regression	0.036911	Sum. of squared resid	0.019074
Durbin-Watson stat	1.467061	F-statistic	77.25356
Log likelihood	36.10740		

WSP<sub>r</sub> – wholesale price of rice at the national level.

**Appendix Table 6 Tariff (percent rates) of different types of fertilizer, the Philippines, 1990-1999.**

Mineral or chemical Fertilizers nitrogenous	% rate 1990	1991-1999
Urea, whether or not aqueous solution	5	3
Ammonium sulphate; double		
Salts and mixtures of ammonium		
Sulphate and ammonium sulphate	5	3
Ammonium sulphate	5	3
Other	5	3
Ammonium nitrate, whether or	30 or kg n.w. P1.90	10
Not in aqueous solution		
Mixtures of ammonium nitrate		
With calcium carborate or other inorganic		
Fertilising substances	5	3
Sodium nitrate	5	3
Double salts and mixtures of		
Calcium nitrate and ammonium nitrate	5	3
Calcium cyanamide	5	3
Mixture in aqueous or ammoniated solution	5	3
Other, including mixtures not specified in foregoing sub headings	5	3

n.w. – Net weight.

Source: Philippine Tariff Commission.

**Appendix Table 7 Tariffs (percent rates) for different agricultural machineries, the Philippines, 1990-1999.**

Description	1990	1991-1993	1994	1995-1996	1997-1999
Ploughs:					
Ploughs for animal drawn and					
Walking tractor (2 wheel)	30	30	30	20	10
Other	30	30	30	20	10
Harrows, scarifiers, cultivators					
Weeders and hoes:					
Disc harrows	30	30	20	20	10
Other	30	30	20	20	10
Seeders, planters and transplanters	30	30	20	20	10
Manure spreaders and fertilizer					
Distributors	30	30	20	20	10
Other machinery	30	30	20	20	10
Parts	30	30	20	20	10
Other mowers, including cutter					
Bars for tractor mounting	30	10	10	10	3
(4-wheel tractor)					
Combined harvester-threshers	30	30	10	10	3
Other threshing machinery	30	30	20	20	10

Source: Philippine Tariff Commission.

**Appendix Table 8 Final regression results for rice, Central Luzon.**

Rice supply, Central Luzon

Dependent variable:  $QS_{rCL}$ 

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	6.4454917	0.3914743	16.464660	0.000
$lnFP_{rCL,-1}$	0.3709906	0.1455643	2.5486371	0.022
$lnFP_{CCL}$	-0.2529279	0.1664070	-1.5199352	0.149
R-squared	0.549542	Mean of dependent var		7.387447
Adjusted R-squared	0.489481	S.D. of dependent var		0.147881
S.E. of regression	0.105662	Sum. of squared resid		0.167466
Durbin-Watson stat	1.787629	F-statistic		9.149715
Log likelihood	16.55522			

 $FP_{rCL,-1}$  – farm price of paddy rice in Central Luzon, lagged one year. $FP_{CCL}$  – farm price of yellow corn in Central Luzon.

Rice demand, Central Luzon

Dependent variable:  $lnQD_{rCL}$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-1.4886328	0.9434477	-1.5778648	0.135
$lnMP_r$	-0.0149152	0.0077218	-1.9315718	0.073
$lnPOP_{NCL}$	0.9657656	0.0594470	16.245839	0.000
R-squared	0.954869	Mean of dependent var		13.48290
Adjusted R-squared	0.948851	S.D. of dependent var		0.130529
S.E. of regression	0.029521	Sum. of squared resid		0.013072
Durbin-Watson stat	1.819272	F-statistic		158.6819
Log likelihood	39.50796			

 $MP_r$  – import price of rice. $POP_{NCL}$  – number of population of Central Luzon.

Price linkages

a. Wholesale price

Dependent variable:  $lnWSP_{rCL}$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	7.8494618	0.0757945	103.56247	0.000
$lnWP_r/MP_r$	0.1051044	0.0367353	2.8611278	0.012
T	0.1117894	0.0062763	17.811395	0.000
R-squared	0.962156	Mean of dependent var		8.848131
Adjusted R-squared	0.957110	S.D. of dependent var		0.641924
S.E. of regression	0.132942	Sum. of squared resid		0.265102
Durbin-Watson stat	1.111637	F-statistic		190.6815
Log likelihood	12.42120			

 $WP_r/MP_r$  – the ratio of world price to the import price of paddy rice.

Price linkages

b. Farm price

Dependent variable:  $FP_{rCL}$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-0.2670561	0.1898901	-1.4063720	0.179
$lnWSP_{rCL}$	0.9595417	0.0214079	44.8211859	0.000
R-squared	0.992099	Mean of dependent var		8.223095
Adjusted R-squared	0.991605	S.D. of dependent var		0.618400
S.E. of regression	0.056661	Sum. of squared resid		0.051367
Durbin-Watson stat	1.361688	F-statistic		2008.999

## Appendix

Log likelihood 27.19130  
WSP<sub>rCL</sub> – wholesale price of rice in Central Luzon.

**Appendix Table 9 Preliminary regressions for rice supply and demand, Central Luzon.**

Rice supply, Central Luzon  
Dependent variable: QS<sub>rCL</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-12727.123	2542.1816	-5.0063782	0.000
InFP <sub>rCL</sub>	93.907971	54.995643	1.7075529	0.108
InAREA <sub>rCL</sub>	2191.1920	443.14293	4.9446620	0.000
R-squared	0.767677	Mean of dependent var		1631.957
Adjusted R-squared	0.736701	S.D. of dependent var		233.3811
S.E. of regression	119.7541	Sum. of squared resid		215115.8
Durbin-Watson stat	1.582807	F-statistic		24.78265
Log likelihood	-110.0379			

FP<sub>rCL</sub> – farm price of paddy rice in Central Luzon.  
AREA<sub>rCL</sub> – area harvested of paddy in Central Luzon.

Dependent variable: In QS<sub>rCL</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	1360.2186	93.224443	14.590794	0.000
InFP <sub>rCL-1</sub>	0.1051980	0.0499180	2.1074151	0.052
InFP <sub>CCL</sub>	-0.0362969	0.0586996	-0.6183498	0.546
R-squared	0.572694	Mean of dependent var		1631.957
Adjusted R-squared	0.515720	S.D. of dependent var		233.3811
S.E. of regression	162.4104	Sum. of squared resid		395657.1
Durbin-Watson stat	1.753283	F-statistic		10.05184
Log likelihood	-115.5223			

FP<sub>rCL-1</sub> – farm price of paddy rice in Central Luzon, lagged one year.

Dependent variable: QS<sub>rCL</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	1419.5749	108.90895	13.034511	0.000
FP <sub>rCL-1</sub>	0.1045880	0.0295681	3.5371843	0.003
PFERT <sub>CL</sub>	-0.8660900	0.7458750	-1.1611731	0.264
R-squared	0.597942	Mean of dependent var		1631.957
Adjusted R-squared	0.544335	S.D. of dependent var		233.3811
S.E. of regression	157.5392	Sum. of squared resid		372279.0
Durbin-Watson stat	1.511663	F-statistic		11.15404
Log likelihood	-114.9741			

PFERT<sub>CL</sub> – wholesale price of fertilizer (urea) in Central Luzon.

Dependent variable: InQS<sub>rCL</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	7.0965799	0.7356342	9.6468866	0.000
InFP <sub>rCL-1</sub>	0.1468461	0.0843012	1.7419220	0.103
InPFERT <sub>CL</sub>	-0.1048141	0.1056851	-0.9917584	0.338
InIRRAREA <sub>rCL</sub>	1.1107970	0.8320908	1.3349468	0.203
R-squared	0.567051	Mean of dependent var		7.387447
Adjusted R-squared	1.474276	S.D. of dependent var		0.147881
S.E. of regression	0.107224	Sum. of squared resid		0.160957
Durbin-Watson stat	1.219128	F-statistic		6.112125
Log likelihood	16.91203			

IRRAREA<sub>rCL</sub> – the ratio of irrigated area to total harvested area of paddy rice in Central Luzon.

Rice demand, Central Luzon  
Dependent variable:  $\ln QD_{rCL}$   
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	3.9674523	1.2140640	3.2679103	0.005
$\ln WP_r$	-0.2345905	0.0639341	-3.6692525	0.002
$\ln RGNP$	0.8068877	0.0923880	8.7336868	0.000
R-squared	0.841146		Mean of dependent var	13.48290
Adjusted R-squared	0.819965		S.D. of dependent var	0.130529
S.E. of regression	0.055384		Sum. of squared resid	0.046011
Durbin-Watson stat	1.111276		F-statistic	39.71303
Log likelihood	28.18225			

Dependent variable:  $QD_{rCL}$   
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	218356.45	116850.53	1.8686817	0.083
$MP_r$	-7.5973747	4.5996836	-1.6517168	0.121
$POP_{NCL}$	0.0753525	0.0244679	3.0796433	0.008
$RP_{rCL}$	6.5922343	3.4882266	1.8898527	0.080
R-squared	0.956912		Mean of dependent var	722858.3
Adjusted R-squared	0.947679		S.D. of dependent var	94943.15
S.E. of regression	21717.12		Sum. of squared resid	6.60E+09
Durbin-Watson stat	2.238575		F-statistic	103.6389
Log likelihood	-203.0245			

$POP_{NCL}$  – population of Central Luzon.

$RP_{rCL}$  – retail price of rice in Central Luzon.

#### Appendix Table 10 Final regression results for corn, the Philippines.

Yellow corn imports  
Dependent variable:  $\ln MVO_c$   
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-3.8663666	2.9930959	-1.2917617	0.221
$\ln TR_c$	-0.1804392	0.0681953	-2.6459197	0.021
$\ln QM_wQM_c$	-0.9121519	0.0211830	-43.060659	0.000
$\ln POPNCK$	1.6443127	0.2957724	5.5593854	0.000
Dummy1	0.2051384	0.1128435	1.8179018	0.094
T	-0.0217591	0.0170739	-1.2744081	0.227
R-squared	0.999372		Mean of dependent var	10.51079
Adjusted R-squared	0.999110		S.D. of dependent var	2.960303
S.E. of regression	0.088306		Sum. of squared resid	0.093576
Durbin-Watson stat	1.828819		F-statistic	3818.541
Log likelihood	21.79333			

$TR_c$  – specific tariff.

$POP_{NCK}$  – population of chicken in the Philippines.

T – time trend (1980 = 1)

$QM_wQM_c$  – ratio of imports of wheat and yellow corn.

Dummy1 – 0 for 1986-1988 and 1991-1994;

1 for the rest of the reference period.

## Appendix

Yellow corn supply, Philippines  
Dependent variable:  $\ln Q_{SC}$   
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	3.4702097	0.5775347	6.0086598	0.000
$\ln FP_{C-1}$	0.3833688	0.0853031	4.4941946	0.000
$\ln AREA_C$	1.1270358	0.1613019	6.9871204	0.000
R-squared	0.974851	Mean of dependent var		14.09425
Adjusted R-squared	0.971498	S.D. of dependent var		0.578639
S.E. of regression	0.097689	Sum. of squared resid		0.143146
Durbin-Watson stat	1.470970	F-statistic		290.7253
Log likelihood	17.96744			

$\ln FP_{C-1}$  – farm price of yellow corn at the national level, lagged one year.

$\ln AREA_C$  – total area harvested of yellow corn at the national level.

Yellow corn demand, Philippines  
Dependent variable:  $\ln Q_{DC}$   
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	10.000655	0.6858434	14.581544	0.000
$\ln RATR_C W_C$	-0.2912520	0.2112810	-1.3785056	0.190
$\ln POPNCK$	0.4926929	0.425530	11.578337	0.000
$\ln WP_C$	-0.1326013	0.0750628	-1.7665372	0.099
R-squared	0.920045	Mean of dependent var		14.77149
Adjusted R-squared	0.902912	S.D. of dependent var		0.154450
S.E. of regression	0.048125	Sum. of squared resid		0.032424
Durbin-Watson stat	1.427253	F-statistic		53.69974
Log likelihood	31.33214			

$POPNCK$  – total population of chicken at the national level.

Price linkages  
a. Wholesale price  
Dependent variable:  $\ln WSP_{CS}$   
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	4.2721044	0.1889995	22.603784	0.000
$\ln WP_C MP_C$	0.2273939	0.0441687	5.1483060	0.000
$\ln TR_C$	0.1913669	0.0448621	4.2656684	0.001
Dummy	-0.2014419	0.0413378	-4.8730727	0.000
T	0.0439556	0.0042205	10.414905	0.000
R-squared	0.906379	Mean of dependent var		5.309314
Adjusted R-squared	0.877572	S.D. of dependent var		0.195455
S.E. of regression	0.068389	Sum. of squared resid		0.060802
Durbin-Watson stat	2.364120	F-statistic		31.46432
Log likelihood	25.67362			

$WP_C MP_C$  – ratio of world price to import price of corn.

$TR_C$  – specific tariff rate for corn.

Dummy – 1 for 1983, 1984, 1987, 1991; 0 otherwise.

The dummy (1) accounts for the period when the peso was devalued.

Price linkages  
b. Farm price  
Dependent variable:  $\ln FP_C$   
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-0.1652894	0.0548749	-3.0121131	0.008
$\ln WSP_C$	0.9726651	0.0381387	25.503393	0.000
R-squared	0.975991	Mean of dependent var		1.122566
Adjusted R-squared	0.974491	S.D. of dependent var		0.570508
S.E. of regression	0.091120	Sum. of squared resid		0.132844
Durbin-Watson stat	1.628291	F-statistic		650.4230
Log likelihood	18.63965			

$WSP_C$  – wholesale price of yellow corn at the national level.

**Appendix Table 11 Preliminary regressions for corn supply and demand, Philippines.**

Yellow corn imports

Dependent variable:  $\ln MVO_C$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-166.67506	39.005493	-4.2731175	0.001
$\ln TR_C$	-3.6786651	0.8497977	-4.3288716	0.001
$\ln POPNCK$	18.107680	3.7571439	4.8195332	0.000
T	-1.0477105	0.2006231	-5.2222814	0.000
R-squared	0.706885	Mean of dependent var		10.51079
Adjusted R-squared	0.644075	S.D. of dependent var		2.960303
S.E. of regression	1.766100	Sum. of squared resid		43.66755
Durbin-Watson stat	1.357806	F-statistic		11.25429
Log likelihood	-33.51699			

Dependent variable:  $MVO_C$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-194609.16	237680.56	-0.8187858	0.428
$MP_C$	-7.3075111	515.51431	-0.0141752	0.989
$POPCK$	7.2282901	2.6610552	2.7163247	0.018
Dummy	176490.36	197851.29	0.8929354	0.389
T	-30267.530	11544.188	-2.6218847	0.021
R-squared	0.712295	Mean of dependent var		184974.3
Adjusted R-squared	0.623771	S.D. of dependent var		164568.1
S.E. of regression	100942.0	Sum. of squared resid		1.32E+11
Durbin-Watson stat	2.090025	F-statistic		8.046311
Log likelihood	-230.0135			

 $MP_C$  – import price of yellow corn, \$/mt, cif.

Dummy – 0 for 1986, 1991-1994; 1 for the rest of the reference period.

Dependent variable:  $\ln MVO_C$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-34.858920	19.475532	-1.7898828	0.099
$\ln MP_C$	-3.0305203	0.4222547	-7.1769969	0.000
$\ln QM_W$	-2.1754722	1.3610586	-1.5983678	0.136
$\ln POPNCK$	6.8907905	2.3080373	2.9855629	0.011
Dummy1	2.3179341	0.5437489	4.2628759	0.001
T	-0.1342692	0.0932699	-1.4395765	0.176
R-squared	0.971847	Mean of dependent var		10.51079
Adjusted R-squared	0.960117	S.D. of dependent var		2.960303
S.E. of regression	0.591195	Sum. of squared resid		4.194136
Durbin-Watson stat	1.744880	F-statistic		82.84914
Log likelihood	-12.43073			

Dummy – 0 for 1986, 1991-1994; 1 for the rest of the reference period.

 $QM_W$  – volume of wheat imports.

## Appendix

Dependent variable: InMVO<sub>C</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-56.371106	16.797548	-3.3559128	0.006
InMP <sub>C</sub>	-0.0125814	1.0388237	-0.0121112	0.991
InQM <sub>W</sub>	-1.5104567	1.4237601	-1.0608927	0.310
InPOPNC	6.7748714	2.3915408	2.8328480	0.15
Dummy	5.4718638	1.3302112	4.1135301	0.001
T	-0.2171836	0.0837535	-2.5931288	0.024
R-squared	0.970629		Mean of dependent var	10.51079
Adjusted R-squared	0.958392		S.D. of dependent var	2.960303
S.E. of regression	0.603846		Sum. of squared resid	4.375553
Durbin-Watson stat	2.105639		F-statistic	79.31458
Log likelihood	-12.81184			

Dependent variable: InMVO<sub>C</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-13.477033	13.106409	-1.0282781	0.323
InMP <sub>C</sub>	-2.7880237	0.4028535	-6.9206894	0.000
InQM <sub>W</sub>	-2.5547658	1.3892973	-1.8388906	0.089
InPOPNC	4.9592114	1.9538710	2.5381468	0.025
Dummy1	2.8371568	0.4233593	6.7015341	0.000
R-squared	0.966985		Mean of dependent var	10.51079
Adjusted R-squared	0.956827		S.D. of dependent var	2.960303
S.E. of regression	0.615096		Sum. of squared resid	4.918457
Durbin-Watson stat	1.645173		F-statistic	95.19095
Log likelihood	-13.86450			

Dependent variable: InMVO<sub>C</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-92.475270	21.362067	-4.3289477	0.001
InMP <sub>C</sub>	-4.0207709	0.5371951	-7.4847493	0.000
InQM <sub>W</sub>	-3.0293593	2.05009406	-1.4770586	0.163
InPOPNC	13.414321	2.6321855	5.0962674	0.000
T	-0.3980025	0.106338	-3.7429523	0.002
R-squared	0.929214		Mean of dependent var	10.51079
Adjusted R-squared	0.907434		S.D. of dependent var	2.960303
S.E. of regression	0.900662		Sum. of squared resid	10.54550
Durbin-Watson stat	1.439845		F-statistic	42.66321
Log likelihood	-20.72884			

Dependent variable: InMVO<sub>C</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-0.6155393	1.0229481	-.6017307	0.558
InMP <sub>C</sub>	-0.1894915	0.1318628	-1.4370358	0.174
InPOPNC	1.3583328	0.0969657	14.008385	0.000
InQM <sub>W</sub> QM <sub>C</sub>	-0.9057799	0.0368238	-24.597691	0.000
Dummy1	0.1912464	0.1354583	1.4118469	0.181
R-squared	0.999125		Mean of dependent var	10.51079
Adjusted R-squared	0.998856		S.D. of dependent var	2.960303
S.E. of regression	0.100140		Sum. of squared resid	0.130365
Durbin-Watson stat	1.536349		F-statistic	3710.757
Log likelihood	18.80919			

QM<sub>W</sub>QM<sub>C</sub> – ratio of volume of wheat and yellow corn imports.

Dependent variable:  $\ln MVO_C$   
 No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-17.718184	46.313318	-0.3825721	0.709
$\ln WP_C$	0.6378380	2.6027489	0.2450632	0.811
$\ln POPNCK$	-6.4247233	2.9100480	-2.2077722	0.047
$\ln QM_wQM_C$	5.9572933	5.3093509	1.1220380	0.284
Dummy1	4.3613436	1.1243049	3.8791466	0.002
T	0.1460591	0.2036160	0.7173260	0.487
R-squared	0.851745	Mean of dependent var		10.51079
Adjusted R-squared	0.789972	S.D. of dependent var		2.960303
S.E. of regression	1.356671	Sum. of squared resid		22.08668
Durbin-Watson stat	1.737134	F-statistic		13.78833
Log likelihood	-27.38232			

$WP_C$  – world price of yellow corn.

Dependent variable:  $\ln MVO_C$   
 No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-33.841501	17.744803	-1.9071219	0.079
$\ln TR_C$	0.5334276	0.4791391	1.1133042	0.286
$\ln POPNCK$	3.4797838	1.8306904	1.9008041	0.080
Dummy	6.3292858	0.5853604	10.812630	0.000
T	-0.1432332	0.1064651	-1.3453533	0.202
R-squared	0.970669	Mean of dependent var		10.51079
Adjusted R-squared	0.961644	S.D. of dependent var		2.960303
S.E. of regression	0.57967	Sum. of squared resid		4.369680
Durbin-Watson stat	2.431916	F-statistic		107.5539
Log likelihood	-12.79976			

Dummy – 0 for 1986, 1991-1994 and 1 for the rest of the reference period.

Dependent variable:  $\ln MVO_C$   
 No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-0.9419235	1.1128281	-0.8464232	0.413
$\ln TR_C$	-0.0691805	0.0741333	-0.9331902	0.368
$\ln POPNCK$	1.3510469	0.0884636	15.272342	0.000
$\ln QM_wQM_C$	-0.9616223	0.0447924	-21.468426	0.000
Dummy	-0.0255599	0.3310780	-0.0772019	0.940
R-squared	0.999083	Mean of dependent var		10.51079
Adjusted R-squared	0.998801	S.D. of dependent var		2.960303
S.E. of regression	0.102492	Sum. of squared resid		0.136560
Durbin-Watson stat	1.894325	F-statistic		3542.281
Log likelihood	18.39138			

Dependent variable:  $\ln MVO_C$   
 No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-0.9419235	1.1128281	-0.8464232	0.413
$\ln TR_C$	-0.0691805	0.0741333	-0.9331902	0.368
$\ln POPNCK$	1.3510469	0.0884636	15.272342	0.000
$\ln QM_wQM_C$	-0.9616223	0.0447924	-21.468426	0.000
Dummy	-0.0255599	0.3310780	-0.0772019	0.940
R-squared	0.999083	Mean of dependent var		10.51079
Adjusted R-squared	0.998801	S.D. of dependent var		2.960303
S.E. of regression	0.102492	Sum. of squared resid		0.136560
Durbin-Watson stat	1.894325	F-statistic		3542.281
Log likelihood	18.39138			

## Appendix

Dependent variable: InMVO<sub>C</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-5.1282524	3.1590559	-1.6233497	0.129
InTR <sub>C</sub>	0.1359916	0.0690747	-1.9687616	0.071
InPOPNCCK	1.7643655	0.3128202	5.6401904	0.000
InQM <sub>W</sub> QM <sub>C</sub>	0.9430807	0.0136029	-68.873624	0.000
T	0.0252524	0.0184080	-1.3718201	0.193
R-squared	0.999199	Mean of dependent var		10.51079
Adjusted R-squared	0.998952	S.D. of dependent var		2.960303
S.E. of regression	0.095815	Sum. of squared resid		0.119346
Durbin-Watson stat	1.938070	F-statistic		4053.675
Log likelihood	19.60401			

Dependent variable: InMVO<sub>C</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-79.502574	28.281830	-2.8110830	0.016
InQM <sub>W</sub>	-2.1387813	0.4252534	-2.3422295	0.000
InTR <sub>C</sub>	-5.7049899	1.6167829	-3.5286061	0.004
InPOPNCCK	12.523865	3.2868534	3.8102902	0.002
Dummy1	3.1338407	0.64889504	4.8290914	0.000
T	-0.2740946	0.1378431	-1.9884537	0.070
R-squared	0.952059	Mean of dependent var		10.51079
Adjusted R-squared	0.932084	S.D. of dependent var		2.960303
S.E. of regression	0.771477	Sum. of squared resid		7.142125
Durbin-Watson stat	1.874989	F-statistic		47.66164
Log likelihood	-17.22164			

Dependent variable: InMVO<sub>C</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-32.964934	17.589930	-1.8740799	0.084
InTR <sub>C</sub>	-1.6425164	0.3814344	-4.3061569	0.001
InQM <sub>W</sub>	-5.9178145	1.7871475	-3.3113185	0.006
InPOPNCCK	8.0320357	2.6449639	3.0367279	0.010
Dummy1	3.9956293	0.5350861	7.4672646	0.000
R-squared	0.936263	Mean of dependent var		10.51079
Adjusted R-squared	0.916651	S.D. of dependent var		2.960303
S.E. of regression	0.854645	Sum. of squared resid		9.495425
Durbin-Watson stat	1.754601	F-statistic		47.74062
Log likelihood	-19.78484			

Corn Supply, Philippines  
Dependent variable: QS<sub>C</sub>  
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	290896.70	57744.177	5.0376855	0.000
FP <sub>C-1</sub>	42.796757	78.689234	0.5438706	0.595
FP <sub>T-1</sub>	-171.12408	61.811313	-2.7684913	0.015
T	179669.75	21387.249	8.4007881	0.000
R-squared	0.981006	Mean of dependent var		1509038.
Adjusted R-squared	0.976936	S.D. of dependent var		688686.4
S.E. of regression	104589.1	Sum. of squared resid		1.53E+11
Durbin-Watson stat	2.232510	F-statistic		241.0293
Log likelihood	-231.3194			

FP<sub>T-1</sub> – farm price of paddy rice at the national level, lagged one year.

T – time trend (1980 = 1)

Dependent variable:  $\ln Q S_C$   
 No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	13.108800	1.2849178	10.202053	0.000
$\ln FP_C$	0.4427974	0.2772201	1.5972777	0.133
$\ln AREA_C / TAREA_C$	1.1759563	0.2133643	5.5114950	0.000
$\ln FP_r$	-0.1174511	0.2441146	-0.4811308	0.638
R-squared	0.973939		Mean of dependent var	14.09425
Adjusted R-squared	0.968355		S.D. of dependent var	0.578639
S.E. of regression	0.102935		Sum. of squared resid	0.148339
Durbin-Watson stat	1.001518		F-statistic	174.4006
Log likelihood	17.64677			

$FP_C$  – farm price of yellow corn at the national level.

$AREA_C / TAREA_C$  – the ratio of yellow corn harvested area to total area harvested of corn (yellow + white).

$FP_r$  – farm price of paddy rice at the national level.

Dependent variable:  $\ln Q S_C$   
 No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	13.091335	1.3295887	9.8461541	0.000
$\ln FP_C$	0.4183397	0.2970518	1.4083055	0.183
$\ln AREA_C / TAREA_C$	1.1627797	0.2245635	5.1779533	0.000
$\ln PFERT_C$	-0.0460409	0.1469907	-0.3132229	0.759
$\ln FP_r$	-0.0627511	0.3069087	-0.2044618	0.841
R-squared	0.974134		Mean of dependent var	14.09425
Adjusted R-squared	0.966176		S.D. of dependent var	0.578639
S.E. of regression	0.106420		Sum. of squared resid	0.147228
Durbin-Watson stat	0.944971		F-statistic	122.3987
Log likelihood	17.71444			

$FP_r$  – farm price of paddy rice at the national level.

Dependent variable:  $\ln Q S_C$   
 No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	13.076836	1.2814560	10.204671	0.000
$\ln FP_C$	0.3662943	0.1477849	2.478564	0.027
$\ln AREA_C / TAREA_C$	1.1524029	0.2111351	5.4581317	0.000
$\ln PFERT_C$	-0.0631421	0.1166646	-0.5412272	0.597
R-squared	0.974051		Mean of dependent var	14.09425
Adjusted R-squared	0.968491		S.D. of dependent var	0.578639
S.E. of regression	0.102714		Sum. of squared resid	0.147701
Durbin-Watson stat	0.851720		F-statistic	175.1737
Log likelihood	17.68554			

Yellow corn demand, Philippines

Dependent variable:  $QD_C$   
 No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	1546270.4	91834.656	16.837548	0.000
POP NCK	10.139362	2.0722362	4.8929566	0.000
T	34236.824	9143.9700	3.7441969	0.002
R-squared	0.953895		Mean of dependent var	2631245
Adjusted R-squared	0.947748		S.D. of dependent var	418745.0
S.E. of regression	95719.46		Sum. of squared resid	1.37E+11
Durbin-Watson stat	1.437996		F-statistic	155.1739
Log likelihood	-230.3452			

## Appendix

Dependent variable:  $\ln QD_C$   
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	14.584071	0.1418584	102.80722	0.000
$\ln RP_C / WSP_C$	-0.1926683	0.2271987	-0.8480168	0.411
$\ln MP_C$	-0.0019206	0.0255198	-0.0752591	0.941
T	0.0277279	0.0026899	10.308254	0.000
R-squared	0.901457	Mean of dependent var		14.77149
Adjusted R-squared	0.880340	S.D. of dependent var		0.154450
S.E. of regression	0.053427	Sum. of squared resid		0.039962
Durbin-Watson stat	0.811528	F-statistic		42.68988
Log likelihood	29.45082			

**Appendix Table 12 Final regression results for corn, Central Luzon.**

Yellow corn supply  
Dependent variable:  $\ln QS_{CCL}$   
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	4.7662911	4.1075632	1.1603695	0.265
$\ln FP_{CCL-1}$	1.1878664	0.6174610	1.9237917	0.075
$\ln FP_{rCL}$	-1.0170877	0.5186382	-1.9610739	0.070
T	0.2658698	0.0641833	4.1423494	0.001
R-squared	0.959211	Mean of dependent var		8.539434
Adjusted R-squared	0.950470	S.D. of dependent var		1.575322
S.E. of regression	0.350592	Sum. of squared resid		1.720803
Durbin-Watson stat	2.285595	F-statistic		109.7431
Log likelihood	-4.412666			

Yellow corn demand  
Dependent variable:  $\ln QS_{CCL}$   
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	5.1392437	0.7187365	7.1503867	0.000
$\ln RP_{CCL} / WSP_{CCL}$	0.6948436	0.0661953	10.496879	0.000
$\ln POPNCK$	-0.2406782	0.1554150	-1.5486165	0.144
Dummy	-0.1190759	0.0464642	-2.5627465	0.023
R-squared	0.910860	Mean of dependent var		12.83949
Adjusted R-squared	0.891759	S.D. of dependent var		0.190423
S.E. of regression	1.062649	Sum. of squared resid		1.054949
Durbin-Watson stat	2.013958	F-statistic		47.68556
Log likelihood	26.58465			

Dummy = 1 for 1983, 1984, 1987, 1991; 0 otherwise. The dummy (1) accounts for the period when the peso was devalued.

Price linkages  
a. Wholesale price  
Dependent variable:  $\ln WSP_{CCL5}$   
No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	-543.57622	242.65392	-2.2401296	0.041
$\ln WP_C$	145.38472	48.707392	2.9848595	0.091
T	10.026802	1.5460672	6.4853597	0.000
R-squared	0.737342	Mean of dependent var		253.1799
Adjusted R-squared	0.702321	S.D. of dependent var		54.37722
S.E. of regression	29.66821	Sum. of squared resid		13203.04
Durbin-Watson stat	2.483371	F-statistic		21.05422
Log likelihood	-84.92137			

$WP_C$  = world price of yellow corn.

Price linkages

b. Farm price

Dependent variable:  $\ln FP_{CCL}$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	0.0452879	0.4167900	0.1086589	0.915
$\ln WSP_{CCL}$	0.9629275	0.0492963	19.533452	0.000
R-squared	0.959754	Mean of dependent var		8.168710
Adjusted R-squared	0.957239	S.D. of dependent var		0.567127
S.E. of regression	0.117275	Sum. of squared resid		0.220055
Durbin-Watson stat	2.396271	F-statistic		381.5557
Log likelihood	14.09733			

**Appendix Table 13 Preliminary regressions for corn supply and demand, Central Luzon.**

Yellow corn supply

Dependent variable:  $\ln QS_{CCL}$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	4.0116896	3.0198282	1.3284496	0.207
$\ln FP_{CCL-1}$	0.2793694	0.5181140	0.5392046	0.599
$\ln FP_{TCL}$	-0.6960011	0.3906458	-1.7816680	0.098
$\ln AREA_{CCL}$	0.7777670	0.2154927	3.6092494	0.003
T	0.1769723	0.0531279	3.3310593	0.005
R-squared	0.979626	Mean of dependent var		8.539434
Adjusted R-squared	0.973358	S.D. of dependent var		1.575322
S.E. of regression	0.257132	Sum. of squared resid		0.859519
Durbin-Watson stat	2.236364	F-statistic		156.2700
Log likelihood	1.834889			

Dependent variable:  $\ln QS_{CCL}$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	5.2363466	4.8599457	1.0774496	0.301
$\ln FP_{CCL-1}$	1.1183463	0.7278311	1.5365465	0.148
$\ln FP_{TCL}$	-0.9521435	0.6275918	-1.5171381	0.153
$\ln PFERT_{CCL}$	-0.0940690	0.4695465	-0.2003400	0.844
T	0.2726910	0.0747129	3.6498533	0.003
R-squared	0.959336	Mean of dependent var		8.539434
Adjusted R-squared	0.946825	S.D. of dependent var		1.575322
S.E. of regression	0.363266	Sum. of squared resid		1.715506
Durbin-Watson stat	2.279923	F-statistic		76.67421
Log likelihood	-4.384922			

Yellow corn demand

Dependent variable:  $\ln QD_{CCL}$ 

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	6.0921940	0.8855973	6.8791919	0.000
$\ln WSP_{CCL-1}$	-0.0471146	0.0545007	-0.8644765	0.403
$\ln MP_{C-1}$	0.0687312	0.0323079	2.1273782	0.053
$\ln WP_C$	-0.0021808	0.1263483	-0.0172605	0.986
$\ln POPNCK$	0.6067020	0.0824635	7.3572143	0.000
R-squared	0.916300	Mean of dependent var		12.87403
Adjusted R-squared	0.860546	S.D. of dependent var		0.193088
S.E. of regression	0.063881	Sum. of squared resid		0.053050
Durbin-Watson stat	2.259119	F-statistic		35.57916
Log likelihood	26.90116			

## Appendix

Dependent variable:  $\ln QD_{CCL}$

No. of observations: 18 (1980-1997)

Variable	Coefficient	Std. Error	T-Stat	2-Tail Sig.
C	6.2806434	0.7180479	8.7468312	0.000
$\ln WSP_{CCL-1}$	-0.0151406	0.0483533	-0.3131257	0.758
$\ln POPNCK$	0.5981308	0.0886343	6.7483024	0.000
R-squared	0.882969	Mean of dependent var		12.87403
Adjusted R-squared	0.867365	S.D. of dependent var		0.193088
S.E. of regression	0.070321	Sum. of squared resid		0.074175
Durbin-Watson stat	1.665662	F-statistic		56.58575
Log likelihood	23.88439			