PN-ABN-207

Postharvest Grain Systems R&D

Technical Assistance Report No. 131
December 1992

A SUPPLY RESPONSE STUDY FOR BASIC GRAINS IN EL SALAVDOR

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PN-ABN-207
ISN 80698

A SUPPLY RESPONSE STUDY FOR BASIC GRAINS IN EL SALVADOR

by

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AGENCY FOR INTERNATIONAL DEVELOPMENT

DAN-4144-B-00-6002-00, Delivery Order No. 10
Postharvest Grain Systems

at

Kansas State University
FOOD AND FEED GRAINS INSTITUTE
Manhattan, Kansas 66506

December 1992

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SECTION I

INTRODUCTION

A. Background

A farmer's decision as to how much area to plant, to plant one crop, as opposed to another, and how much technology to use, is based on many factors including the need for food for the household, the past and expected prices of the crop, the past and expected prices of other crops, and the prices of inputs such as seeds, fertilizer, pesticides, interest costs, labor, rent, and others. Collectively these factors of production influence individual decisions which in turn affect the supply (supply response) of basic grains at the national level.

During the last 10 to 12 years, farmer's decisions to adjust their basic food grains production process have had a negative effect on per unit productivity, and therefore on per capita production of basic grains. Decisions to reduce productivity and to increase land area used for the production of basic food grains have been taken in response to a given set of macro and sectoral policies, input and product market conditions, and supporting services, all affecting the very production factors which impact on farmer's returns.

After more than a decade of decline, the Salvadorian economy, and especially the agricultural sector, seems to be responding favorably to numerous macro-policy, sectoral, structural, and trade related adjustments which were initiated in June 1989 and continue at present. [1]

As the agricultural sector returns to positive growth rates, and basic grains farmers perceive higher real incomes, the supply of basic grains can be expected to increase. Accordingly, the impacts of the on-going changes in policies, regulations, and institutions related to this key sub-sector must be monitored and adjusted in order to achieve and sustain the most supportive and facilitating environment possible.

A continuing assessment of supply response functions for the country can provide information on the relationships between various technical and economic indicators and the potential farmer response, leading to changes in the supply of basic grains. An econometric model which can adequately describe farmer response to appropriate factors can be useful for policy making as it provides a way to forecast the probable impact of potential policy changes as they affect the technical and economic signals upon which farmers base their production decisions, and hence the supply of basic grains.

B. Terms of Reference

The de-technification of the basic food production system and parallel decline in per capita production since the early 1980's is of great concern to the Government of El Salvador (GOES). The trends have been not only negative but

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[1] See bibliography for relevant documents.

threaten to stymie the positive policy impacts achieved so far in the agricultural sector, especially in the basic grains sub-sector.

The team was charged with establishing a theoretical and practical framework for undertaking supply response analysis of the basic grains sub-sector, and to develop a programmatic approach to institutionalize such capabilities within appropriate institutions. [2]

Being the third in a series of reports and manuals, this report is linked backwards to the first two studies [3] and forward to the fourth [4]. For the sake of integrity certain sections have been repeated or modified as appropriate in each of the reports and/or manuals. This allows for independent reading as well as for continuity in the presentation of the results and applications.

C. Acknowledgements

The work was undertaken between February 11 and March 6, 1992. During the visit the team worked with many individuals and institutions, primarily in the private sector. [5] The team wishes to thank them all for their support, collaboration, arguments, and criticism. It is the sincere hope of the authors that this small contribution will help the efforts being undertaken to shift the production of basic food grains to a higher level of productivity in El Salvador.

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[2] See Appendix 1 for complete terms of reference.

[3] See "Invigorating the Seed Industry in El Salvador", by Cornelius Hugo, Hunter Andrews, and David Stimpson, Food and Feed Grains Institute, Kansas State University, Manhattan, Kansas, September 1991, and "The Agricultural Inputs Industry in El Salvador" by Cornelius Hugo, Frederick Worman and Hugo Ramos, Food and Feed Grains Institute, Kansas State University, Manhattan, Kansas, March 1992.

[4] Improving the Statistical Base for Basic Grains and Its Utilization in El Salvador.

[5] See Appendix 2 for contacts.

SECTION II

THE BASIC GRAINS SUB-SECTOR

A study of supply response in the basic grain sub-sector is based on statistical data gathered from that sector. In order to understand, and accurately interpret, the statistical and econometric results which are generated using the statistical data available, it is necessary to have an understanding of the basic grains system as it functions in El Salvador. This section will discuss the importance of the basic grains sub-sector, will describe the system and trends, and will offer some information on conditions that may be contributing to the observed trends. The section will conclude with a summary outlook for the sub-sector.

A. Importance of Basic Grains in El Salvador

The production of basic grains is an important part of any country's effort to feed its population, and El Salvador is no exception. In El Salvador, as in much of Central America, the most important grain is white corn. While not a grain, edible beans are also a major contributor to the diet in El Salvador, and will be included with the basic grains in this study. Rice is a third important component of the diet of many Salvadorians. Yellow corn, and the fourth basic grain - sorghum are important as animal feeds, with some sorghum also used for human consumption. How important are these four basic grains in El Salvador?

1. Basic grains contribution to the gross national product (GNP)

One measure of the importance of a sector is its contribution to the gross national product of the country. The basic grains sub-sector plays a relatively important part in the gross national product in El Salvador (Figure II-1 and Table II-1). In 1976 basic grains accounted for 2.9 percent of the gross national product, and 12.5 percent of the agricultural sector's share of the GNP. The basic grains sector is playing an increasingly important roll in the GNP, accounting for 4.5 percent of GNP in 1990. The contribution of basic grains to the agricultural sector's proportion of GNP has also increased, to 19 percent by 1990. The basic grains contribution to GNP grew from 94,000 Colones in 1976 to 149,000 Colones in 1990 (in constant 1962 prices). This represents a growth of 58 percent over the 15 years, or a growth of 3.9 percent a year. The basic grains sub-sector did remarkably well when compared to the growth in GNP which was 1.2 percent total for the 15 years (0.08% per year), and to the growth in the agricultural sector which was 4.4 percent over the period (0.3% per year).

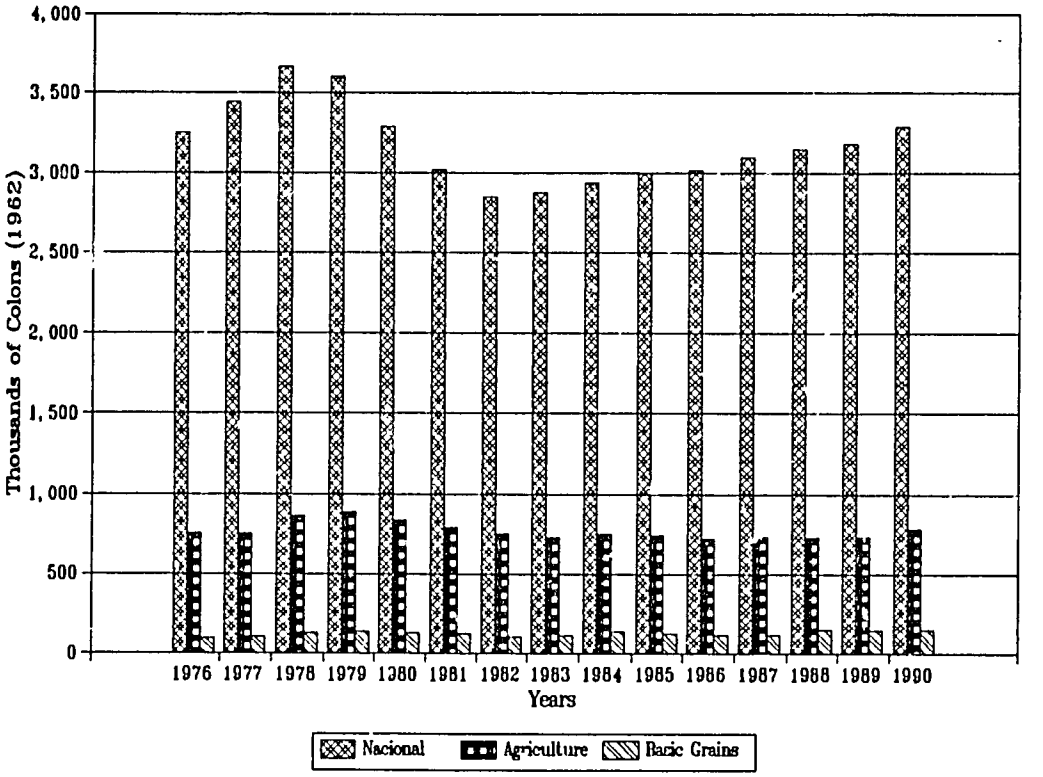
2. The role of basic grains in farm income

That basic grains production contributes food and/or income to most producers is a basic assumption for policy makers and others interested in El Salvador's agriculture. A recent study by Calderon and San Sebastian provides a per manzana[6] estimate of the costs and returns for eleven different sub-systems in the agricultural sector. As can be seen in Table II-2 the systems produce an average

[6] One manzana = .7056 of one ha.

FIGURE II-1

GROSS NATIONAL PRODUCT, 1976-1990
NATIONAL AGRICULTURE - BASIC GRAINS



Source: Table II-1

TABLE II-1

GROSS NATIONAL PRODUCT
(1,000 Colons, 1962 Constant Prices)

Year	National	Agriculture	Basic Grain
1976	3,246.9	752.2	94.3
1977	3,443.9	751.3	96.9
1978	3,664.7	856.6	126.6
1979	3,601.6	887.4	132.0
1980	3,289.3	841.1	128.3
1981	3,016.8	787.5	120.7
1982	2,847.7	750.6	101.6
1983	2,870.4	726.8	109.6
1984	2,935.6	750.9	132.4
1985	2,993.7	742.8	122.7
1986	3,012.5	719.7	115.4
1987	3,093.5	734.7	113.2
1988	3,143.8	727.7	146.0
1989	3,177.0	731.1	141.6
1990	3,285.0	785.5	149.0

Source: UAP-MAG

FILE: GNP.PRN

TABLE II-2

BASIC GRAIN PRODUCTION BY TYPE OF PRODUCTION SYSTEM

TYPE	NAME OF SYSTEM	AVAILABLE LAND (MZ)	SUB-SYSTEM	BASIC GRAIN PRODUCED	NET RETURN FOR GRAIN/1 COLONES
TYPE I-1	HOME USE ONLY	1.0	CORN ONLY - 0.5 MZ CORN & BEANS - 1 MZ CORN & SORGHUM - 1 MZ	20 QQ CORN 20 QQ CORN & 6.6 QQ BEANS 25 QQ CORN & 5 QQ SORGHUM	332 664 664
TYPE I-2	HOME USE WITH SALES	1.5-3.0	CORN ONLY - 1 MZ CORN ONLY - 2.5 MZ CORN & BEANS - 2.5 MZ CORN, BEANS & SORGHUM - 1.25 MZ	30 QQ CORN 60 QQ CORN 55 QQ CORN & 13.4 QQ BEANS 35 QQ CORN, 7.5 QQ BEANS & 18.75 QQ SORGHUM	1,442 3,606 3,606 1,803
TYPE II-1	INTENSIVE BASIC GRAINS AND HORTICULTURE	2.3	CORN & SORGHUM - 1 MZ & RICE - 1 MZ CORN & TOMATOES - 2.6 MZ	54 QQ CORN, 15 QQ SORGHUM & 30 QQ RICE 70 QQ CORN	2,480 3,224
TYPE II-2	INTENSIVE BASIC GRAINS AND COFFEE	2.4	CORN & BEANS - 0.75 MZ EACH, & COFFEE - 2 MZ	40 QQ CORN & 8 QQ BEANS	2,552
TYPE II-3	BASIC GRAINS AND CATTLE	2.5	CORN - 0.5 MZ & CATTLE FEEDING - 1 MZ	12 QQ CORN	667
TYPE III-1	FAMILY FARMS WITH 5-20 MZ (FAMILY LABOR)	9.5	CORN - 9 MZ, BEANS & SORGHUM 1.5 MZ EACH	352.5 QQ CORN, 18 QQ BEANS & 30 QQ SORGHUM	15,960
TYPE III-2	OTHER FARMS WITH 5-20 MZ (HIRED LABOR)	13.0	CORN - 4.5 MZ, SORGHUM - 3 MZ & RICE - 1 MZ	135 QQ CORN, 18 QQ SORGHUM & 50 QQ RICE	8,007
TYPE IV-1	FAMILY FARMS GREATER THAN 20 MANZANAS	59.25	CORN - 7 MZ & PASTURES	234 QQ CORN	1,162
TYPE IV-2-1	CAPITAL EXTENSIVE FARMING (LATIFUNDIO)	64	MIXED FARMING CORN - 3 MZ	140 QQ MAIZ	2,045
TYPE IV-2-2	CAPITAL INTENSIVE DAIRY	64	SORGHUM - 6 MZ	240 QQ SORGHUM	8,550
TYPE V	COOPERATIVES (AGRARIAN REFORM DECREE 154)	921.8	CORN - 150 MZ, FORAGE CORN - 73 MZ, RICE - 355 MZ		219,756

/1 Includes return to family labor, land, management, etc.
Source: Caracterizacion de Los Productores de Granos Basicos en El Salvador, CADESCA, Oct. 1991

FILE: CADESCA.WQ1

net return per manzana of basic grains production of 1,028 Colones. These net returns per manzana range from 166 to 1,702 Colones per manzana. If the estimated returns per manzana are combined with the information on how many manzanas are dedicated to basic grain production, shown in Table II-3, we are able to estimate the total net return from basic grain production for each sub-system. For the smallest producer, Type I-1, the return of 332 Colones represents the return to family labor used in producing grain for home consumption. At the other extreme, a large cooperative will earn almost 220,000 Colones from basic grains production.

3. The role of basic grains in the family budget

Procuring food is usually a major expense for families, particularly non-farm families, in most countries. The purchase of basic grains is important for most families if they are to have an adequate diet, and do not produce their own food. The 1990-91 National Home Income and Expenses Survey found that basic grains accounted for 4.9 percent of the typical family's weekly household purchases. As can be seen in Figure II-2, the family typically spends 37.8 percent of its weekly purchases on food, beverages and tobacco. Within the food, beverages, and tobacco category (Figure II-3), corn and corn products account for 7.1 percent, beans for 3.7 percent, rice for 2.1 percent and sorghum approximately 0.04

percent. Finally, within the family expenditure for basic grains (Figure II-4), corn and corn products account for over half (54.8%) of the expenditures, while beans account for 28.5 percent and rice for 16.4 percent. Sorghum for direct human consumption represents a very small 0.3 percent of basic grains purchased for family consumption.

These consumption figures do not include the use of basic grains for feed for animals which will eventually be used for family consumption. The Direccion General de Economia Agropecuaria [7] estimates that in 1990, 14.3 percent of corn and 28.8 percent of sorghum produced were destined for animal consumption. A portion of the family expenditures on meat and eggs can thus be attributed to basic grains, increasing the actual importance of basic grains in the family budget.

TABLE II-3

ECONOMIC RESULTS FOR BASIC GRAIN PRODUCTION PER MANZANA, BY TYPE OF SYSTEM

TYPE	GROSS VALUE PRODUCT	INPUT COSTS	WAGES	NET PRODUCER RETURNS/1
TYPE I-1 HOME USE ONLY	1,267.5	552.1 (43.6%)	51.0 (4%)	664.4 (52.4%)
TYPE I-2 HOME USE WITH SALES	1,851.4	401.0 (21.6%)	8.0 (0.4%)	1,442.4 (78%)
TYPE II-1 INTENSIVE BASIC GRAINS AND HORTICULTURE	1,900.0	660.0 (34.7%)	0.0	1,240.0 (65.3%)
TYPE II-2 INTENSIVE BASIC GRAINS AND COFFEE	2,069.1	156.4 (7.6%)	210.9 (10.2%)	1,701.8 (82.2%)
TYPE II-3 BASIC GRAINS AND CATTLE	1,746.7	412.0 (23.6%)	0.0	1,334.7 (76.4%)
TYPE III-1 FAMILY FARMS WITH 5-20 MZ (FAMIL/ LABOR)	1,805.0	422.2 (23.4%)	52.8 (2.9%)	1,330.0 (73.3%)
TYPE III-2 OTHER FARMS WITH 5-20 MZ (HIRED LABOR)	1,258.9	251.3 (20%)	65.6 (5.2%)	942.0 (74.8%)
TYPE IV-1 FAMILY FARMS GREATER THAN 20 MANZANAS	227.8	54.0 (23.7%)	8.1 (3.5%)	165.7 (72.8%)
TYPE IV-2-1 CAPITAL EXTENSIVE FARMING (LATIFUNDIO)	1,327.8	393.2 (29.6%)	252.9 (19%)	681.7 (51.4%)
TYPE IV-2-2 CAPITAL INTENSIVE DAIRY	2,340.0	268.2 (11.5%)	647.0 (27.6%)	1,424.8 (60.8%)
TYPE V COOPERATIVES (AGRARIAN REFORM OECREE 154)	1,458.0	521.1 (35.7%)	556.7 (38.2%)	380.2 (26.1%)
AVERAGE	1,568.4	371.9 (23.7%)	168.5 (10.7%)	1,028.0 (65.6%)

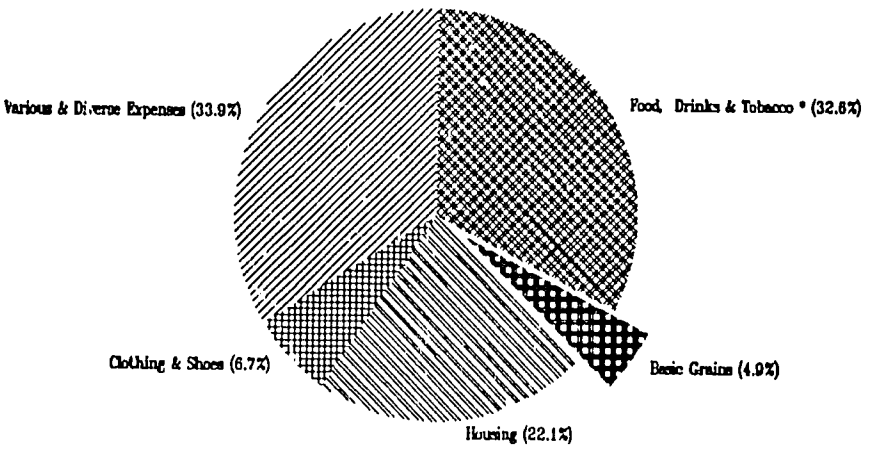
/1 Includes return to family labor, land, management, etc.
Source: Caracterización de Los Productores de Granos Básicos en El Salvador, CADESCA, Oct. 1991

FILE: CADESCA2.WQ1

[7] UAP-MAG, "Política Agrícola", Vol 1, No 1, August 1991

FIGURE II-2

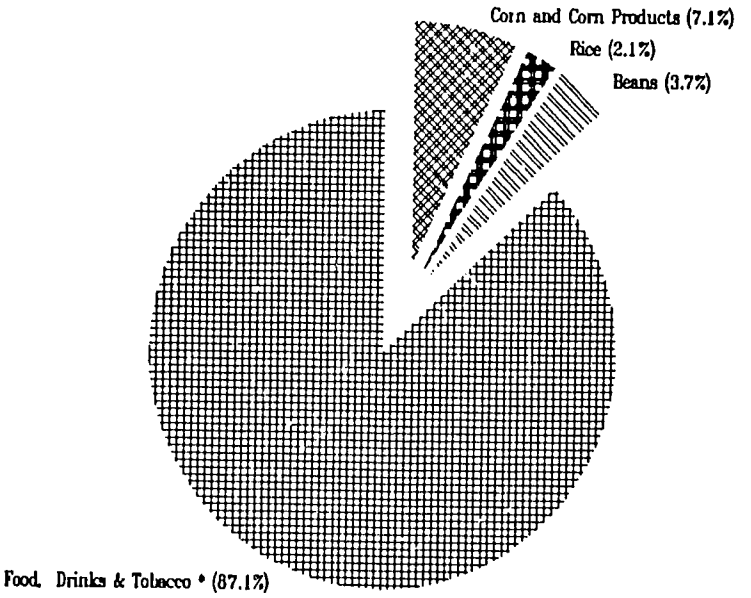
MONTHLY FAMILY PURCHASES, 1990-91
TOTAL PURCHASES



Source: APPENDIX 3

FIGURE II-3

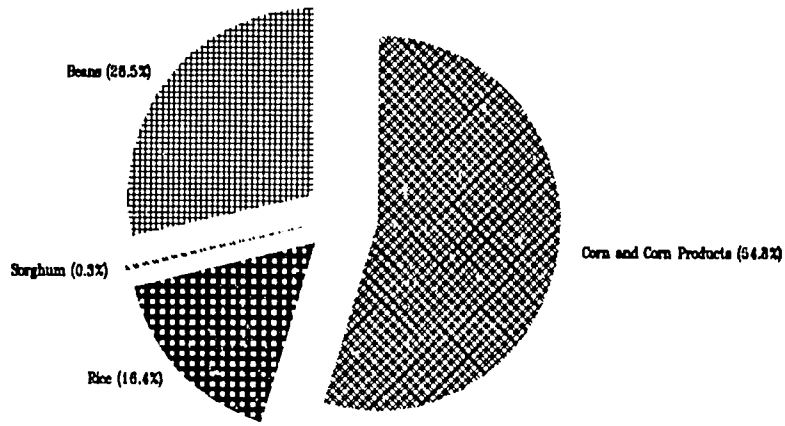
MONTHLY FAMILY PURCHASES, 1990-91
MONTHLY PURCHASES OF FOOD



Source: APPENDIX 3

FIGURE II-4

MONTHLY FAMILY PURCHASES, 1990-91
MONTHLY PURCHASES OF BASIC GRAINS



Source: APPENDIX 3

4. The role of basic grains in nutrition

A preliminary version of the paper, "Documento Pais Para La Conferencia Internacional de Nutricion a Celebrarse en Roma, Italia en Diciembre, 92", indicates that between 1985 and 1989 there was a 6.3 percent annual growth in the availability of basic grains. Despite this growth El Salvador is still considered one of the Central American countries with the highest food dependency index [8]. The dependency index for basic grains grew from 7.0 percent in 1985 to 18.9 percent in 1991 (See Table II-12). Food aid, both consessionary and donations, of corn, rice and beans are important in meeting El Salvador's food needs. The dependence on imported basic grains is aggravated by the complete dependency of the country on imports of wheat.

Corn, beans and rice have all suffered erratic but generally negative movements in terms of their dependency index. Corn, which provides approximately 43 percent of the minimum daily calory intake, has had a dependency index which grew from 6.7 percent to 19.9 percent between 1985 and 1991. For rice the dependency index grew from 13.6 percent in 1985 to 39.0 in 1991. Over the period the dependency index for beans ranged from 0.9 percent to 15.5 percent.

For 1990-91 El Salvador's production of corn available for human consumption, estimated at 74 percent of total production, was 25 percent below demand (Table

[8] Dependency index = Imports/Total Supply.

II-4). Bean production was 47 percent below demand, and the demand for rice exceeded available production by 38 percent. Only Region I produced more corn and beans than its population required, and only Region III showed a rice surplus. Otherwise the shortfall for basic grains varied widely among regions and crops, going as high and as an 86 percent shortfall for beans in Region IV.

B. Basic Grains Production

An understanding of basic grains production can come from examining the way production takes place, i.e. a profile of the system, and from examining the trends in the actual functioning of the system, i.e. area planted, production and yield, for the last several years.

1. Production profiles

An over simplified characterization of most Latin American agriculture is to divide the sector into the "traditional" producers of basic grains, and the "modern" producers of export crops. Generally, traditional producers are described as obtaining low yields per area planted, not using "improved" methods, i.e. hybrid seeds, agro-chemicals and machinery, and displaying a resistance to change [9]. This is not a good characterization of present production because agriculturalists in El Salvador have adopted hybrid seed and agro-chemicals, to the extent that they probably use the highest level of fertilizers and pesticides of any Central American country. In reality, agriculture in El Salvador is a mixture of large and small farmers, who use various levels of improved technology.

a. Land use profiles

The 1989 El Salvador Agricultural Land Use and Land Tenure Survey (Table II-5) paints a picture of many small farmers (minifundios), with 71 percent of the farmers working under 2 hectares (2.86 manzanas). Collectively this group farms 10 percent of the land under cultivation. At the opposite extreme, one percent of the agricultural holding of 50 or more hectares, account for 40 percent of the land. More than 80 percent of renters and land holders under Agrarian Reform Decree 207 have access to less than 2 hectares, while over 95 percent of the Agrarian Reform Cooperatives have access to more than 200 hectares. Land ownership is the most common tenancy arrangement, with two-thirds of the producers utilizing 76.9 percent of the land. Renters account for 10.5 percent of farming operations, while Decree 207 beneficiaries account for 13.5 percent, and Reform cooperatives, for 8.5 percent of farming operations.

The same survey indicates that 68.7 percent, more than 168,000, of the countries' agricultural producers grow at least some basic grains crops (Table II-6). These crops are grown on 49 percent of the land used by producers of basic grains. One of the important findings of the survey is that over 80 percent of basic grain producers own less than five hectares of land, which total 54.5 percent of all land utilized by basic grain producers. The majority of grains produced by this

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[9] Calderon and San Sabastian reference. Ver D. Browing, "El Salvador, la tierra y el hombre", on this point.

group are probably consumed by the farm family (subsistence farmers) with only a small quantity available for sale. Despite the assumption of production for home consumption, it was found that farmers from all size of land holding groups sold crops. The data indicate that more than 50 percent of producers sell corn, with more than 55 percent selling beans. Sorghum is also sold by more than 30 percent of farmers, although the primary use for sorghum is animal feed rather human consumption. Although the majority of farmers sell some of their crop, a review of the Price and Quantity Sold Survey data collected by DGEA for 1989-90, indicates that the majority of sales reported were for quantities under 10 quintals.

TABLE II-4

RELATIONSHIP OF PRODUCTION AND DEMAND FOR HUMAN CONSUMPTION FOR BASIC GRAINS 1990-91

REGION	POPULATION	TO MEET DBN QQ/YR/PR	TOTAL DEMAND QQ	TOTAL PRODUCT QQ	PROD FOR HUMAN CONSUMP QQ	DEMAND MINUS PROD FOR HC QQ	SHORTFALL PERCENT
			CORN		(74%)		
REGION I	1,048,247	2.47	2,589,170	3,917,800	2,899,172	(310,002)	-12
REGION II	2,252,257	2.47	5,563,075	3,213,800	2,378,212	3,184,863	57
REGION III	688,347	2.47	1,700,217	1,996,600	1,477,484	222,733	13
REGION IV	1,262,818	2.47	3,119,160	3,972,000	2,939,280	179,880	6
TOTAL	5,251,669	2.47	12,971,622	13,100,200	9,694,148	3,277,474	25
			BEANS		(88.2%)		
REGION I	1,048,247	0.36	377,369	450,000	396,900	(19,531)	-5
REGION II	2,252,257	0.36	810,813	452,600	399,193	411,619	51
REGION III	688,347	0.36	247,805	171,800	151,528	96,277	39
REGION IV	1,262,818	0.36	454,614	71,000	62,622	391,992	86
TOTAL	5,251,669	0.36	1,890,601	1,145,400	1,010,243	880,358	47
			RICE (HULLED)		(88.9%)		
REGION I	1,048,247	0.25	262,062	54,332	48,301	213,761	82
REGION II	2,252,257	0.25	563,064	514,080	457,017	106,047	19
REGION III	688,347	0.25	172,087	207,944	184,862	(12,775)	-7
REGION IV	1,262,818	0.25	315,705	135,592	120,541	195,163	62
TOTAL	5,251,669	0.25	1,312,917	911,948	810,722	502,195	38

DBN = DAILY BASIC NEED
SOURCES: Documento País Para La Conferencia Internacional de Nutricion, 1991 Dirección de Población, Boletin #3, 1990 Política Agrícola, UAP-MAG, Vol 1, Aug 1991.

FILE: HUMANDM.WQ1

TABLE II-5

CHARACTERISTICS OF LAND TENURE

Form of Tenure	Size of Holding (in Hectares) 0<2	2<5	5<20	20<50	>50	Total
No. Owners	154,935	35,087	30,968	9,072	3,786	233,848
Percent	66.3	15.0	13.2	3.9	1.6	100.0
Land Area	86,763	114,693	293,252	275,671	387,547	1,157,926
Percent	7.5	9.9	25.3	23.8	33.5	100
No. Renters	30,207	3,809	1,950	258	148	36,372
Percent	83.1	10.5	5.4	0.7	0.4	100.0
Land Area	19,065	11,668	18,460	8,449	13,678	71,320
Percent	26.7	16.4	25.9	11.8	19.2	100.0
No. D-207	41,246	4,891	854	0	0	46,991
Percent	87.8	10.4	1.8	0	0	100.0
Land Area	44,528	17,768	6,935	0	0	69,231
Percent	64.3	25.7	10.0	0	0	100.0
No. Reform Coops.*	0	0	1	4	317	322
Percent	0	0	0.3	1.2	98.4	100.0
Land Area	0	0	15	166	207,687	207,868
Percent	0	0	-	0.1	99.9	100.0
Total Producers	226388.0	43787.0	33773.0	9334.0	4251.0	317533.0
Percent	71	14	11	3	1	100
Land Area	150356.0	144129.0	318662.0	284286.0	608912.0	1506345.0
Percent	10	10	21	19	40	100

* There are a total of 30,268 socios in the Reform cooperatives.
Source: The 1989 El Salvador Agricultural Land Use and Land Tenure Survey.

FILE LANDTEN.WK1

TABLE II-6

CHARACTERISTICS OF BASIC GRAINS PRODUCTION

Form of Tenure	Size of Holding (in Hectares) 0<2	2<5	5<20	20<50	>50	Total
No. Grain Producers	104,221	29,707	23,153	4,785	1,770	163,636
Percent Grain Prod.	63.7	18.2	14.1	2.9	1.1	100.0
Percent All Prod.	69.7	67.6	72.4	57.1	40.6	68.7
Land Area of Grain Producers	100,610	58,231	70,362	29,553	33,002	291,759
Percent Grain Prod.	34.5	20.0	24.1	10.1	11.3	100.0
Percent All Prod.	76.3	70.8	67.9	36.0	16.9	49.1
Percentage of Producers Selling Crop						
Corn	54.8	55.2	56.4	55.9	70.5	
Beans	84.4	68.7	55.3	63.7	81.1	
Sorghum	39.0	45.2	36.1	32.1	35.8	

* Reform cooperatives are treated as a single producer.
In all cases, land planted in associated crops is not counted separately.
Source: The 1989 El Salvador Agricultural Land Use and Land Tenure Survey.

BASIC-GR.WK1

b. Producer profiles

Agricultural statistics in El Salvador are collected on the basis of land use classifications and aggregated by region. While data collected under this system allows for aggregation based on regions, it does not provide information on the characteristics of the agricultural producers themselves. Calderon and San Sabastian used the available agricultural statistics, and a set of case studies, to propose a classification system based on characteristics of the producers themselves. The five major system types they propose are broken down into eleven sub-systems on the basis of type of product, amount of land, type of labor, and economic criteria. Tables II-2 and II-3, discussed above, summarize this classification system.

c. National cropping practices profile [10]

The agricultural statistics do provide data by region on some of the cropping practices of El Salvador's basic grain producers. Corn production is broken down by type of seed -- hybrid and national -- and whether the crop was planted as a sole stand or was planted in association with another crop, i.e. corn followed by beans or sorghum. For the 1990-91 crop year more than half (57.7%) of the corn crop was planted with hybrid seed. The land planted with hybrid seed yielded 13.7 qq/Mz (55.5%) more than land planted with national seed. This resulted in 67.7 percent of total production coming from the 57.7 percent of the land planted with hybrids.

The second breakdown of corn production is by modality of planting. In 1990-91, 75.3 percent of the corn crop was planted as a sole stand. The sole stand produced 16.6 percent (4.8 qq/Mz) more per manzana that the associated plantings, and so accounted for 78 percent of total production. Hybrid corn planted as a sole crop yielded 10.5 percent (3.7 qq/Mz) more than hybrids planted in an association with another crop. For national seed the sole crop produced 7.7 percent (1.8 qq/Mz) more.

Sorghum production is also broken down by variety and modality. For the 1990-91 crop year, national sorghum seed was planted on 83.6 percent of the land, and accounted for 81.4 percent of the production. The improved sorghum varieties produced an average of 3 qq/Mz (16.3%) more than the national varieties. Sorghum planted as a sole crop yielded 34.3 percent (5.7 qq/Mz) more than sorghum planted in association with corn. However, the associated plantings accounted for 59.2 percent of all sorghum planted, and accounted for slightly over half (51.8%) of production nationally.

Bean production is distinguished only on the basis of modality. Sole cropping, including planting into corn fields after the corn is doubled to allow drying, was practiced on 79.4 percent of the bean fields in 1990-91. This cropping system accounted for 82.1 percent of all production. Yield per manzana was 2 quintals (17.9%) greater for sole cropped beans.

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[10] Data for this section was taken from the Annex section of Política Agrícola, Vol 1, August 1991.

No specific characterizations are made for rice cropping.

d. Costs of production information

Annual crop budgets for the basic grains are produced by DGEA from a Multiple Visit Survey and provide specific economic information on average crop production costs. The 1990-91 crop budgets for basic grain crop systems are included in Appendix 4. Summary information from crop budgets from 1980 to 1990 is used in a later section on prices and cost trends.

e. Crop calendar

A crop calendar, identifying the major planting and harvesting dates, can be derived from the agricultural statistics and discussions with extensionists. Such a calendar for El Salvador is presented in Figure II-5. Information contained in the cropping calendar can identify potential conflicts in terms of competition for land and labor, as well as complementarities in the use of land and labor. Information from this calendar was used in aggregating price data for use in the econometrics portion of this study and will be discussed later.

f. Harvest by months

The agricultural statistics provide information on the quantities of the basic grains harvested by month. Figure II-6 shows the percentage of each basic grain crop harvested by month for the 1990-91 cropping year. This data complements the cropping calendar. A similar summary could also be extracted from the data available to DGEA for plantings by month.

g. Seasonal price index

There is generally a seasonal price movement related to the supply of basic grains, with the peak prices occurring just before the harvest begins for a particular grain, and the lowest price coming at or just after the close of harvest. As can be seen in Figure II-7, the peak price for corn occurs in August, not long before the harvest begins in October. Likewise, the low price for corn is in December, after the harvest is mostly completed.

For beans the seasonal price index is more erratic due to the presence of two different planting and harvest periods (Figure II-8). The highs occur in July, just as May planted beans are being harvested and August planting is beginning, and in October, before the main crop of beans which was planted in August is harvested.

The seasonal price indexes for rice (Figure II-9) and Sorghum (Figure II-10), follow the same pattern of peaking just before harvest, and bottoming out at the end of harvest.

Seasonal price movements of the nature reflected in the seasonal price indices are important for farmers because the farmer can expect a much better price for basic grains produced, if it is possible to store the product for several months. Otherwise low prices can be expected at harvest time, and the purchase of seed will be more dear.

FIGURE II-5

AGRICULTURAL CALENDAR FOR BASIC GRAINS

PRODUCT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	% PRODUCT
RICE					P1	P1*				H1*	H1		≈ 90%
		P2			H2								≈ 10%
BEANS					P1		H1	H1					≈ 15%
								P2c			H2*		≈ 82%
			H3									P3	≈ 3%
CORN					P1*	P1		Dobl		H1	H1*		≈ 90%
								P2	P2		H2	H2	< 10%
	P3		H3	H3								P3	< 1%
SORGHUM	H12					P1	P1	P2c				H12	= 100%

Notes: Dobl: producers "double" (bend over) the plant to dry the grain in the field.
P1, 2, 3: first, second and third planting.
h1, 2, 3: first, second and third harvest.
* definitely the major planting or harvest.
c planted in association with corn.

Source: Planting and harvest records from DGEA.

2. Trends

Grain production is a result of area under cultivation and the productivity per unit of cultivation. This relationship can be expressed as a simple function, as follows:

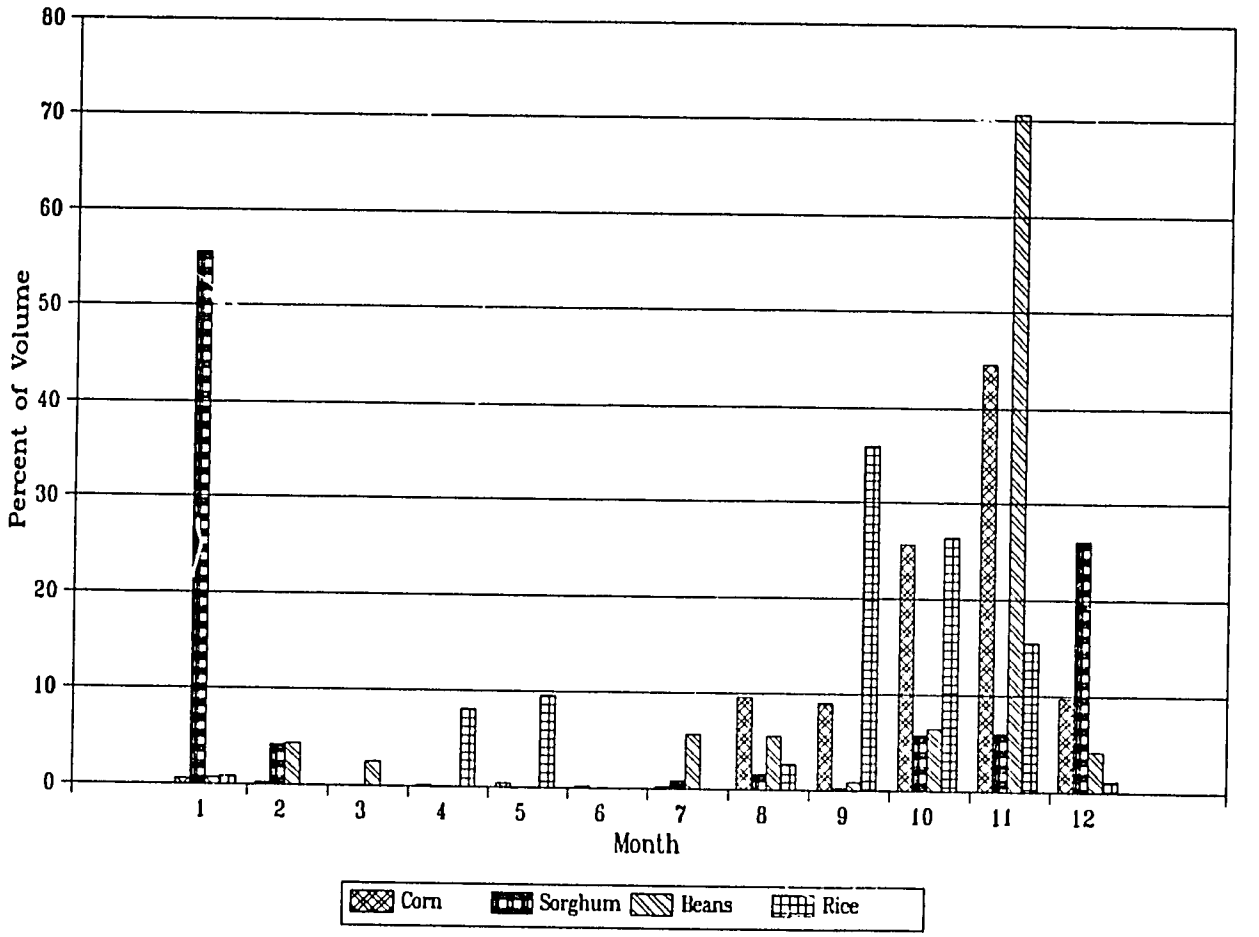
$Q_t = A_t * P_t$, where:

Q_t = Total production in time period "t", given in quintals (qq).
A_t = Area under cultivation in time period "t", given in manzanas (Mz).
P_t = Productivity per unit of production in time period "t", or yield per manzana, given as (qq/Mz).

While both area and yield contribute to total production, many factors will sway producers to use more acreage, to increase yields, or both. A production trend which over the years uses more acreage than increases in productivity is characterized as "extensive". Conversely, a production trend which over the years increases productivity more than the area being put under cultivation is characterized as "intensive". Naturally, there can be a production trend which falls in-between. At the extremes, each production trend will have both negative and positive consequences.

FIGURE II-6

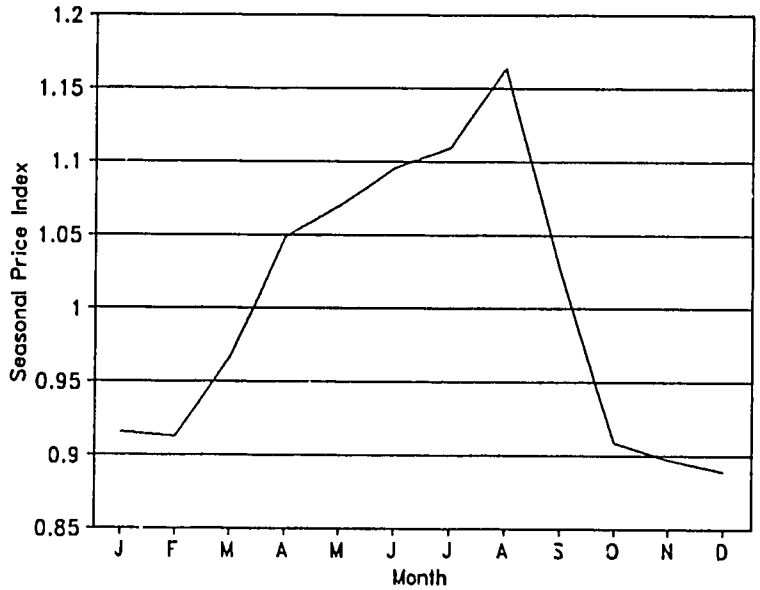
BASIC GRAINS VOLUME HARVESTED BY MONTH, 1990-91
(Percentage)



Source: Appendix 5

FIGURE II-7

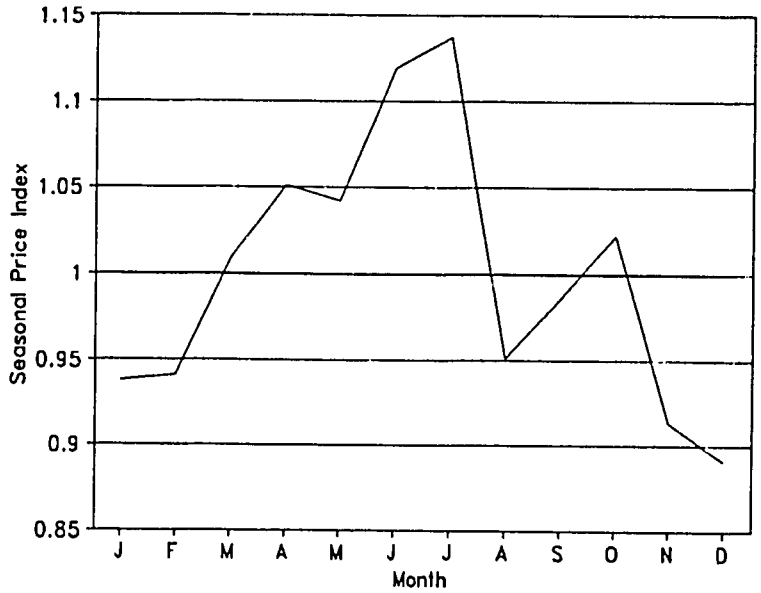
SEASONAL PRICE INDEX - CORN



Source: Appendix 6

FIGURE II-8

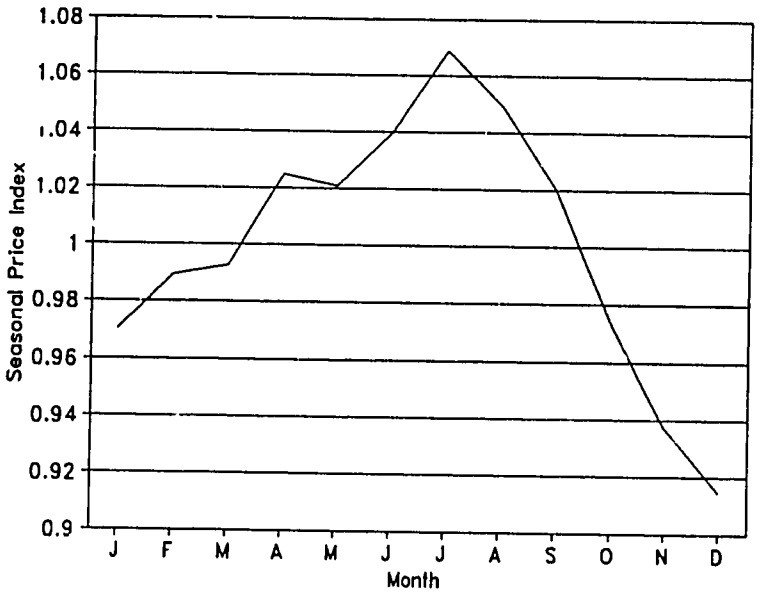
SEASONAL PRICE INDEX - BEANS



Source: Appendix 6

FIGURE II-9

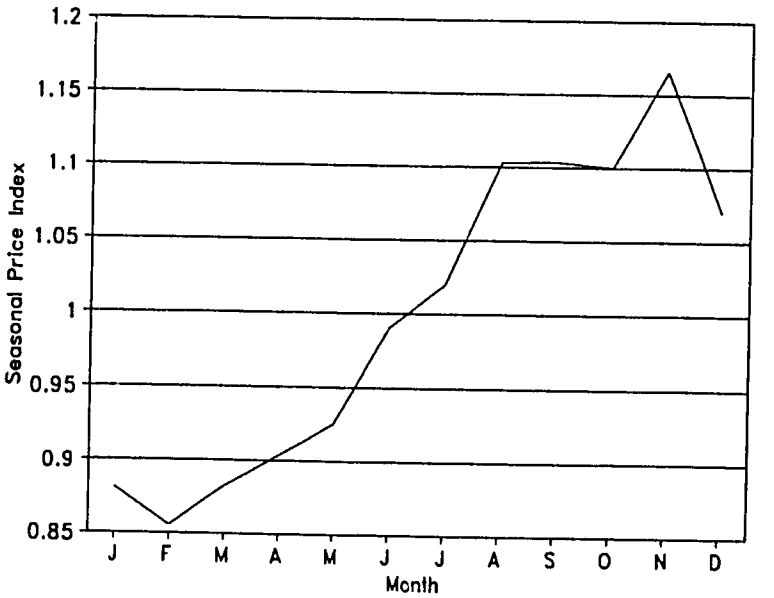
SEASONAL PRICE INDEX - RICE



Source: Appendix 6

FIGURE II-10

SEASONAL PRICE INDEX - SORGHUM



Source: Appendix 6

Gains in productivity result from research efforts or trials by individuals or institutions which, after a successful transfer to a commercial production level, result in higher yields per unit of production. In the case of basic grains production many factors affect this needed increase in productivity, including the development and availability of higher yielding varieties, availability of reasonably priced inputs, improved cultivation practices, appealing market conditions and prices for farm products, and effective outreach efforts and distribution mechanisms which encourage farmers to shift to higher levels of intensiveness in their production process.

a. National trends in basic grains crop area, yield, and production

The national average production, area, and yield trends for basic grains in El Salvador are summarized in Table II-7 and Figures II-11, 12, 13, and 14. These averages were obtained from four time periods between 1961/62 and 1989/90. Such a long time period tends to diminish the importance of variables with medium to short-term impacts, such as droughts, and allows those with significant long-term impacts to demonstrate their effects on basic grains production trends.

Generally, all four grains show remarkably similar trends in area and yields over the 30 year period. The individual tendencies are also very similar when analyzed within the four time periods. All this points out some common set of factors which influenced the components of the production equations over the 30 year time period. In other words, basic grains producers have responded to some externalities over the 30 year period which encouraged them to change their production process for basic grains over time.

TABLE II-7

TRENDS IN GRAIN PRODUCTION, AREA AND YIELD

Crop	Year	Average Production (qq)	Average Annual Change (%)	Average Area (Mz)	Average Annual Change (%)	Average Yield (qq/Mz)	Average Annual Change (%)
CORN	61/61-64/65	4,100,241		246,967		17	
			20.47%		4.92%		11.76%
	71/72-74/75	7,457,895		295,613		25	
			9.33%		5.21%		4.00%
	81/82-84/85	10,240,579		357,175		29	
			4.19%		2.37%		0.86%
	85/86-89/90	11,956,598		391,025		30	
RICE	61/61-64/65	528,375		15,403		34	
			16.09%		1.83%		13.24%
	71/72-74/75	868,525		16,530		52	
			5.05%		3.62%		1.44%
	81/82-84/85	1,043,948		18,925		55	
			2.34%		0.03%		2.27%
	85/86-89/90	1,141,513		18,950		60	
SORGHUM	61/61-64/65	2,072,305		139,642		15	
			13.66%		7.15%		5.00%
	71/72-74/75	3,205,000		179,600		18	
			-2.81%		-2.07%		-1.39%
	81/82-84/85	2,845,320		164,735		17	
			-2.26%		1.38%		-2.94%
	85/86-89/90	2,588,350		173,825		15	
BEANS	61/61-64/65	302564		36944		8	
			34.75%		17.59%		12.50%
	71/72-74/75	723150		62940		12	
			6.43%		6.12%		0.00%
	81/82-84/85	909030		78350		12	
			1.36%		4.04%		-4.17%
	85/86-89/90	958450		91025		10	

Source: Appendix 7

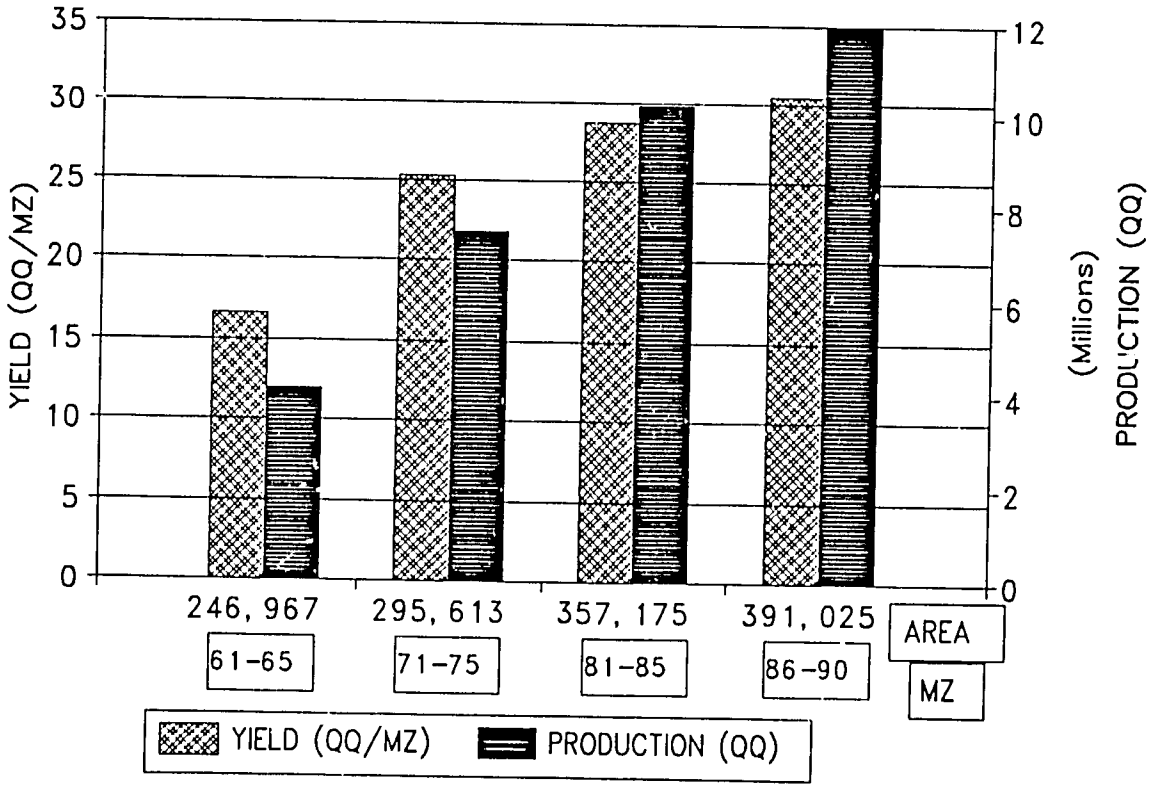
(1) Corn

Since 1961, corn production increased threefold from 4 million quintals to 12 million. While a function of area and yield, the relative importance of these two basic variables have changed over the years. Production during the 60's and 70's can be characterized as becoming "intensive" with yields increasing by 47%, from 17 to 25 qq/Mz between 1961-65 and 1971-75, and area expanding by only 20%, from 247,000 to 296,000 Mz during the same time period. For the time period 1981-85 and 1986-90 the reverse is true. Area expanded by 10% to 391,000 Mz while yield increased only 3.4%, to 30 qq/Mz. In other words, corn production became more extensive.

The estimated annual percentage changes listed in Table II-7 indicate the degree of loss in productivity per unit of production as corn production became more and more a function of area rather than yield. Yields which were growing at an average rate of nearly 12% during the 60's, were cut to 4% during the 70's, and are now barely increasing at 1% per year. As the cultivated area rate of expansion slowed from nearly 6% per year during the 60's to less than 3% per year during the 80's so did the rate of production, declining from over 20% per year to 4%.

FIGURE II-11

TRENDS IN CORN PRODUCTION, AREA AND YIELD



Source: Appendix 7

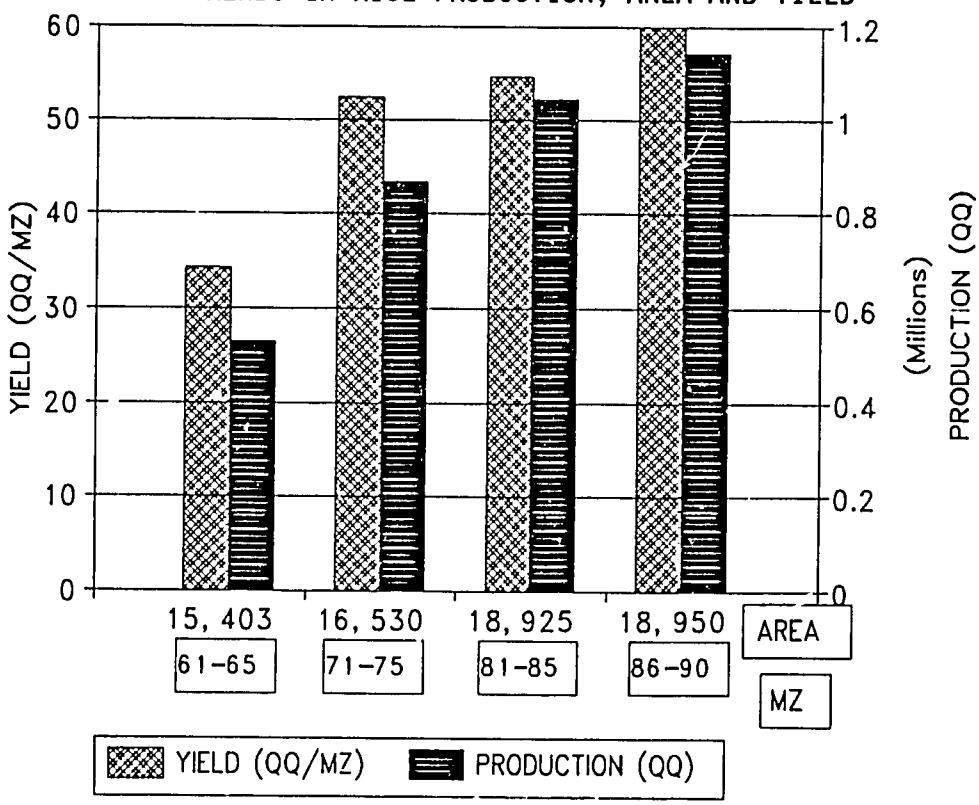
(2) Rice

Rice shows the same tendencies as corn during the 60's and 70's. Application of improved technologies intensified production and yields increased by 53% from 34 to 52 qq/Mz, while area expanded only 7% from 15,400 to 16,500 Mz. During the 70's and first half of the 80's, farmers' production response shifted to area expansion and productivity declined. By the 1980's the trend reversed and further increases in production became strictly a function of productivity as a result of a slight 9% increase in yields. Area remained constant at 18,900 Mz. The decreasing productivity per unit of production over time is reflected by the heights of the bars representing the quantities of rice produced over time (Figure II-12). As indicated, production continued to increase during the 1970's and 80's, but at an increasingly diminishing rate.

An analogue history can be drawn from the Average Annual Change columns in Table II-7. The tremendous productivity gained during the 1960's nearly disappeared during the 70's and early 80's. With land area under cultivation remaining nearly constant, annual production increases dropped from 16% to just over 2% by the late 1980's.

FIGURE II-12

TRENDS IN RICE PRODUCTION, AREA AND YIELD



Source: Appendix 7

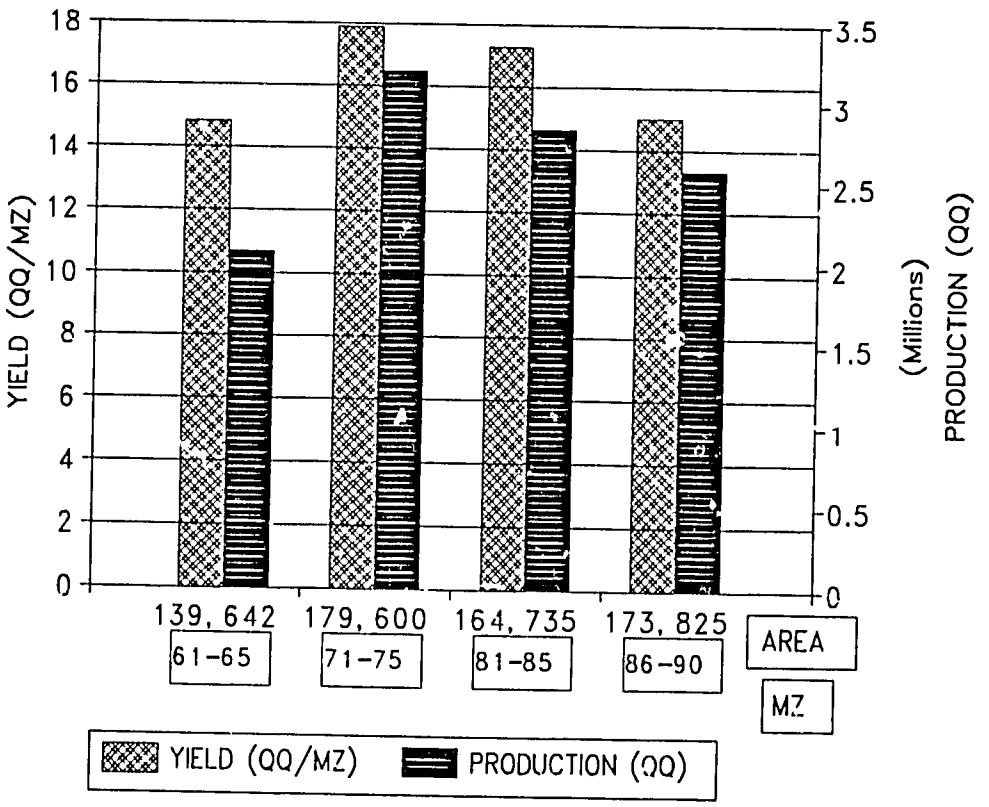
(3) Sorghum

Unlike corn and rice, area and yield contributed in a more balanced fashion to sorghum production during the 60's and first half of the 70's (Figure II-13). While area increased 29% from 139,000 to 179,000 Mz between 1961-65 and 1971-75, yield also increased 20% from 15 to 18 qq/Mz. By the 1980's, however sorghum production declined as a result of a severe reduction in yields which dropped by 12% to the levels experienced in the early 1960's. The slight increase in acreage of 6% to 174,000 Mz was insufficient to arrest the decline in productivity per unit of production.

An indication of the degree of loss in "technification" in sorghum production is given by the Average Annual Change columns in Table II-7. Whatever gains were made during the 1960's, were lost during the last two decades, with total production decreasing since the peaks obtained in the early 70's.

FIGURE II-13

TRENDS IN SORGHUM PRODUCTION, AREA AND YIELD



Source: Appendix 7

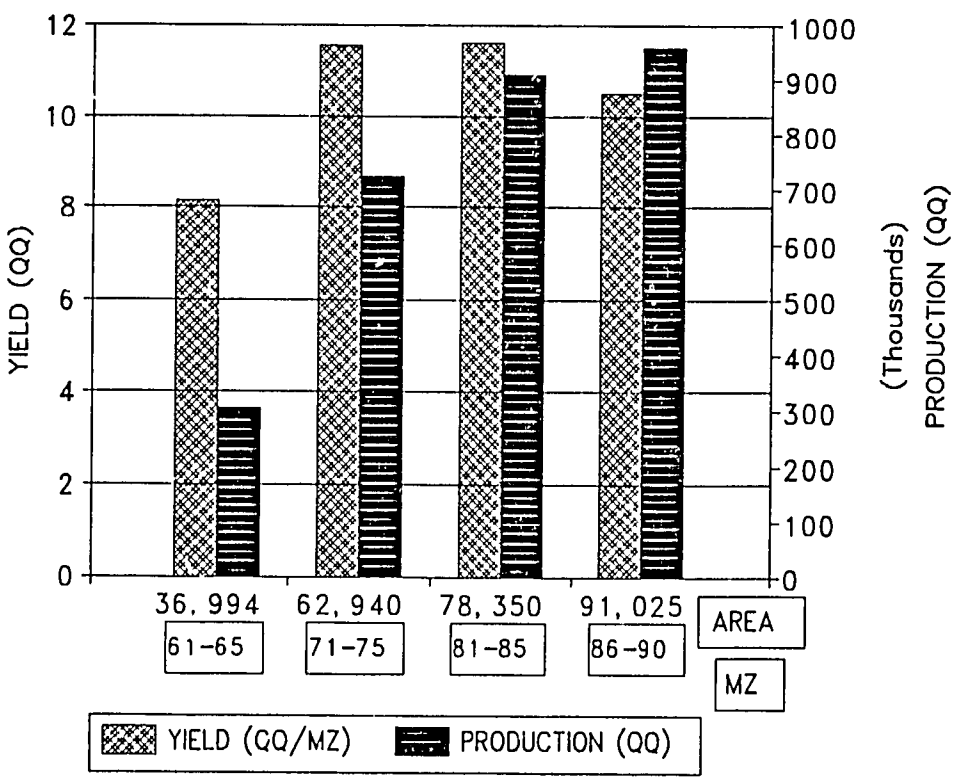
(4) Beans

Between 1961-65 and 1971-75, bean production increased as a balanced contribution of area expansion and yield increases (Figure II-14). Area expanded by 70% from 40,000 to 63,000 Mz, at roughly 18% per year, while yields increased by 50% from 8 to 12 qq/Mz, at approximately 13% per year. During the next decade yields ceased to increase and increases in bean production became a function of expansion in the area cultivated. During the 1980 a severe constriction in yields more than offset a moderate increase in the area cultivated. Yield dropped by 17% to 10 qq/Mz, while acreage increased by 16% to 91,000 Mz.

Again, the increasingly declining rate at which production grew after the first period exemplifies the detrimental combination of a shift to extensive production (area expanding at a rate of 6.12% between 71/75 and 81/85, and 4.04% per year during the last decade) and a decline in productivity (at a rate of 0% between 71/75 and 81/85 and a negative 4.17% during the second half of the 80's).

FIGURE II-14

TRENDS IN BEAN PRODUCTION, AREA AND YIELD



Source: Appendix 7

All commodities demonstrated an intensive or balanced production phase during the 60's and first half of the 70's and a shift to an extensive phase after that. With the exception of sorghum production volumes have continued to increase, but at increasingly declining rates.

b. Regional trends - area, production and yield

The national statistics on area, production and yield provide an insight into overall trends for El Salvador. Looking at regional trends data can provide some additional information which may be useful in analyzing the supply response over time. Area, production and even yield figures tend to vary considerably from year to year within the Regions. In order to smooth out some of the short run variation, so that the underlying trends may be identified, the data for the period 1975 to 1991 was divided into periods of four years each -- 1975-79 (5 years), 1980-83, 1984-87, and 1988-91. The following discussion of regional trends is based on the data as aggregated into these four periods.

(1) Corn

Between 1975 and 1991 corn production nationally increased by 15 percent. There were two periods of greater production during this time, from 1978 to 1980 and from 1988 to 1990. As can be seen from Figure II-15 (Table II-8), not all regions followed this pattern. The national increase in production was due in part to a national increase of 23 percent in area planted. While regions generally followed the increase in area planted, there was some variation among regions (Figure II-16). Nationally there was an actual decrease in average yield between 1975 and 1991, however, this is due to a low average yield in 1991 (a drought year) and if the average of the preceding three years is used as more representative of recent yields, there was an increase of 21 percent in yield, almost the same as the increase in area planted. Again regions showed a generally increasing yield, with some interesting variations (Figure II-17).

Taken together this data indicates that Region I has increased production mostly through improvements in productivity, i.e. through intensification, particularly after 1979 (Table II-8). On the other hand, the region of greatest area planted, Region IV, has shown considerable volatility, both in terms of area -- decreasing then increasing to about the same level -- and yield -- increasing over the period, with the greatest increase in the last four years. However, this region still has the lowest yield level of any region. The large production increase in the last four years in Region IV appears to be due in great part to a recovery in area planted, down during the first period, along with a significant increase in yield. Agriculturalists in Region II have demonstrated an increasing, decreasing, increasing pattern for area planted and yield, with the swing in yield being more important. Thus they appear to have gone from an intensifying production system to a more extensive system, and then returning to intensification. The growth in Region III has been mixed, with extensification being most important in the period from 1988-1991, when there was a decrease in yield and production. Early production gains were a balance of increased area planted and increased yields, while the 1980-83 period saw a greater influence of the intensification of production.

TABLE II-8

TRENDS IN GRAIN PRODUCTION, AREA AND YIELD

CORN

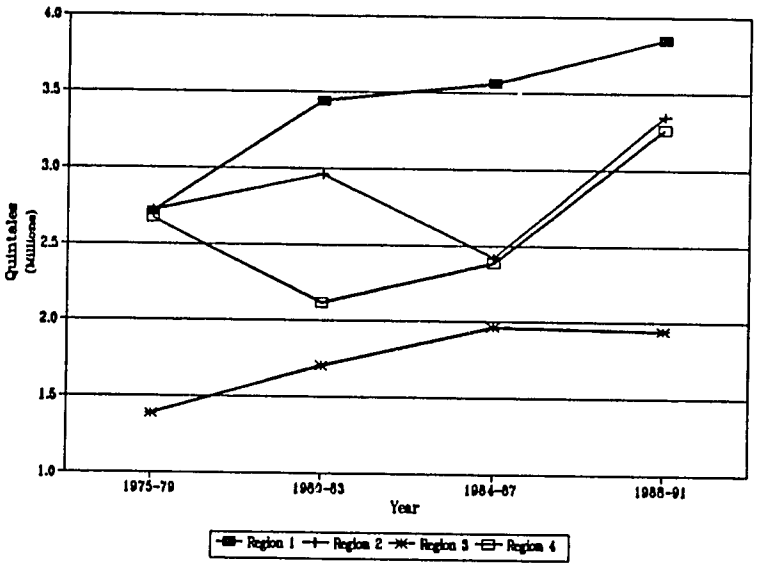
Region	Year	Average Production QQ	Average Annual Change %	Average Area Mz	Average Annual Change %	Average Yield QQ/Mz	Average Annual Change %
I	1975-79	2,712,690		100,667		28.9	
			27.0%		9.9%		8.0%
	1980-83	3,444,507		110,653		31.2	
			3.3%		0.4%		2.6%
	1984-87	3,558,706		111,054		32.0	
			8.2%		-1.1%		9.5%
	1988-91	3,849,225		109,825		35.1	
II	1975-79	2,719,964		86,922		30.9	
			9.0%		4.1%		7.9%
	1980-83	2,964,004		90,477		33.3	
			-18.3%		-4.0%		-12.4%
	1984-87	2,421,631		86,888		29.2	
			38.1%		10.7%		18.9%
	1988-91	3,345,150		96,200		34.7	
III	1975-79	1,385,843		51,352		26.7	
			22.9%		12.5%		10.4%
	1980-83	1,703,395		57,780		29.5	
			15.2%		4.1%		10.7%
	1984-87	1,961,725		60,121		32.6	
			-1.0%		6.5%		-6.7%
	1988-91	1,941,275		64,000		30.4	
IV	1975-79	2,670,599		136,650		19.4	
			-20.6%		-22.7%		6.3%
	1980-83	2,120,986		105,580		20.7	
			12.5%		4.1%		5.3%
	1984-87	2,387,088		109,860		21.8	
			36.6%		25.0%		11.4%
	1988-91	3,261,825		137,350		24.2	

Source: Appendix 8

FILE: TRNCORN.WQ1

FIGURE II-15

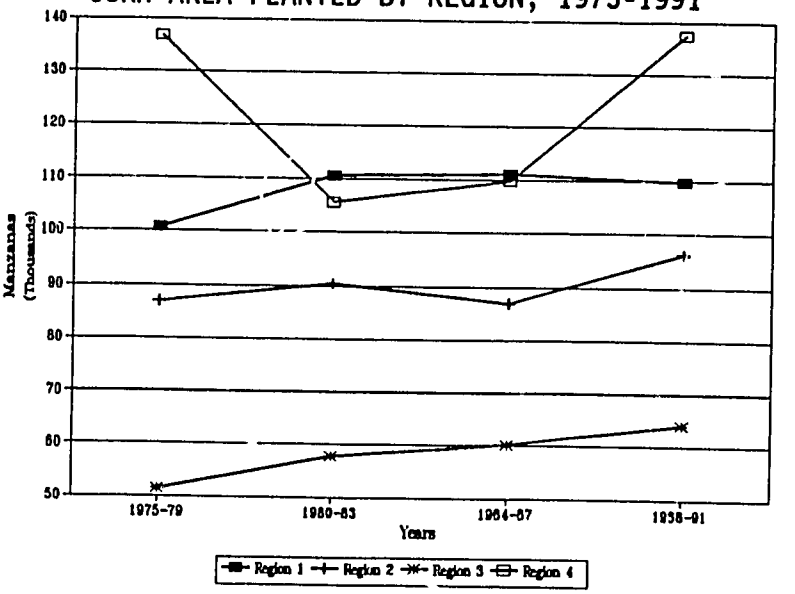
CORN PRODUCTION BY REGION, 1975-1991



Source: Table II-8

FIGURE II-16

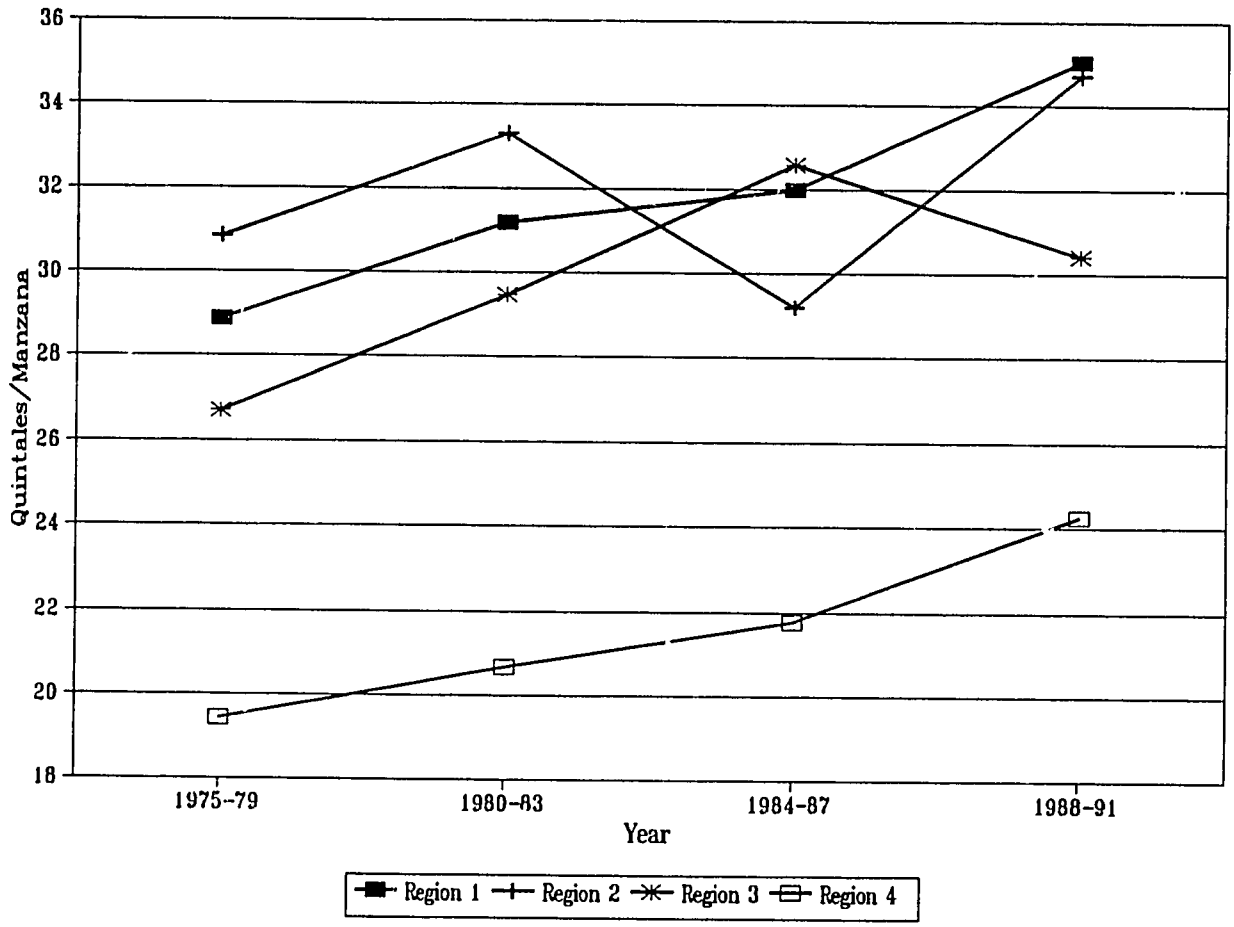
CORN AREA PLANTED BY REGION, 1975-1991



Source: Table II-8

FIGURE II-17

CORN YIELD BY REGION, 1975-1991



Source: Table II-8

(2) Beans

Bean production increased 64 percent between 1975 and 1991. This increase of almost 550,000 quintals was due more to extensification, as the area dedicated to bean production increased 34 percent, than to intensification, as the yield increased 22 percent. The trend of extensification of production was particularly apparent in the first periods as yields decreased for all regions between 1975-79 and 1984-87 (Figures II-18, II-19, and II-20). As with corn, there is considerable difference in the trends in production, area and yield between regions.

Two regions, Region I and II, showed a steady growth in both production and area planted over the entire 17 year period (Table II-9). Region I had a greater increase in production for the first and last periods, while Region II had an almost 60 percent increase in production during the last period. This region had a steady increase in area planted, ranging from 19 to over 25 percent, which more than made up for the slight decreases in yield for the first two periods. Region I, on the other hand, showed most growth in area planted during the first two periods, with a large increase in production during the final period. The increase more than made up for the decrease in yield experienced in the second period.

Regions III and IV tended more towards decreases than increases. In Region IV there was an overall decrease of 80 percent in production over the 17 years, caused primarily to the 103 percent decrease in area planted. Yields in region IV declined for the first two periods, recovering to almost the starting level during the final period.

Region III demonstrated an overall decline of 30 percent in area planted to beans. This overall decline masks a much greater decline during the first two periods, which was offset by a 31 percent increase in area planted during the third period. Productivity in the region followed the same downward trend during the first two periods, which was more than made up for in the final period. Despite an impressive increase of 57 percent in total production during the final period, overall production in the region declined by 11 percent.

It is noteworthy that production and yields increased in all regions during the 1988-91 period, while area planted to beans increased in all but Region IV. This increase coincides with the increasing de-regulation of the agricultural and agricultural inputs sectors.

(3) Rice

Within the rice production sub-sector, Region II has shown the greatest overall growth, while Region I has suffered the greatest decline (Figures II-21, II-22 and II-23). Nationally there was a decrease in rice production of 15 percent between 1975 and 1991, although this is due partially to low production in 1991 (a drought year), because if averages of the first five years and the last four years are used, there is an increase of 23 percent between the first and last periods (Table II-10). There was also a decrease in area planted to rice of 16 percent between 1975 and 1991. If the averages of the first and last period are used, there was an increase of 144 manzanas dedicated to rice between the periods. Although the average yields in 1975 and 1991 were basically the same, there was a substantial increase (23 percent) in average yields between the first and last periods.

TABLE II-9

TRENDS IN GRAIN PRODUCTION, AREA AND YIELD

BEANS

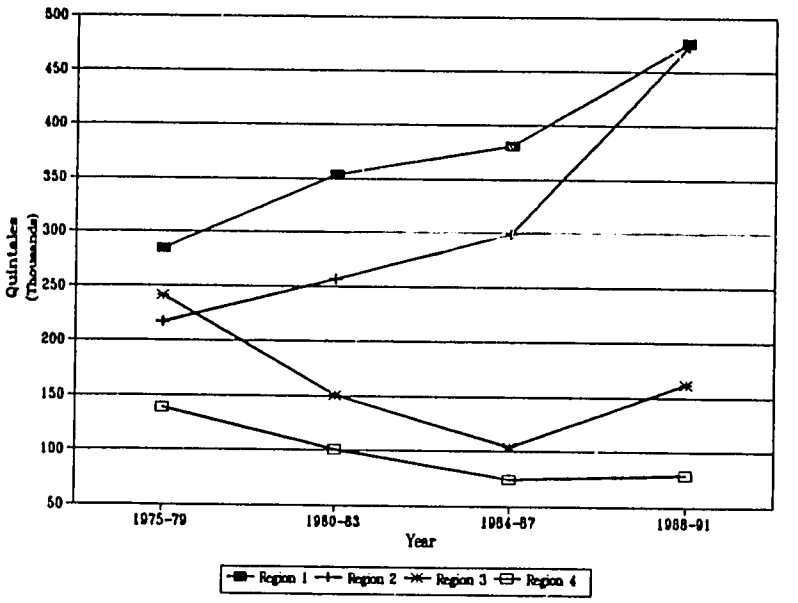
Region	Year	Average Production QQ	Average Annual Change %	Average Area Mz	Average Annual Change %	Average Yield QQ/Mz	Average Annual Change %
I	1975-79	284,547		23,468		12.2	
			24.2%		21.1%		3.1%
	1980-83	353,414		28,420		12.5	
			7.8%		31.6%		-18.4%
	1984-87	380,925		37,400		10.2	
			25.0%		2.6%		20.3%
	1988-91	476,300		38,375		12.3	
II	1975-79	216,905		20,878		10.8	
			18.5%		19.2%		-4.8%
	1980-83	257,059		24,882		10.3	
			16.5%		20.4%		-2.4%
	1984-87	299,430		29,950		10.1	
			58.1%		25.5%		24.9%
	1988-91	473,400		37,600		12.6	
III	1975-79	241,590		21,229		11.5	
			-37.7%		-37.0%		-2.4%
	1980-83	150,572		13,383		11.3	
			-31.2%		-27.0%		-5.4%
	1984-87	103,575		9,770		10.7	
			56.6%		30.8%		18.1%
	1988-91	162,175		12,775		12.6	
IV	1975-79	138,912		13,059		11.1	
			-27.6%		-24.8%		-8.4%
	1980-83	100,611		9,816		10.2	
			-26.4%		-14.1%		-14.1%
	1984-87	74,088		8,430		8.7	
			6.8%		-14.6%		26.1%
	1988-91	79,100		7,200		11.0	

Source: Appendix 9

FILE: TRNBEAN.WQ1

FIGURE II-18

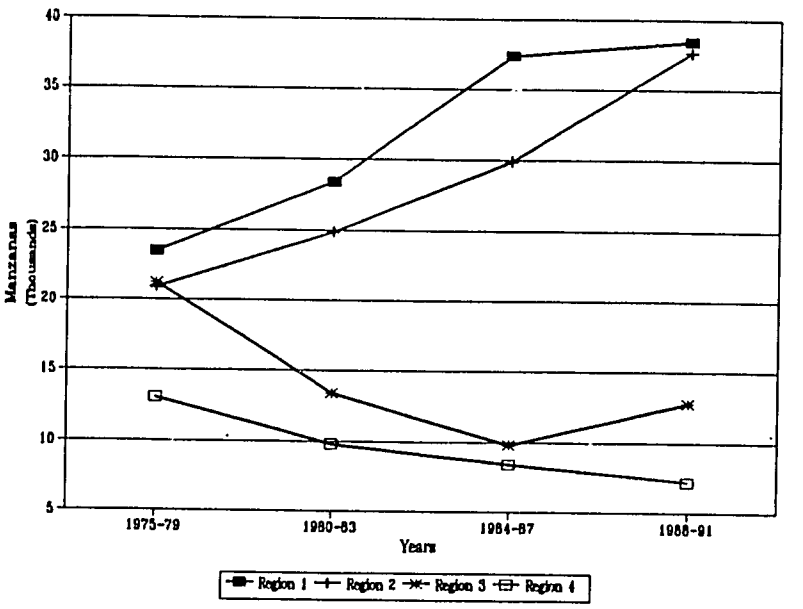
BEAN PRODUCTION BY REGION, 1975-1991



Source: Table II-9

FIGURE II-19

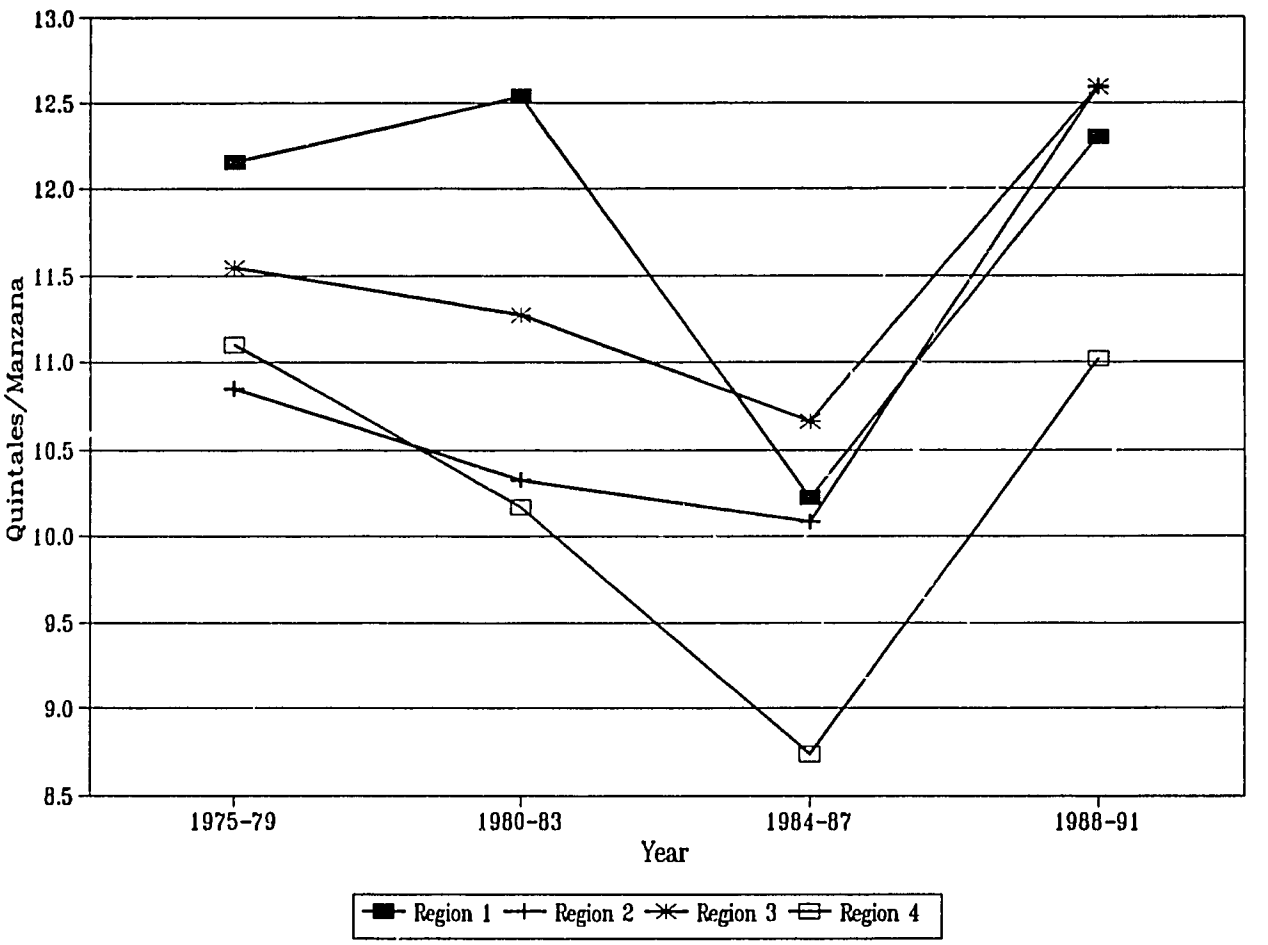
BEAN AREA PLANTED BY REGION, 1975-1991



Source: Table II-9

FIGURE II-20

BEAN YIELD BY REGION, 1975-1991



Source: Table II-9

TABLE II-10

TRENDS IN GRAIN PRODUCTION, AREA AND YIELD

RICE

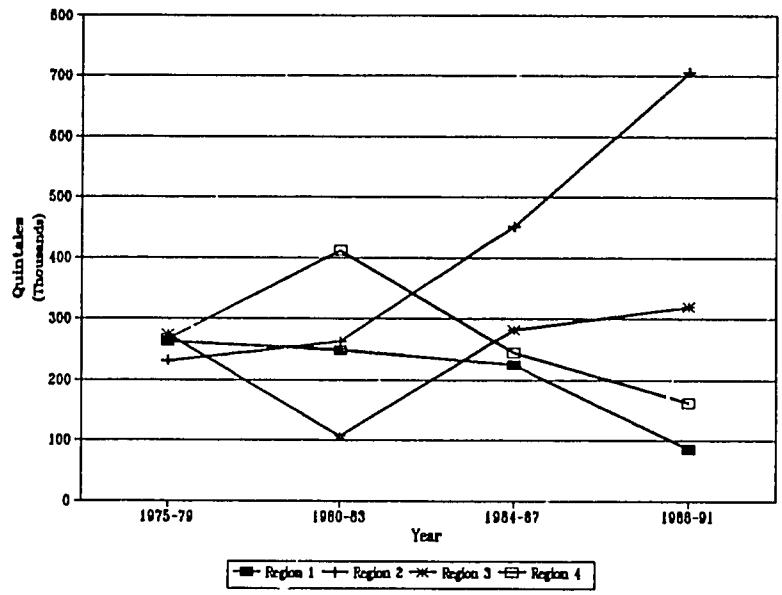
Region	Year	Average Production QQ	Average Annual Change %	Average Area Mz	Average Annual Change %	Average Yield QQ/Mz	Average Annual Change %
I	1975-79	263,210		4,890		52.0	
			-5.6%		-8.6%		6.6%
	1980-83	248,435		4,470		55.4	
			-9.6%		-16.7%		7.0%
	1984-87	224,588		3,725		59.3	
			-61.8%		-62.4%		3.6%
	1988-91	85,750		1,400		61.4	
II	1975-79	231,679		4,465		51.2	
			13.7%		7.2%		6.5%
	1980-83	263,383		4,786		54.6	
			71.1%		36.9%		26.4%
	1984-87	450,550		6,550		69.0	
			56.5%		56.5%		0.4%
	1988-91	705,325		10,250		69.3	
III	1975-79	274,044		5,636		47.7	
			-61.2%		-65.0%		15.9%
	1980-83	106,269		1,972		55.3	
			165.9%		158.6%		-0.1%
	1984-87	282,525		5,100		55.3	
			12.9%		13.2%		-0.9%
	1988-91	319,100		5,775		54.8	
IV	1975-79	267,012		5,539		48.2	
			54.2%		48.4%		-0.4%
	1980-83	411,866		8,222		48.0	
			-40.6%		-42.2%		5.2%
	1984-87	244,650		4,750		50.5	
			-33.6%		-31.6%		-2.7%
	1988-91	162,400		3,250		49.2	

Source: Appendix 10

FILE: TRNRICE.WQ1

FIGURE II-21

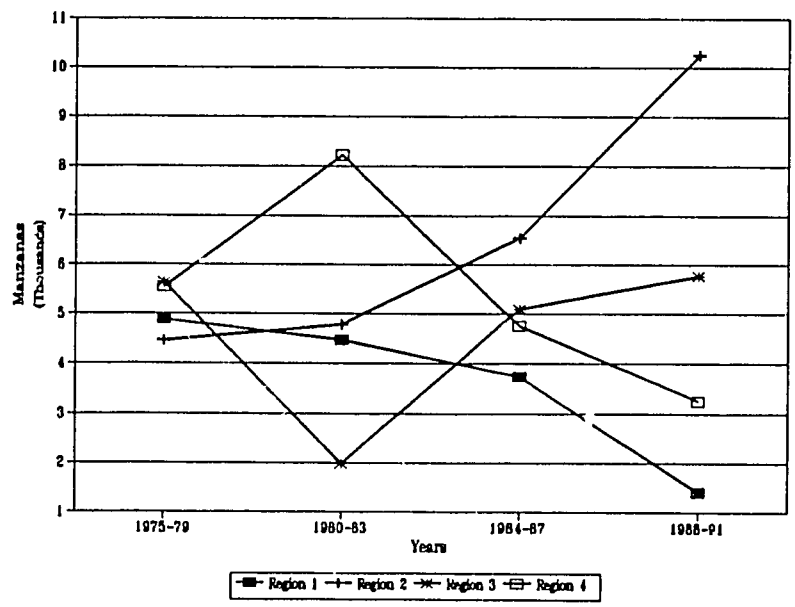
RICE PRODUCTION BY REGION, 1975-1991



Source: Table II-10

FIGURE II-22

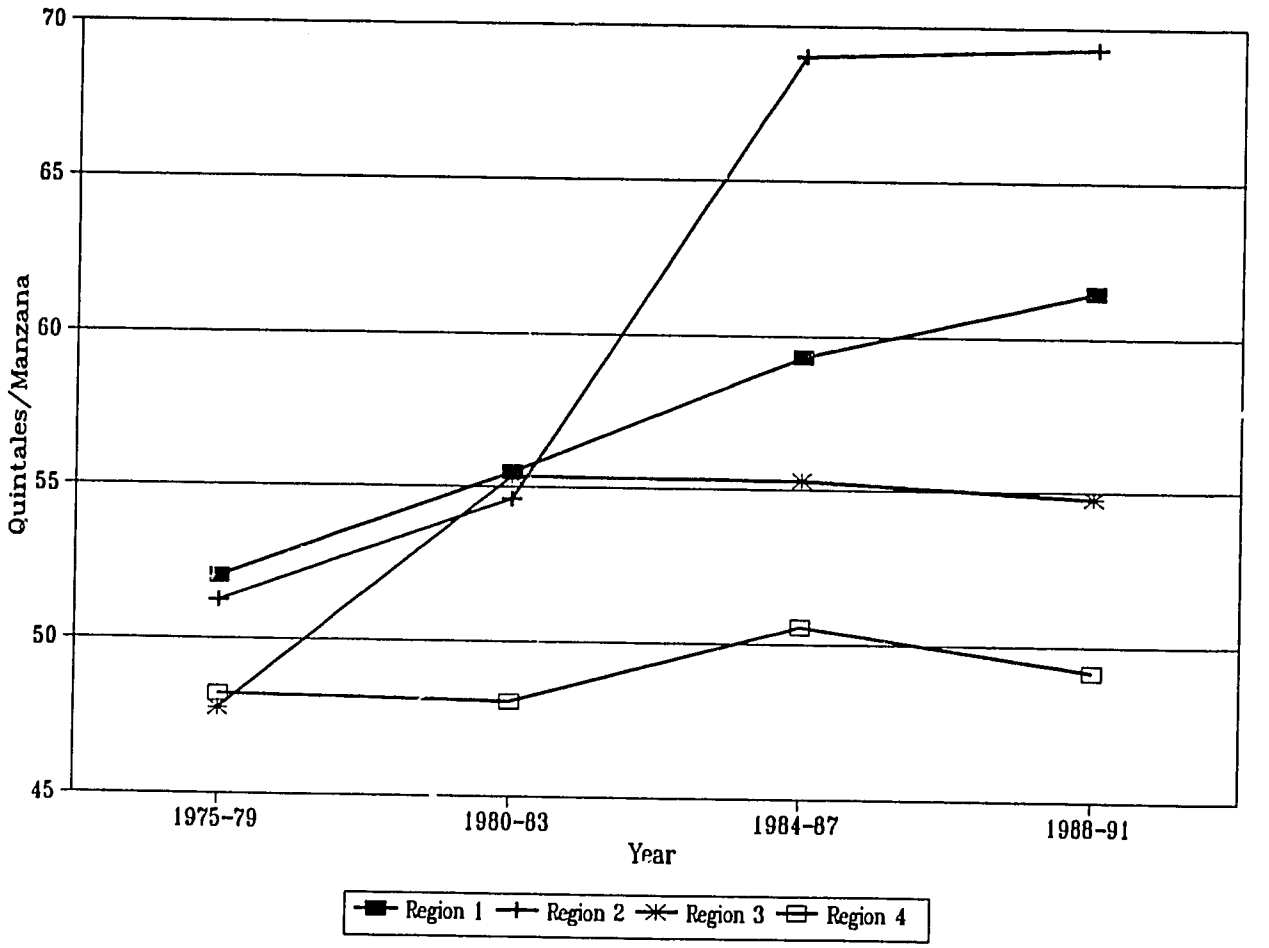
RICE AREA PLANTED BY REGION, 1975-1991



Source: Table II-10

FIGURE II-23

RICE YIELD BY REGION, 1975-1991



Source: Table II-10

On a region by region basis, the greatest decrease in production occurred in Region I, where there was a 62 percent decrease in the 1988-91 period alone. This decrease was due entirely to the greater decrease in area planted, as there was a small but steady increase in yield over the 15 year period. Region II, in contrast, showed a great increase in area planted, particularly during the second two periods, and a substantial increase in yield, although the final period produced only a 0.3 qq/Mz yield increase. These increases combined to produce a major increase in production, particularly in the second period when both extensification and intensification exceeded 25 percent.

The growth in rice production in Region III was due primarily to a growth of over 150 percent in area planted during the 1980-83 period. This growth more than replaced the 65 percent decline in area planted during the preceding period. Following a 16 percent increase in yield during the first period, there was a total decline of one percent in the next two periods.

Region IV also had slight yield declines in the first and last periods, which were more than offset by the increase in yields during the second period. The overall decrease in production in this region can be attributed to the 30 plus percent decline in each of the second and third periods, which more than offset the 54 percent gain made in the first period.

(4) Sorghum

With the exception of a very poor harvest in 1987, sorghum production remained relatively stable over the 17 years, registering an slight decrease of 6 percent (Figures II-24, II-25 and II-26). This decrease was entirely due to the 7 percent decrease in area planted as there was a small, 1.5 percent, increase in yield from 1975 to 1991.

Region I experienced the greatest growth in production of both area planted and production (Table II-11). For the first two periods the growth in production was due to extensification, while the third period growth was due mostly to intensification. The other region registering a slight increase in production, Region II, showed an increase due to the large increase in productivity, a 38 percent increase in yield, coupled with a moderate increase (14%) in area planted during the 1988-91 period. The increase in production during the third period more than offset the loss in production during the preceding two periods.

The increases in production during the 1988-91 period in both Regions III and IV, were not sufficient to offset the reduction in area planted during the first two periods. In Region III there was a substantial increase in production during the final period, due to both extensification and intensification. On the other hand, there was a decrease in area planted in all periods for Region IV. During the final period the 44 percent increase in yield was sufficient to more than offset the decrease in area planted, resulting in an overall increase in production of 26 percent.

Again it is worth noting that there was a major increase in productivity during the 1988-91 period, although yields remain relatively low.

TABLE II-11

TRENDS IN GRAIN PRODUCTION, AREA AND YIELD

SORGHUM

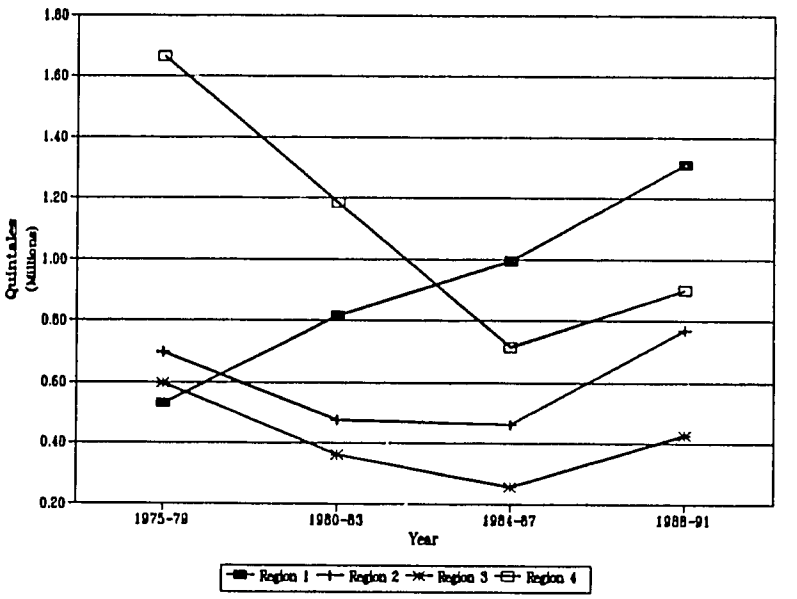
Region	Year	Average Production QQ	Average Annual Change %	Average Area Mz	Average Annual Change %	Average Yield QQ/Mz	Average Annual Change %
I	1975-79	529,977		27,151		19.5	
			54.3%		53.4%		3.1%
	1980-83	817,665		41,650		20.1	
			21.7%		38.0%		-14.9%
	1984-87	995,075		57,475		17.1	
			31.7%		4.6%		27.9%
	1988-91	1,310,850		60,100		21.8	
II	1975-79	696,698		36,986		18.9	
			-31.8%		-29.2%		-5.3%
	1980-83	475,481		26,175		17.9	
			-3.2%		26.4%		-16.4%
	1984-87	460,375		33,075		15.0	
			67.1%		13.7%		37.8%
	1988-91	769,200		37,600		20.5	
III	1975-79	596,200		31,948		18.6	
			-39.2%		-30.6%		-13.4%
	1980-83	362,474		22,177		16.1	
			-29.4%		-8.1%		-13.4%
	1984-87	255,900		20,375		14.0	
			65.9%		28.8%		16.0%
	1988-91	424,550		26,250		16.2	
IV	1975-79	1,664,504		95,275		17.5	
			-28.7%		-20.3%		-12.3%
	1980-83	1,186,450		75,923		15.4	
			-39.7%		-22.3%		-22.4%
	1984-87	715,575		58,975		11.9	
			25.7%		-11.0%		43.8%
	1988-91	899,175		52,475		17.2	

Source: Appendix 11

FILE: TRNSORG.WQ1

FIGURE II-24

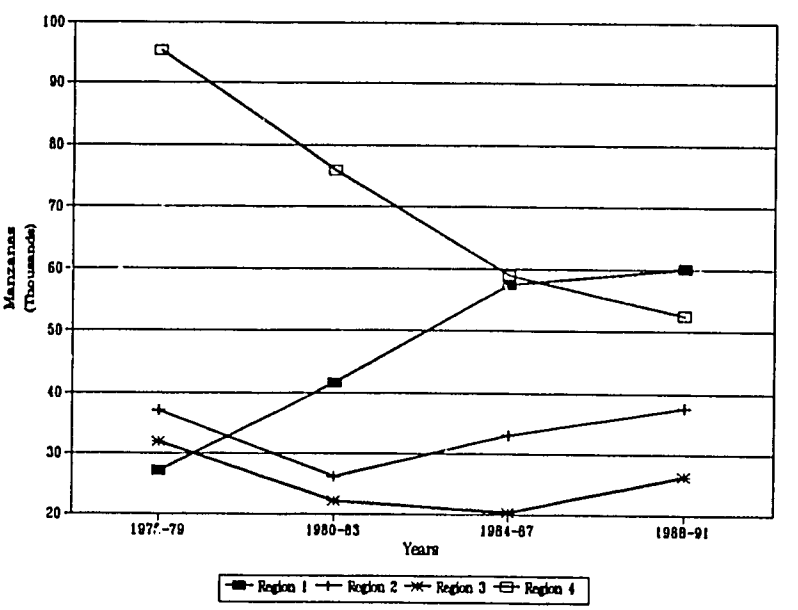
SORGHUM PRODUCTION BY REGION, 1975-1991



Source: Table II-11

FIGURE II-25

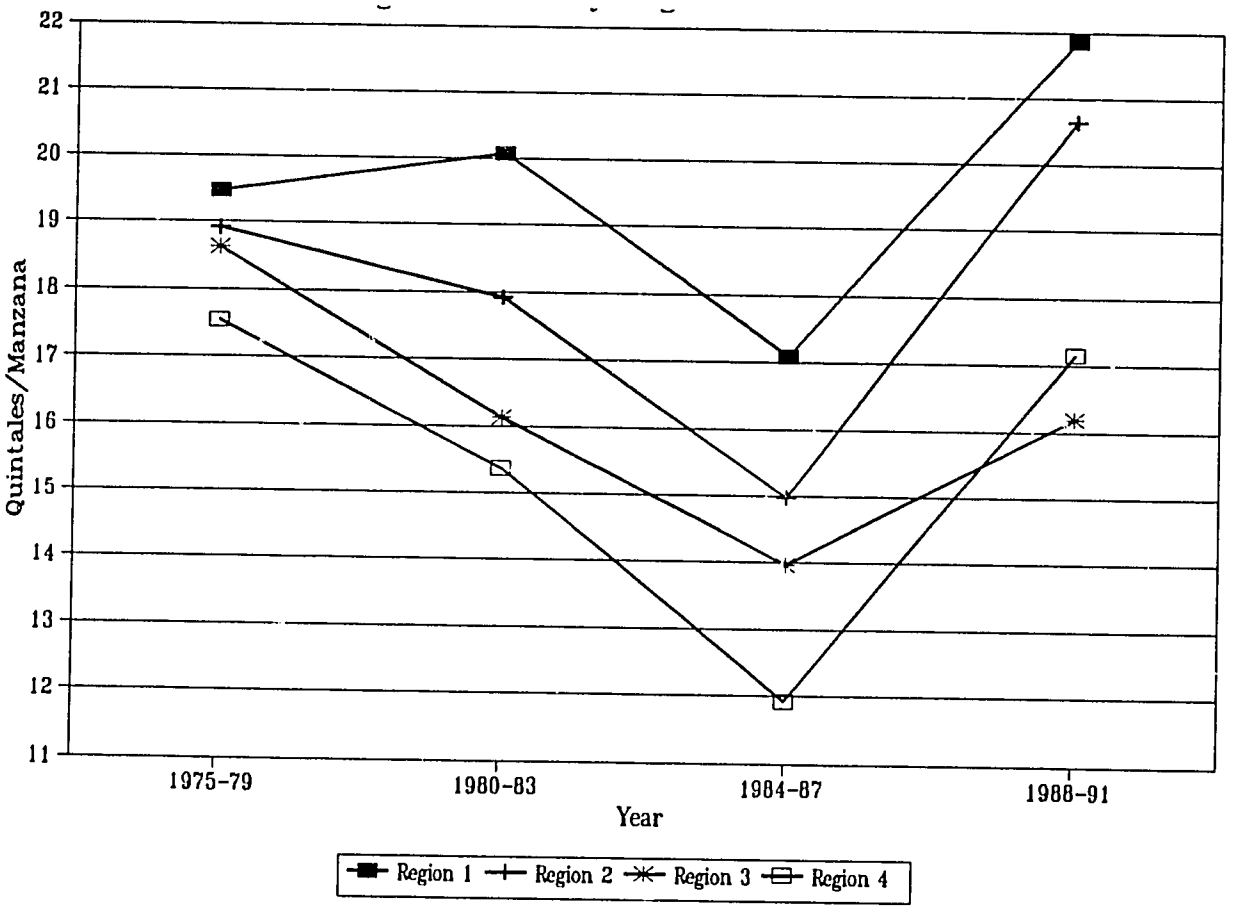
SORGHUM AREA PLANTED BY REGION, 1975-1991



Source: Table II-11

FIGURE II-26

SORGHUM YIELD BY REGION, 1975-1991



Source: Table II-11

c. Import and export trends

Exports and imports of basic grains will only affect the internal supply response function if the quantities involved are major, if they are timed to affect local prices, or if they are concentrated to affect a certain portion of the sub-sector. For all practical purposes the amount of basic grain exported has been too small to have any effect (Table II-12). This could change in the future, at least in some boarder areas, assuming that plans to liberalize trade between the Central American countries are carried out.

The quantities of corn, beans and rice imported during the last seven years have shown a high degree of variability (Figure II-27). Generally, the indices of food dependence for corn, beans and rice have not been great, but the imports they represent have probably been large enough to adversely affect certain segments of the basic grains sub-sector. The largest quantities imported have been of yellow corn which is destined for animal feed. It is reasonable to assume that this type of import has had an impact on local producers, particularly when imports arrive to coincide with local harvest. Rice imports have been important in some years, but may have been in response to local shortages, and so may not have had a long term impact on local production. The importation of donated basic grains, or grains provided at consessionary prices, may have adversely affected local production incentives if they entered the market at lower than the competitive price.

There does not seem to be a general trend in the importation of basic grains, although the last three years have seen a higher average level of combined basic grain imports than occurred during the prior four years. This increase in imports may be partially due to the increased privatization of the basic grains sector over the latter period.

d. Conclusions

The data on trends while varied among regions, and nationally over time, has indicated periods of intensification and extensification of basic grains production. Naturally, a series of questions and concerns are raised as to whether the supply response which has occurred in basic grains production has been desirable and in keeping with national policy. Farmers have responded to economic, political and technical realities, but how has their response to the economic, political and technical signals contributed to the "desirable" form of basic grains production (either intensive or balanced) during the 1960's and 70's, and to the "undesirable" form of production (extensive) during the 1980's. Why was EL Salvador well on its way to "technification", that is increase the productivity of its is basic food production system, and after 30 years finds itself barely keeping up with population growth?

A historical understanding of the reasons for the shift will enable policy makers to appreciate the critical linkages between policy decisions, farmers reactions, the basic grains sub-sectors supply response, and consumers' welfare. This appreciation should encourage the development of ways and means to enable follow-up on policy decisions to monitor their impacts of supply response and develop adjustments as necessary. Agriculturalist and other private sector participants can also gain a better understanding of the impact of policy decision on their business, the sub-sector, consumer demand, and the importance of productivity.

TABLE II-12

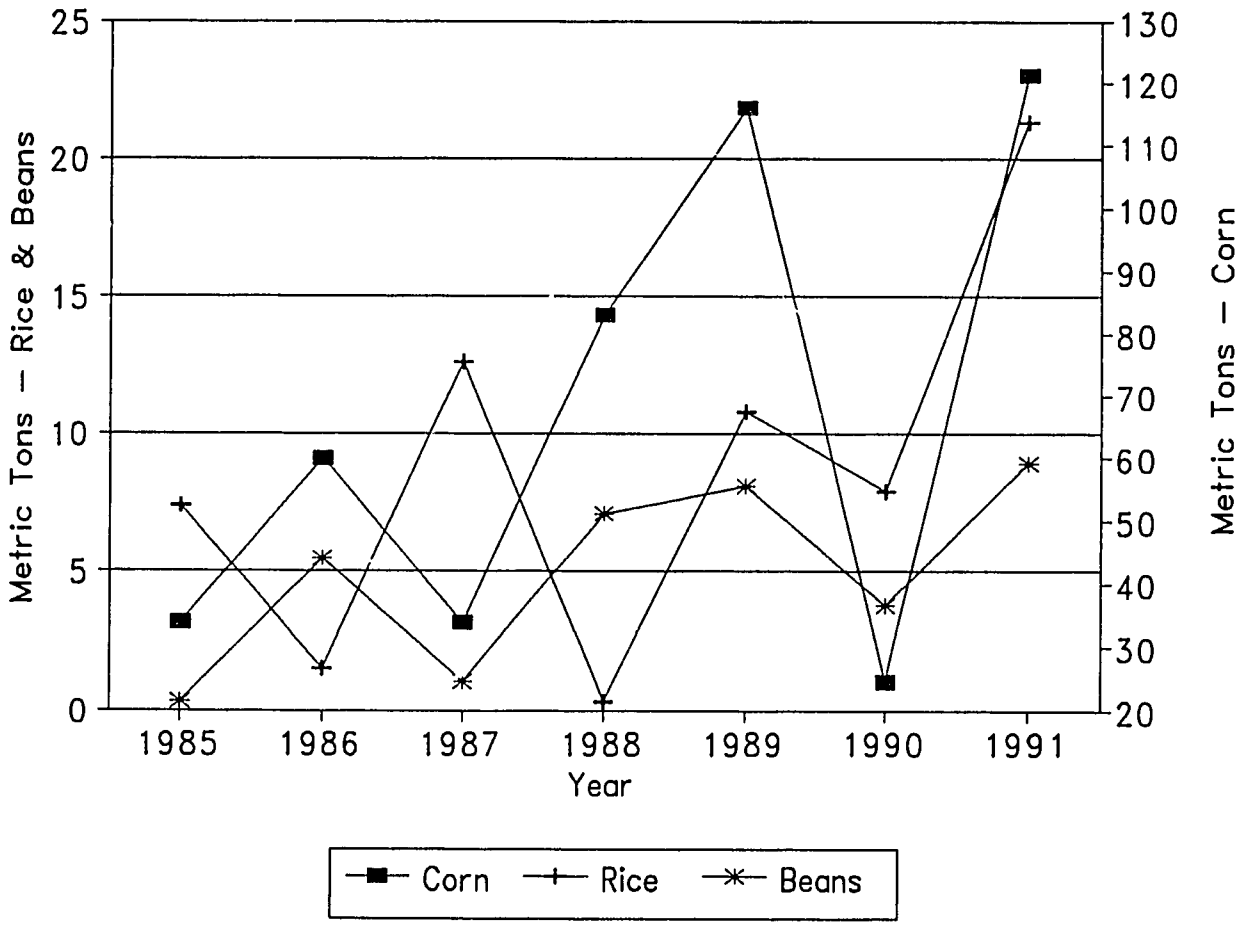
EVALUATION OF AVAILABILITY OF BASIC GRAINS
El Salvador 1985-1991
(En miles T.M.)

CONCEPTO	1985	1986	1987	1988	1989	1990	1991
GRANOS BASICOS							
PRODUCCION	571.1	512.9	625.0	683.9	668.0	688.3	586.1
IMPORTACION	41.7	67.0	47.6	99.4	134.9	36.2	151.6
TOTAL OFRETA	612.8	579.9	672.6	783.3	802.9	802.9	802.9
EXPORTACION	20.0	---	---	---	---	0.3	0.8
DISPONIBILIDAD TOTAL	592.8	579.9	672.6	783.3	802.9	802.9	802.9
INDICE DE DEPENDENICIA ALIMENTARIA	7.0%	11.6%	7.1%	12.7%	16.8%	4.5%	18.9%
MAIZ							
PRODUCCION	490.0	432.0	572.0	589.0	582.0	595.5	488.1
IMPORTACION	34.0	60.0	34.0	83.0	116.0	24.5	121.4
TOTAL OFRETA	524.0	492.0	606.0	672.0	698.0	620.0	609.5
EXPORTACION	20.0	---	---	---	---	---	---
DISPONIBILIDAD TOTAL	504.0	492.0	606.0	672.0	698.0	620.0	609.5
INDICE DE DEPENDENICIA ALIMENTARIA	6.7%	12.2%	5.6%	12.4%	16.6%	4.0%	19.9%
ARROZ							
PRODUCCION	46.9	31.8	28.9	38.5	42.0	40.7	33.9
IMPORTACION	7.4	1.5	12.6	0.3	10.8	7.9	21.3
TOTAL OFRETA	54.3	33.3	41.5	38.8	52.8	48.6	55.2
EXPORTACION	---	---	---	---	---	0.2	0.6
DISPONIBILIDAD TOTAL	54.3	33.3	41.5	38.8	52.8	48.4	54.6
INDICE DE DEPENDENICIA ALIMENTARIA	13.6%	4.5%	30.4%	0.8%	20.5%	16.3%	39.0%
FRIJOL							
PRODUCCION	34.2	49.1	24.0	56.4	44.0	52.1	64.1
IMPORTACION	0.3	5.5	1.0	7.1	8.1	3.8	8.9
TOTAL OFRETA	34.5	54.6	25.0	63.5	52.1	55.9	73.0
EXPORTACION	---	---	---	---	---	0.1	0.2
DISPONIBILIDAD TOTAL	34.5	54.6	25.0	63.5	52.1	55.8	72.8
INDICE DE DEPENDENICIA ALIMENTARIA	0.9%	10.1%	4.0%	11.2%	15.5%	6.8%	12.2%

Source: Documento País Para La Conferencia Internacional de Nutrición a Celebrarse en Roma/Italia en Diciembre/92 (Version Preliminar), Dic 1991.

FIGURE II-27

BASIC GRAIN IMPORTS, 1985-1991



Source: Table II-12

C. Conditions Contributing to Trends

Farmers base their decisions concerning planting, and thereby to a great extent production, on a number of factors. Most of these factors can not be affected by the farmers. The supply response for basic grains is derived from the response of individual farmers. Therefore, how farmers respond to the external factors they face will determine the type of supply response found in the country. Several important factors which will affect the supply response will be identified under the headings of change in the input/output relationships, the institutional setting, and macroeconomic factors. Because these factors are the same for agricultural inputs, most of them have been discussed in a previous study and are included here only briefly. [11]

1. Changes in input/output relations over time

Of the numerous factors which impact on farmers' decisions concerning basic grains production, probably the most directly observable for the farmer are the prices of the inputs which must be purchased, and the prices received for the product. Farmers will respond to increasing input prices by cutting the amount of inputs if they perceive that the prices received for their grains are not keeping up with the prices of inputs, or if they do not have funds available to make the purchases.

a. Prices and costs

Input prices which are recurrent and direct out of pocket expenses include seed, fertilizer and pesticides. Of these seed represents the smallest outlay, and is the most easily reduced expense because farmers can generally use stored seed from the previous harvest. Fertilizer and pesticides are more difficult to replace, and also represent a high cash investment.

(1) Fertilizer prices

Over the last 15 years the average nominal price paid for fertilizers has shown a relatively steady upward trend. Nominal fertilizer and average farm-gate prices for the four basic grains have tended to follow the same generally increasing path. Overall, fertilizer prices increased 209 percent from 1978 to 1990 while farm-gate basic grain prices increased 205 percent.

(2) Pesticide prices

There has been a general increase in nominal pesticide prices, particularly over the last decade. A comparison of nominal pesticide prices and average farm-gate prices for four basic grains for the period indicates that the basic grain prices generally increased more than pesticide prices in the early 1980's, with the gap closing in the mid-1980's. During the last four years grain prices have again climbed more rapidly than pesticide prices. Over the 12 year period (1978-1990),

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[11] For further discussion see Hugo, Worman, and Ramos, "The Agricultural Inputs Industry in El Salvador".

the nominal average basic grains price rose 205 percent, while the nominal average pesticide price rose 246 percent.

(3) Inflation

Inflation is perhaps the most important indirect factor contributing to farmer's decisions concerning the use of technologies which will intensify production, primarily fertilizers and agro-chemicals. Inflation's adverse impact can be inferred through the generated "real" impact on farmers' returns, their decisions to adjust production, and therefore to modify the rate of utilization of agricultural inputs. The inflation rate was over 15% in the late 1970's, it ranged between 12 and 15% during the early 1980's and accelerated to 32% per year by the end of 1986. Since then it has gradually declined yearly to 19.4% in 1990. The 1991 rate of inflation is expected to be under 15 percent.

(4) Real producer prices for basic grains and beans [12]

Between 1978 and 1990, nominal farm gate prices for basic grains and beans increased multi-fold. For example, nominal corn prices more than tripled from 19.39 C/qq to 70.76 C/qq between 1978 and 1991. Bean farm gate prices increased nearly five times from 59.15 C/qq to 279.49 C/qq during the same time period. Rice and sorghum price also tripled, from 34.11 to 110.28 C/qq and from 17.49 to 46.36 C/qq, respectively.

However, when the annual inflation rates during the same period of time are taken into account a completely different picture emerges. When these nominal prices are deflated, real farm gate prices for basic grains consistently decline until they are only a fraction of their levels a decade before. As a result, inflation not only eroded such nominal gains but reduced real farm gate prices, and therefore the purchase power of these producers, by substantial amounts.

(5) Real input prices [13]

The relative movements of real input costs and real returns from production will impact on farmers' decisions concerning production, particularly their decisions as to production of grains for sale. Generally, limited resource farmers will choose to plant a certain amount of land which will, in their experience, produce a minimum level of production sufficient to cover family needs for basic grains. Production on additional land is more likely to be influenced by the real prices of inputs related to the real value of the product.

Figure II-28 shows the real input costs and returns for corn production for the 1980-1991 period (Table II-13). For the first half of the period the costs of inputs was greater than the return from production. Because the input costs include the value of labor used in production, this apparent loss per manzana

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[12] Robert A. Nathan, page 73, updated.

[13] This discussion of real input prices differs from that in Hugo, Worman and Ramos in that the previous discussion was based only on physical inputs while this discussion includes labor cost.

probably indicates that family labor used in production is receiving a lower return than the going wage rate for agricultural labor in the area. If interest costs, rent for land and other costs are included, the real return for investment in corn will be even less. Despite the negative returns shown, the actual return for the farm families appears to have been sufficient to maintain or slightly increase the area in corn production for the 1980-85 period. For the last three years the real returns have been positive, and corresponds to an increase in area under corn production for two of the four regions.

Input costs for bean production dropped below returns, in real terms, in 1984 (Figure II-29, Table II-14). Since 1988 the margin between returns for bean production and cost of inputs has been widening, which should provide an incentive for farmers to look on bean production more favorably. The actual trend of bean production has been rather erratic due in part to problems with disease and pests, coupled with a lack of resistant varieties. Again labor costs are a major factor in the inputs to production.

Unlike corn and bean production, the real returns from the production of rice have been greater than the real cost of inputs, including labor, for the last 11 years (Figure II-30, Table II-15). For the first half of the period the margin between returns and cost of inputs was narrowing, creating a dis-incentive for rice production. From 1989 onward the margin has been increasing, producing an incentive to go into rice production. Although this incentive may exist, there has been a slight decrease in area planted in the last few years, coupled with a decrease in total production.

The trend data for sorghum is scarce, but it does appear that the returns for sorghum production exceeded the cost of inputs in 1990, creating a positive margin for the product (Figure II-31, Table II-16).

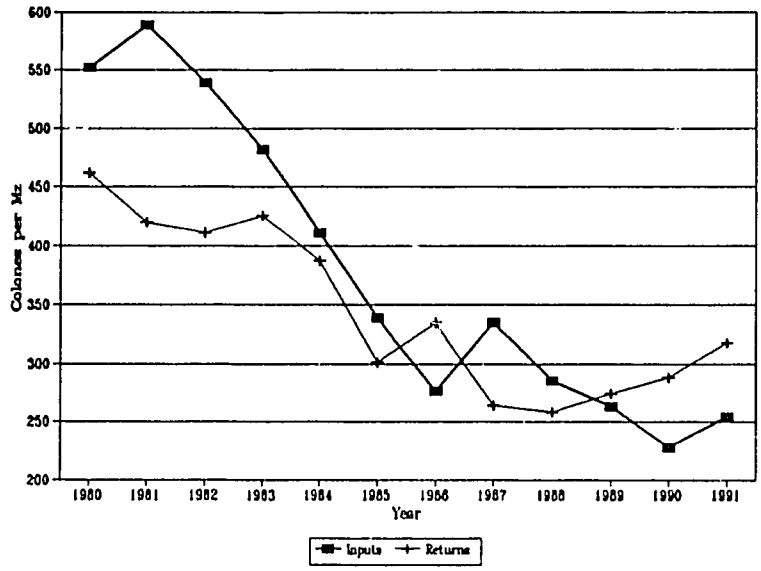
While real rates of return and real costs of production have been decreasing since 1980, creating a dis-incentive for engaging in crop production, the decrease in returns have been less than the decrease in the costs of production, making the production of the basic grains slightly more favorable. The negative margins between costs and returns, or the very low positive margins, has contributed to the erratic and relatively poor growth in basic grains production. It has also lead to a greater emphasis on increasing production through extensive techniques, i.e. bringing more land into production, rather than through intensification by using more inputs.

b. Physical trends

During the last 30 years the trend in production of basic grains has been positive. However, the rate of production as well as the technical production parameters applied to such production have been influenced by development policies, macro policies, institutional settings (research and extension), and general economic conditions. The structural reforms taking place since 1988 are already having some effect on production levels and technical parameters as well. During the last decade the deterioration in production system parameters, that is the abandoning of technology, or even worse the increasing inappropriate use of technology, is cause for concern. The trends and implications in fertilizer and pesticide use are discussed in detail in Hugo and Worman.

FIGURE II-28

REAL INPUT COSTS AND RETURNS FOR CORN



Source: Table II-13

TABLE II-13

REAL INPUT COSTS AND RETURNS FOR CORN
(Colones per Manzana; Index 1978 = 100)

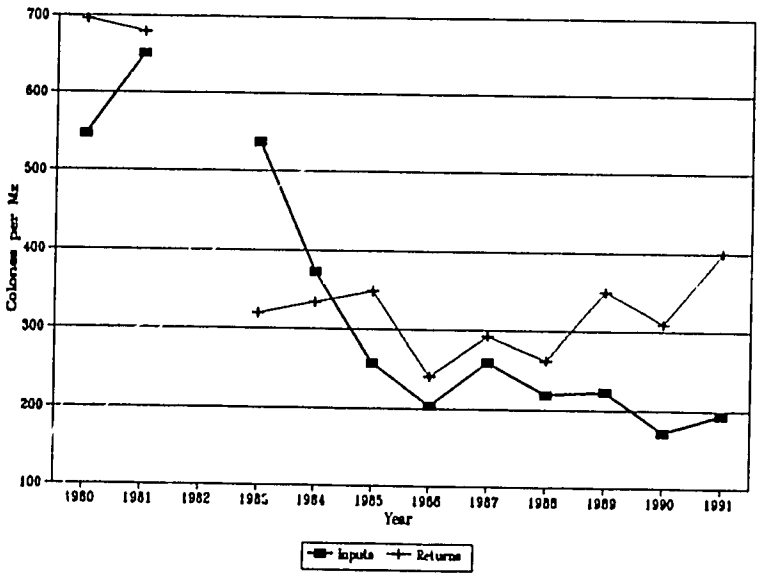
Year	S-F-P Costs	Labor Costs	Total Input Costs	Farm gate Price C/QQ	Average Yield QQ/Mz	Gross Return per Mz	Net Return per Mz
1978				19.39	31.1	602.45	
1979				13.17	38.3	504.60	
1980	202.81	349.11	551.92	12.79	36.1	461.62	-90.30
1981	231.94	356.77	588.70	12.16	34.5	419.53	-169.18
1982	224.15	314.50	538.65	12.38	33.2	410.81	-127.84
1983	205.45	276.61	482.05	13.31	31.9	424.88	-57.17
1984	151.68	258.78	410.45	11.50	33.6	387.02	-23.43
1985	113.96	225.05	339.01	8.18	36.8	301.07	-37.95
1986	99.40	176.66	276.06	9.77	34.3	334.72	58.66
1987	141.72	193.03	334.75	9.02	29.2	263.75	-71.01
1988	112.44	172.40	284.85	6.85	37.7	258.28	-26.56
1989	101.10	162.17	263.27	7.54	36.4	274.39	11.11
1990	80.93	146.88	227.81	7.89	36.5	287.95	60.14
1991	96.89	157.53	254.42	8.27	38.4	317.55	63.14

S-F-P = Seed, Fertilizer and Pesticides

FILE: IMPCORN.WQ1

FIGURE II-29

REAL INPUT COSTS AND RETURNS FOR BEANS



Source: Table II-14

TABLE II-14

REAL INPUT COSTS AND RETURNS FOR BEANS
(Colones per Manzana; Index 1978 = 100)

Year	S-F-P Costs	Labor Costs	Total Input Costs	Farm gate Price C/QQ	Average Yield QQ/Mz	Gross Return per Mz	Net Return per Mz
1978				59.15	9.8	579.67	NA
1979				40.65	12.6	512.16	NA
1980	218.23	327.75	545.98	53.88	12.9	695.07	149.10
1981	272.21	378.29	650.50	58.53	11.6	678.94	28.43
1982	0.00			42.97	11.7		NA
1983	246.22	290.62	536.84	30.50	10.5	320.25	-216.59
1984	165.95	206.92	372.87	29.31	11.4	334.18	-38.68
1985	104.68	153.24	257.93	27.26	12.8	348.98	91.05
1986	86.83	117.56	204.39	26.76	9	240.83	36.44
1987	113.17	146.57	259.73	23.25	12.6	292.96	33.22
1988	95.70	123.95	219.65	44.61	5.9	263.19	43.54
1989	106.19	117.89	224.08	27.13	12.9	350.00	125.92
1990	77.16	95.13	172.30	29.19	10.6	309.41	137.12
1991	91.51	102.68	194.19	32.66	12.23	399.48	205.29

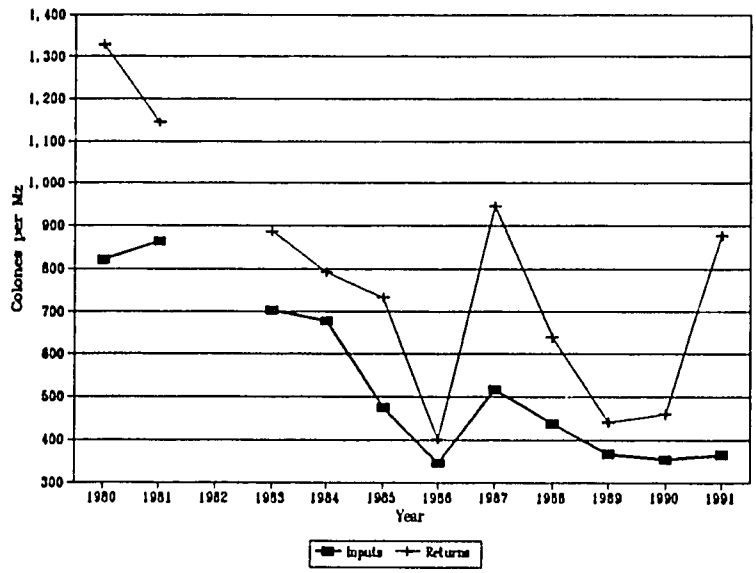
S-F-P = Seed, Fertilizer and Pesticides

Source: Appendix 12

FILE: IMPBEANS.WQ1

FIGURE II-30

REAL INPUT COSTS AND RETURNS FOR RICE



Source: Table 15

TABLE II-15

REAL INPUT COSTS AND RETURNS FOR RICE
(Colones per Manzana; Index 1978 = 100)

Year	S-F-P Costs	Labor Costs	Total Input Costs	Farm gate Price C/QQ	Average Yield QQ/Mz	Gross Return per Mz	Net Return per Mz
1978				34.11	40.0	1364.40	NA
1979				30.98	55.6	1722.61	NA
1980	348.23	473.18	821.42	22.15	60.0	1329.12	507.70
1981	401.68	462.21	863.89	20.81	55.0	1144.79	280.90
1982				19.14	55.0		NA
1983	343.67	360.14	703.81	18.42	48.1	886.06	182.25
1984	340.88	337.29	678.17	15.19	52.2	792.73	114.56
1985	207.62	268.61	476.22	11.69	62.8	733.85	257.63
1986	147.58	198.27	345.84	6.64	60.6	402.16	56.32
1987	255.39	261.07	516.46	15.95	59.3	946.10	429.64
1988	215.97	220.78	436.75	11.70	54.8	640.97	204.22
1989	156.19	210.75	366.94	7.00	63.2	442.22	75.28
1990	153.93	200.97	354.90	7.36	62.4	459.43	104.53
1991	166.01	199.00	365.00	12.89	68.1	878.08	513.08

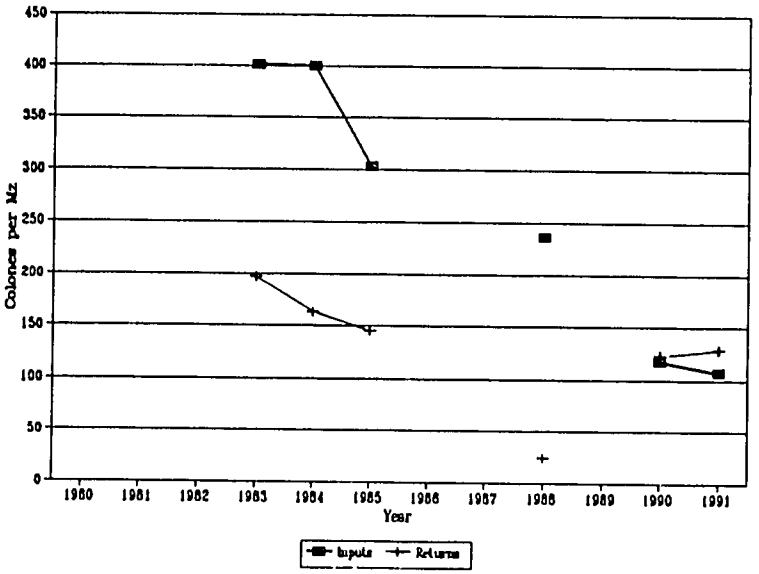
S-F-P = Seed, Fertilizer and Pesticides

Source: Appendix 12

FILE: IMPRICE.WQ1

FIGURE II-31

REAL INPUT COSTS AND RETURNS FOR SORGHUM



Source: Table II-16

TABLE II-16

REAL INPUT COSTS AND RETURNS FOR SORGHUM
(Colones per Manzana; Index 1978 = 100)

Year	S-F-P Costs	Labor Costs	Total Input Costs	Farm gate Price C/QQ	Average Yield QQ/Mz	Gross Return per Mz	Net Return per Mz
1978				17.49	14.8		NA
1979				14.63	19.5		NA
1980				14.44	17.0		NA
1981				14.07	17.8		NA
1982				12.51	17.9		NA
1983	91.04	310.79	401.83	12.38	15.9	196.87	-204.96
1984	124.95	275.10	400.06	9.66	16.9	163.32	-236.73
1985	86.86	216.90	303.75	7.92	18.4	145.76	-157.99
1986				8.03	17.6		NA
1987				8.57	18.7		NA
1988	82.04	154.28	236.31	7.56	3.2	24.18	-212.13
1989				6.21	19.1		NA
1990	41.69	75.72	117.40	6.47	19.0	122.89	5.48
1991	30.45	76.96	107.41	5.42	23.9	129.49	22.08

S-F-P = Seed, Fertilizer and Pesticides

Source: Appendix 12

FILE: IMPSORG.WQ1

2. Institutional setting

a. Land tenancy and property rights

As was previously noted the predominant land tenancy form is ownership, accounting for approximately two-thirds of the tenancy arrangements. However, there is still a land distribution problem as more than 70 percent of producers have less than two hectares of land, making it difficult for them to produce at more than the subsistence level. That this is a continuing problem is manifest by the number of problems concerning land invasions and denunciations which appear in the press.

The Peace Agreement re-affirms the governments commitment to transfer lands in excess of 245 hectares to beneficiaries under the Agrarian Reform Laws. In addition government owned lands and lands offered for sale by the owners will be used to provide parcels, with ownership, to the landless and small farmers (particularly former members of the government and FMLN forces). The question of land ownership in the conflict zones will be a particular problem which must be resolved.

The importance of secure land tenure, be it ownership, formal rental agreements, or formal usufructure under one of the land reform cooperative arrangements, can not be under-emphasized when addressing supply response questions. The primary problem is that farmers who do not have security in the use of land will not be willing to make medium or long-term investments in technologies which are necessary to assure the long run productivity of the land, and increase medium and even short run returns from working the land.

b. Research

In the 1960's and 1970's, CENTA produced a number of new lines of hybrid and improved varieties which, with the associated improved management systems, were effectively extended by the Extension Service. During the 1980's CENTA has been separated from the Extension Service and thus from one of the feed-back mechanisms necessary to an effective research program. There have been few successful varieties released in the last 10 years. Varieties which have been released have had undesirable characteristics either from the market, the farmer's, or from the seed producer's point of view.

c. Extension service

During the 19 year time period between 1960 and 1979 the extension service played an instrumental role in the increased use of agricultural inputs, i.e. hybrid corn, fertilizers, and pesticides, throughout the country. The system as organized and executed was critical to the growth of crop production. To a large degree, the agrarian reform legislation of 1979 was responsible for the reorganization of the structure of the extension service, and changes in its priorities, programs, and activities. This reorganization and changes led to a complete collapse of the effectiveness of the extension service in relation to the objectives of the basic grains program originally designed and implemented by CENTA. As a result, the critical link between research and extension was severed and information on agricultural inputs, cultivation techniques, and other

research developments ceased to flow to grain producers. Extension no longer advised farmers on the benefits of input use and related cultivation techniques, and the initially successful drive to increase and improve their utilization faltered.

3. Macroeconomic factors

The growth, decline and nascent recovery of basic grains production is closely linked to a set of macroeconomic, sectorial, and institutional variables. Over the last 30 years these variables have sent direct and indirect signals to grain producers, who in turn have responded by altering their production functions and with them the supply of basic grains. The effects of those variables which are thought to be more important in contributing to the trends, and therefore supply of basic grains are summarized below.

a. General economic growth and decline [14]

One of the major reasons for the growth of the basic grains production in El Salvador is found in the overall economic performance of the country, and the region in general, between 1950 and 1978. During this 30 year period the economy of El Salvador grew at an average annual rate of 5%. Under favorable macro-economic and market conditions during this period the production of basic grains expanded in El Salvador. The favorable environment which was instrumental in the growth of agricultural production in El Salvador came to an abrupt halt at the end of the 1970's.

During the 1980's GDP had mostly negative annual growth rates which by 1988 had reduced GDP to 13% below the level of 1979. On a per capita basis this GDP reduction reflected a 24% decrease. Inflation accelerated to unprecedented levels pushing consumer prices to increase by 90% over the same time period; salaries, however increased at a much slower rate, leading to an erosion in consumer purchase power; the agrarian reform, started in 1980 had an immediate and negative effect on agricultural production; capital markets were weakened when private capital sought safer heavens in other countries; and an increasingly overvalued exchanged rate penalized agricultural production in the country.

b. Credit

Agricultural credit played a crucial role in the growth of agricultural production. The favorable economic, structural, and market conditions created favorable financial terms under which farmers could borrow and repay their loans. Thus, production grew as farmers benefitted from a growing national economy and the effectiveness of supportive services such as extension.

Area of basic grains production financed by the Banco de Fomento Agropecuario (BFA) grew very slowly during the 1960's and exploded during the 1970's, reaching a peak during the 1979/80 crop year. At the onset of the agrarian reform BFA production credit financed nearly 80% of the area cultivated with rice, 50% in beans, and nearly 40% in corn and sorghum.

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[14] Taken directly from "Evaluation of AID Agrarian Reform Credit Project in El Salvador", Chechi and Company, page 8 and 9, September 1985.

Until 1989, BFA charged farmers a rate of interest which was below the inflation rate. These negative interest rates not only misallocate the use of credit funds in general but tended to create an incentive for borrowers to postpone repayment of their credit obligations as long as possible, since eventually they would pay it back with cheaper Colones. While this implicit subsidy (negative interest rate) might have dampened the effects of inflation on farmers' incomes it was not enough to offset them, thus discouraging grain producers from taking on further credit obligations.

c. Exchange rate

The negative effects of an overvalued currency on agricultural production have been well documented by Norton and others in the late 1980's. The negative impact on demand for production credit was well documented by Robert R. Nathan in 1989. An overvalued currency tends to make imports of grains and other agricultural commodities cheaper than the same commodities produced in El Salvador. Farmers do benefit some from the overvalued exchange rate, in that imported agricultural inputs are bought without paying their full price. Nevertheless, the subsidies in the cost of imported inputs (due to overvaluation) explains only a fraction of the gross income. The overvalued exchange rate has been the principal cause of reduced producer prices in the country, although low international prices and reduced domestic demand have also contributed.

d. International versus domestic agricultural prices

A series of price indices for agricultural imports to El Salvador were documented by Norton et al. (1988), and were summarized by Nathan, page 78, (1989). According to the study, between 1980 and 1986 the price index for agricultural imports, in current Colones, increased by 30%, while the production cost index for nationally produced foods rose 74%. Under these circumstances the incentives to import agricultural commodities (including grains) rather than buying locally produced commodities was great. Increasing import levels contributed to a reduction in demand for locally produced grains. Reduced demand for locally produced grains (probably reflected in depressed real farm gate prices) reduced farmers' incentives to produce for the local market.

e. The agrarian reform - a pivotal development

The agrarian reform was the most important public statement to legitimatize the government which assumed power in October, 1979. Under different schemes, a process was implemented to confiscate private agricultural property, compensate owners, and distribute such property to landless farmers. This action had two negative consequences on the supply of basic grains.

- First, many of the farm units formed under the agrarian reform schemes did not have, or did not retain, the needed farm management skills to sustain them as profitable farming enterprises, and accordingly farm output declined.

- Second, a number of the major grain producers lost their land and stopped producing. Many did not recover, or took years to resume production.

f. Other factors

(1) Civil conflict

The civil conflict which started in 1979 affected basic grains production, especially in certain areas of the country. Nevertheless, the significance of this factor is probably outweighed by the economic, structural and market factors.

(2) Weather

Weather has not been a factor. The periodic droughts and extremely wet periods have not been consistent and prolonged enough over the 30 year period to have affected production for more than a limited period.

SECTION III

THEORETICAL FRAMEWORK

A. Objectives of the Study

The objectives of this study were multiple and ambitious. However, since this effort was to a great extent the first of its kind, some of the objectives were only achieved in a preliminary manner, stressing the need for more and deeper research in this area. The objectives were as follows:

- Describe and analyze the variables and factors which are considered by producers of basic grains when taking planting decisions.

- Quantify the relationship that could exist between the production of basic grains, as a result of various decisions taken by the producer in regard to area and utilization of other inputs, and relevant variables such a product prices and the cost of inputs.

- Analyze the results of the quantitative analysis, especially those related to elasticities, and correlate them to the economic and institutional environment affecting the basic grains sub-sector.

- Propose immediate feasible changes to the way statistical information is being gathered in order to improve presentation and use.

- Suggest ways and means to strengthen the evaluation and analysis of statistical information by respective organizations, such as the Dirección General de Economía Agropecuaria and the Unidad de Análisis de Políticas in order to improve the process of formulating economic and sectoral policies.

- Develop a document which could demonstrate, in a very simple form, the application of economic theory to a real and practical situation.

B. Analytical Methods

1. Review of the economic environment as related to the production of basic grains

As an economic sub-sector, the production and domestic supply of basic grains is analyzed as a component of a larger economic system whose elements include the policies which are implemented to influence how the system functions, the institutions which are created to make the system sustainable, and the participating agents. Given this framework, the analysis of the basic grains sub-sector is carried out using a model or paradigm which contains three dimensions, namely structure, conduct, and performance (S-C-P).

The structural dimension describes the importance that basic grains have in the gross national and sectoral products of the country, in total expenditures and

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consumption outlays of families, and in the contribution to total calories and nutrients ingested by the population. Additionally, this dimension describes the composition of agricultural products and the utilization of land as indispensable elements to bring about an understanding of the productive processes. The importance of this becomes evident once it is realized how different a subsistence agriculture reacts to economic variables and factors than a commercial agriculture.

The institutional framework to which this structural dimension refers, includes also the organizations which are linked with the production process, the laws and regulations, and especially the cultural and social habits which influence the decisions taken by farmers. Examples of these institutions include, property rights and inforcement of contracts. Another example is given by the social practices of vertical coordination which establish tacit future buy-sell contracts, based on mutual trust between the parties. These informal contracts represent closed relationships which prevent entry of other participants into the "business", facilitating opportunistic behavior and, therefore, distorted prices.

Any particular productive structure will generate a corresponding behavioral pattern which is reflected in the way markets are formed and prices discovered and determined. For example, one could expect that a subsistence agriculture is likely to continue with its traditional cultural patterns though moderate changes in important economic variables, and diffusion of modern technologies, might be taking place. On the other hand, a commercial production structure reflects a high sensibility towards changes in economic variables and has the tendency to develop national and international markets for its products.

The structural characteristics of any sector and the conditions which affect the behavior result in a specific level of performance. There are many qualitative and quantitative measures which can be used to make an assessment of this dimension of the S-C-P model. The most important include: efficiency (result or product per unit of factor or input), equity (equitable distribution of costs, risks, and benefits among participants), employment generation (capacity to absorb labor), and rate of modernization (adoption of improved agricultural practices).

2. Statistical analysis of data

This study attempts to undertake a statistical analysis of some hypotheses related to the national supply of basic grains.

a. Positive correlation between quantities and prices

The first statistical hypothesis refers to the positive correlation one would expect to find between marketable surpluses (sold off the farms) and prices. The difference between the price paid by the final consumer (primary demand) and the price paid by the merchant or intermediary to the producer (derived demand)

represents a gross margin which covers the marketing costs [15]. A portion of these costs are incurred when the products is first assembled at the farm gate.

The business of grain marketing offers only very small margins per unit handled; this requires an investment in large volumes in order to generate a gross total income high enough to provide a net margin, sufficient to maintain the interest in market intermediation. On the other hand, the possession of large volumes increases the negotiating power of the seller (in this case the intermediary's or trucker merchant's with the wholesaler), allowing him to obtain a better price for his product, given the market conditions (that is ceteris paribus).

If the volumes offered for sale by producers at their farm gates are small, then the trucker merchants searching for supplies will have to incur higher assembly costs in order to accumulate large quantities which they can sell to wholesalers. If the market price faced by trucker merchants (the assemblers) is market determined (they may have some negotiating power) these higher assembly costs would translate into lower farm gate prices and not necessarily into a reduction in the merchandizing margin obtained by the intermediary. In a similar manner, if the volumes offered for sale at the farm gate are relatively large, the assembly costs would decrease, resulting in higher farm gate prices for the grain producers (see Figure III-1).

This price-volume hypothesis proposed for El Salvador is supported by other positive correlations between quantities and prices in other developing countries such as Colombia, Ecuador, and Peru [16].

To test this hypothesis, an estimation of the simple correlation coefficients between quantities and prices of each product is needed. Another way of estimating this relationship is to estimate a regression in which prices are given as a function of quantities and observing the significance of the coefficient which modifies the "quantity" variable.

b. Low variation of farm gate prices among departments

There are two basic reasons which support the notion that prices received by producers in each department should not, on average, have a variation which is larger than the variation associated with the costs of distributing agricultural inputs; these are the size of the country and the available transportation services. This proposition has a close relation with the hypothesis of adequately integrated markets for b sic grains in EL Salvador (see Ramos, 1991).

The low price variation among departments should not imply price uniformity in all departments. The prices received by producers can vary considerably, not only due to the volumes traded, but also and mainly due to the quality of the

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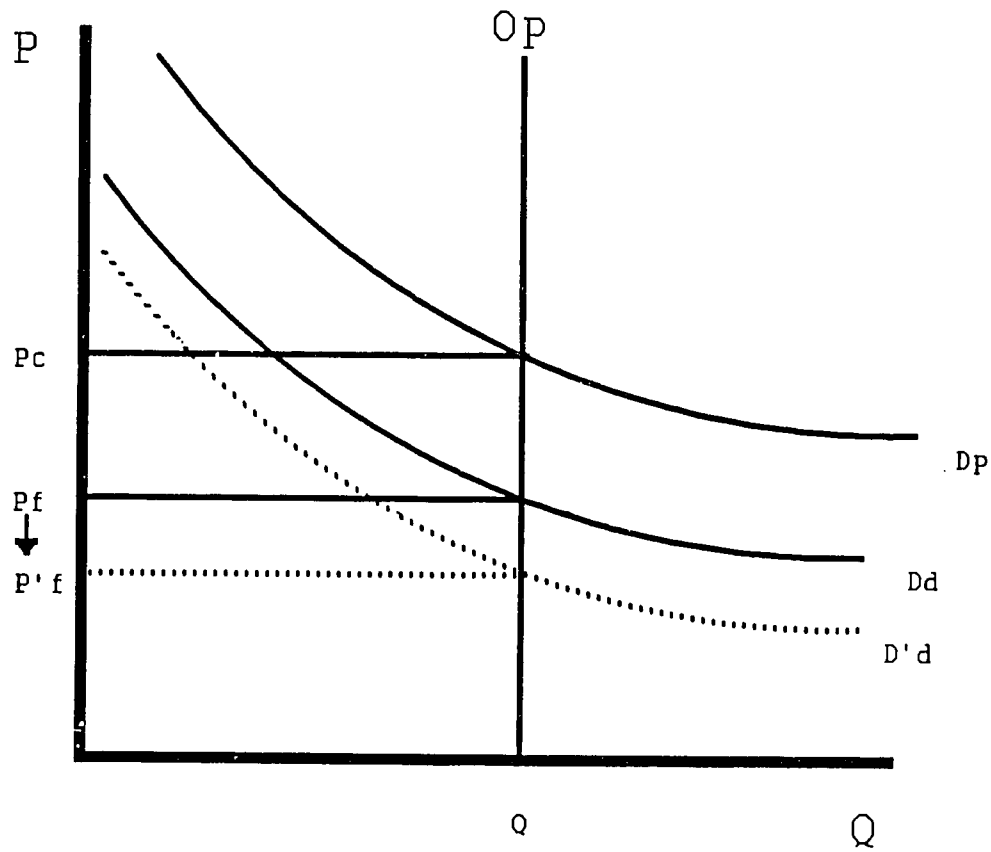
[15] A very complete and simple explanation of this topic is contained in the text by Tomek y Robinson (1991).

[16] Personal observations by H. Ramos in his work with the Junta del Acuerdo de Cartagena, JUNAC.

FIGURE III-1

EFFECTS OF AN INCREASE IN ASSEMBLY COSTS



Note:

The gross marketing margin is the difference between P_c and P_f (price of primary demand --consumer-- D_d and price of derived demand --farm-- D_p). If assembly costs increase -- and threaten to reduce the marketing margin --, the reaction of the market agent will be to lower the price offered to the farmer P'_f, instead of reducing his gross margin. (O_p is the short term supply being offered.)

product offered for sale. Quality is understood to include moisture, impurities, and product presentation. Naturally, prices will also vary as a function of the varieties of the product offered, especially in beans.

The low price variation among departments is expected due to the reasons previously explained, and additionally due to the structural characteristics of grain production. There are no departments with a monopoly on grain production, although there is some specialization. There is also no department with at least some production of basic grains. This distribution among departments allows a healthy competition to take place which tends to homogenize the prices, after discounting for transportation costs.

To test this hypothesis, among many options, an evaluation can be made of the significance of the differences among the average weighted prices for each department and the averaged weighted national price.

c. Important inter-seasonal price variation

Under a situation of marked seasonal condition in grain production and a steady demand in consumption, it is to be expected that during harvest time prices will be relatively low, and relatively high during the time period prior to harvest. The difference between the price during the time of harvest and the price during the time of planting would have to pay both operational and financial storage costs, under free market conditions (that means under a market situation free of price controls and government intervention in the market).

If the harvest itself is not markedly seasonal, but on the contrary is distributed throughout the agricultural year, the difference between planting and harvest prices will not be large. Previous analysis on grain production and price behavior (Hugo et al., 1990, Ramos, 1991) indicate the presence of a significant seasonality in the national supply of grains in El Salvador. As indicated, the presence of seasonality convey a strong expectation of significant statistical difference between planting and harvest prices.

Economic theory supports this hypothesis. Nevertheless, an additional proof requires the evaluation of the statistical significance of the difference in planting versus harvest prices for each type of grain.

d. Traditional and subsistence sub-sectors

A revision of the literature on land tenancy and distribution (see, for example by CADESCA, 1991), indicates that the mayor proportion of land cultivated with basic grains is in farms of less than 4 manzanas [17]. This size brings up the assumption that the commercial production of grains coming from this size of landholding is low or close to zero, an assumption strengthened by the fact that these farmers are not producers of a single commodity.

A simple frequency analysis of the distribution of the size of lots dedicated to the production of basic grains would clearly indicate the concentration of farms

[17] Manzana, mz, equivalent of 2.82 has. --1 mz = 0.7056 ha.

in small sizes, and therefore the preponderance of non-commercial production of basic grains. Comparative analysis of farms with production levels above the per capita consumption of grains together with the composition of rural households could add evidence that in reality the largest portion of agricultural production is for subsistence and not for commercial purposes.

3. Econometric formulations of the supply response function

a. Some theoretical considerations

(1) Supply curves and supply response functions

One of the objectives of this study is to analyze the supply response functions or how the production of basic grains reacts. Before continuing with the topic, it is important to understand the fundamental difference between the formulation and analysis of a supply curve and that of a supply response function.

A supply function (curve) measures, in essence, the changes in quantity offered for different prices, while maintaining all other variables constant (the condition of ceteris paribus). In other words, a supply curves measures the movements along the curve as prices are varied. A supply response function, on the contrary, estimates the response or reaction in the quantity offered (produced) to changes in product prices, without maintaining the other determining variables constant (the analysis takes place without the condition of ceteris paribus). Thus a supply response function tends to measure the movements along the curve as well as the shifts in the curve itself.

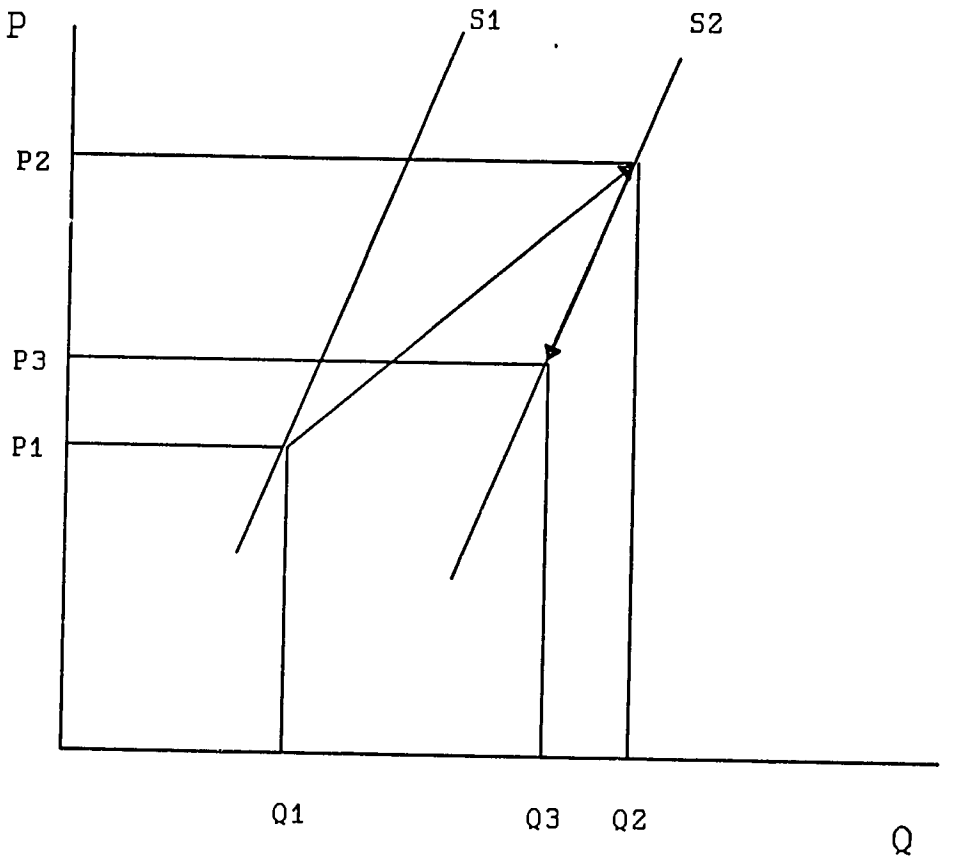
A common characteristic of a supply curve is the easy reversibility of the changes in quantity offered to changes in prices offered for the product. It is expected that an increase in price will lead to a corresponding increase in the quantity offered, and equally, a reduction in price will lead to a proportional reduction in the quantity being offered. This reversibility is not probable in a supply response function (Tomek and Robinson, 1990).

Real price increases for agricultural products stimulates investments in agricultural production assets; the specificity (specialty) of these investments reduces their mobility, and therefore an agile and dynamic functioning of the market for these inputs. The investments in these production assets generate an observable increase in the production and quantities offered in the market. A subsequent reduction in product prices, on the contrary, will not necessarily lead to a reduction in quantities offered. It is simply not possible to retire, in the short term and in the face of price reductions, assets or abandon investments in order to adjust production to the new product prices.

In term of elasticities, those of the supply curve can explain changes in quantities offered given increases or decreases in the price of the product. The elasticity of the supply response function associated with a product price increase is quite different from the estimated elasticity associated with a decrease in product price. This asymmetric behavior is due to the fact that changes in product prices are associated with changes in other determinant variables of the supply response function which generate shifts in the supply curve itself.

FIGURE III-2

ILLUSTRATION OF THE IRREVERSIBILITY IN THE ELASTICITY OF A PRODUCTION RESPONSE FUNCTION



Note:

When the price of a product is increased from P_1 to P_2, the quantity produced increases from Q_1 to Q_2. If the price is then reduced to P_3, the quantity is reduced only to Q_3. The quantity reduced due to a decrease in price is proportionally less than the increase in quantity offered when the price is increased.

(2) Relative input/output prices

The supply curve of a firm starts in the point where the marginal cost reaches its lowest point. Economic theory indicates that a firm maximizes its profits when it produces at a point where the marginal cost of the product is equal to the marginal income or to the price of the product (see Figure III-3). This simple rule has certain implications which are useful when formulating supply response functions as well as supply functions.

If we define:

π = profits of the firm,
P_q = product price (for grains),
P_x = price of input X (fertilizer or seed, for example),
X = input, or group of inputs,
CFT = total fixed cost,
f = function,

the profit function for the firm is then given by the following equation:

$$\pi = (P_q \cdot f(X)) - (P_x \cdot X) - CFT$$

where $f(X)$ is the production function, in response to an input X (or a group of inputs X_j).

The maximum value of the profit function (necessary condition) is obtained by differentiating the equation with respect to X and setting the differential equal to zero, as follows:

$$d\pi/dX = (P_q \cdot f'(X)) - P_x = 0$$

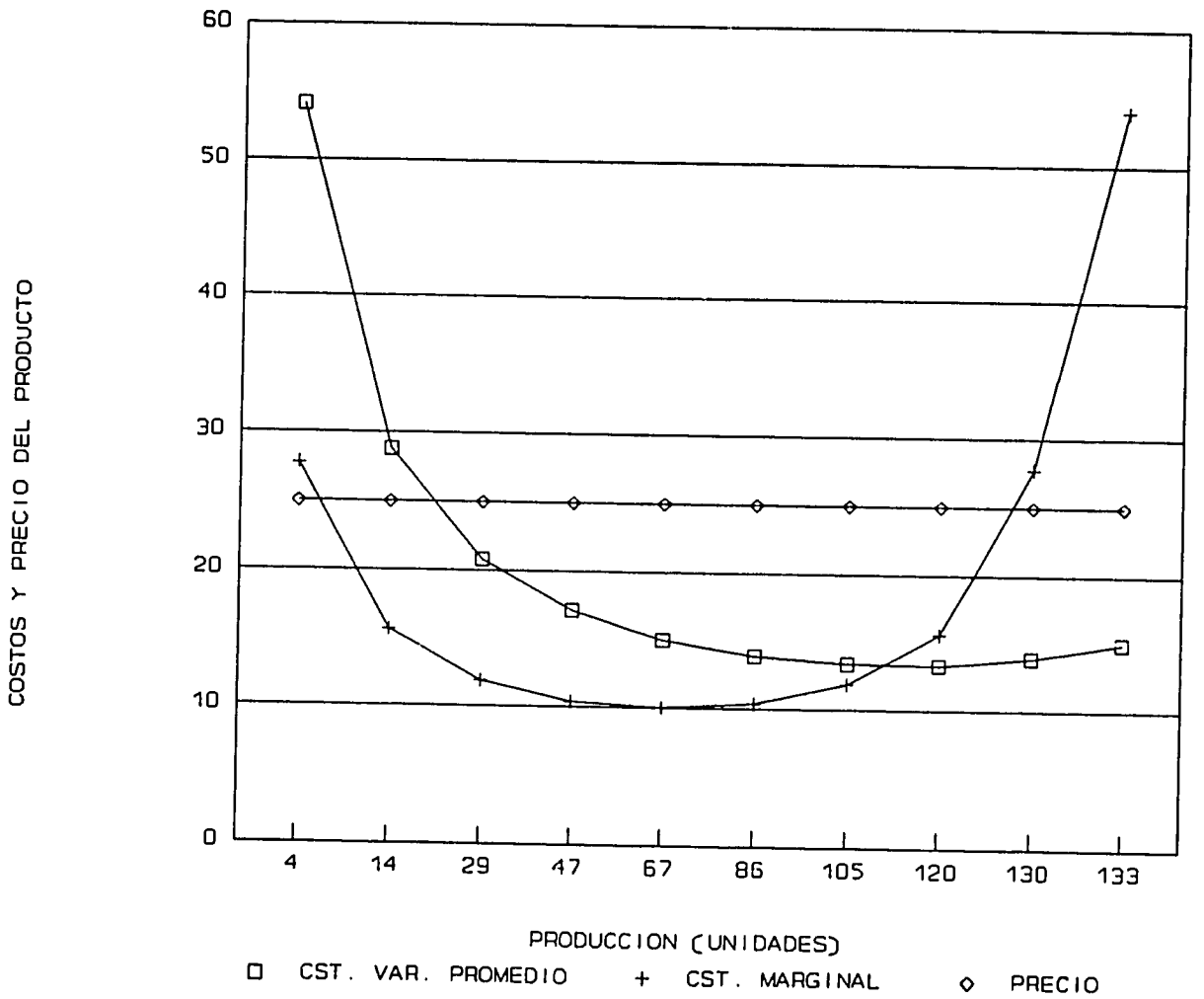
The expression $f'(X)$ is the derivative of the production function and represents the equation of the marginal product of the input X (MP_x). Rearranging the terms of the marginal income equation, the following identity is obtained:

$$MP_x = P_x / P_q$$

This identity indicates that the marginal product is equal to the relation between the input and output prices, under profit maximization conditions.

FIGURE III-3

HYPOTHETICAL EXAMPLE OF AVERAGE VARIABLE COST AND MARGINAL COST CURVES, AND PRICE OF A PRODUCT



The utility of this simple theoretical analysis becomes apparent in the specification of the supply response function where the relative input/output prices (or product - input) are used as explanatory variables. Obviously, a modification in the use of these two prices is to include both of them as independent explanatory variables.

b. Appropriate econometric techniques

(1) Historical and cross-sectional data

In general, econometric models used to quantify supply, demand, and response or reaction functions utilize historical or seasonal data, cross-sectional data or a combination of these two basic types. Depending on which type is used, different implications are to be kept in mind when interpreting the results.

Historical or seasonal series are obtained from periodic annotation of the variables through time. Examples of these agro-economic variables include annual, quarterly and monthly time series, or even weekly and daily registry for a few of them. Obviously, the services which provide these statistics incur costs, but also offer a number of benefits. Nevertheless, these statistics and information services are not always cost-effective.

When variables with annual time intervals are used to formulate a model it is soon discovered that very few degrees of freedom [18] are left to support, with any degree of confidence, a model specification which includes several independent variables. Often, when a quarterly or monthly time series is needed, it is possible to encounter the frustrating situation that not all the data needed is collected on a quarterly or monthly basis.

Cross-sectional data is normally aggregated in groups or categories previously established, such as products, regions, or departments. Such data is usually obtained from surveys which can be very costly and time consuming, for example surveys on household budgets and expenditures. If these surveys and research is carried out periodically, the researcher can use the original survey forms to extract the required data. The advantage of this option is that the number of observations and degrees of freedom can be large enough and sufficient to increase the degree of confidence in the results obtained.

Both the time series and the cross-sectional data can be combined into a single data set for certain purposes, one of which would be to increase considerably the number of degrees of freedom.

The importance to distinguish between time series and cross-sectional data lies in the way the resulting coefficients can be interpreted. In general, the coefficients generated from time series data suggest long-term tendencies or reactions, especially when the periodicity of the data is annually. Nevertheless, there are regression models which allow to distinguish between short, medium, or long-term trends (or elasticities). On the other hand, the

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[18] In a simple manner, number of observations less the number of parameters that are to be estimated.

coefficients or estimators derived from cross-sectional data, generally indicate short-term reactions or answers. For example, if the coefficients represent elasticities (say, derived with a log-log model) then those obtained from annual time series could indicate, in general, medium to long-term elasticities, and those obtained from cross-sectional data would indicate short-term elasticities.

(2) Single equations and system of equations

As indicated before, one of the objectives of the present study is to develop supply response functions for basic grains, including rice, beans, corn, and sorghum. This group of products offers the opportunity of developing single and independent equations for each product as well as a system of equations which relates all the grains produced.

The econometric results of single and independent equations measure the changes in the production of grains, given changes in the variables used to explain the production process, independently from changes that might occur outside the environment represented by the independent variables used in the model. This type of equation is useful to measure such indicators as production elasticities to assess the impact of changes in the price of the product as well as factors of production, however, always assuming that changes that occur outside the context of the equation do not have an impact on production. In reality, however the production response reacts to signals generated by changes in the variables included in the model, as well as to changes in variables not included [19].

This fact can be perceived by intuition when supply response functions for grains are analyzed. Considering the limited production resources, a production increase in one of them is likely to influence to amount produced of the others. In other words, if two or more grains are competitive in the use of land, an increase in area cultivated under one grain implies a decrease in area available for the others (assuming there is no additional land available). The use of independent equations limits the analysis of interrelationships that might exist among the different grains. A solution to this constraint is offered by the use of a system of equations.

The system of equations to be used in this study assumes that the quantities produced of one grain -dependent variable- take the role of independent variables in the production function of the other grains. This rigorous simultaneity can be relaxed to permit the formulation of a system of equations, related through the residuals or error terms, such as in a system of seemingly unrelated equations (SUR). In any case, the purpose of specifying a system of equations model is to measure the total impact that all independent variables included in the model, as well as that of the dependent variables as they functions as independent variables, have on the group of grains.

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[19] This point does not allude to the problem created when a relevant variable is excluded from the model which would result in biased estimators, but to the influence of factors related to the dependent variable which have not been included.

c. Stating of the hypothesis and specification of the functions

(1) Use of historical time series

The historical production time series and the variables which affect production come from two different time periods, namely the period before the armed conflict (1981), and the time period during the conflict (1981- January 1992). It is natural to expect a significant change in the production trends after 1981. Any econometric model trying to relate production with a set of explanatory variables should have this time period distinction.

The manner in which this differentiation is captured in an econometric formulation is to include 0-1 variables (dummies) or categories in the equations. Two types of specifications are possible. The first lowers the whole equation, starting in 1981, which requires the introduction of an artificial variable in the following manner:

D = {1 for values of X from 1981 onwards until December 92, and 0 for other values}

where X represents a relevant independent variable (time, for example).

The second type of specification requires a change in the slope of a relevant independent variable X, starting in 1981. In this case, the categoric variable D, as defined in the previous case would have to modify the relevant variable X, creating a new independent variable DX (product of D and X).

The available historical data reduces the annual time series to a period between 1975 and 1991, giving 17 observations for the relevant independent variables to be analyzed. This number is way too small to intent a study which would give any confidence in the estimators (parameters).

With these necessary explanations out of the way, the model developed and used in this study is presented as follows.

(2) General supply (production) response models

The volume of production (Q) of a product is the result of the yield (R) obtained from a unit of production (area), multiplied by the number of units under cultivation (A). This can be stated simple as:

$$Q = A * R$$

(quantity is equal to area times yield). Assuming that production, area, and yield are functions of the price of the product (P), and differentiating this equation, we obtain:

$$dQ/dP = R\ (\delta A/\delta P) + A\ (\delta R/\delta P)$$

If we assume that the inputs utilized to produce Q vary in proportion to the area, and that the production function represents constant returns to scale (a homogenous function of first degree), and divide the last equation by the relation Q/P, we can then express the production in terms of the production-price (ϵ_{qp}), area-price (ϵ_{ap}), and yield-price (ϵ_{rp}) elasticities:

$$\frac{dQ/dP}{Q/P} = \frac{(Q/A)(\delta A/\delta P)}{Q/P} + \frac{(Q/R)(\delta R/\delta P)}{Q/P}$$

$$\frac{dQ/dP}{Q/P} = \frac{(\delta A/\delta P)}{A/P} + \frac{(\delta R/\delta P)}{R/P}$$

that is

$$\epsilon_{qp} = \epsilon_{ap} + \epsilon_{rp}$$

Log-log regressions of the area and yield as a function of price facilitate the estimation of the production-price elasticity. The area put under cultivation is the one which depends entirely on the decision of the farmer, while yield depends on factors which are quite often not under his control. It is for these reasons that it is important to explain the theoretical basis used to specify the model to estimate the response in area cultivated, given changes in prices and other explanatory variables.

The relevant price influencing the decision as to how much land to cultivate is the price the farmers <u>expects</u> to obtain in the future. Because it is in the future, this price cannot be observed. A way to circumvent this obstacle is to use the area planted in time period t as a result or response to prices prevalent during time period t-1, and to consider the actual area planted (At) as a proxy of the area to be planted (A^*). This procedure allows to formulate an equation of the response in area planted in the following manner:

$$A_t = C\ P_{t-1}^{\epsilon}\ Z_t^{\mu}$$

which is equivalent to the logarithmic expression:

$$\ln A_t = \ln C + \epsilon \ln P_{t-1} + \mu \ln Z_t$$

where Z represents a group of independent variables, such as fertilizer and seed prices, labor costs, etc., and ϵ and μ, the respective elasticities.

Even though simple, this formulation does not include all the important elements which would allow us to make valid conclusion with respect to the decision making processes used by farmers.

(3) Specific supply (production) response models

Other approximations have been developed and applied based on models by Koyck and Nerlove (Dillon and Anderson, 1988). In general, the principle which drives these models is based on the premise that past prices received by farmers have an influence on today's production decision. This premise also assumes that prices in the immediate past have more weight than prices further in the past, and that the price influence diminishes as the prices recede more and more in the past. In a functional form, this premise would be specified as follows:

$$Q_t = a + b\ (P_{t-1} + wP_{t-2} + w^2\ P_{t-3} + \dots\ ) + e_t$$

where w is the weight -decreasing- of the lagged prices, and assumes a value between zero and 1, that is:

$$0 <= w < 1$$

Subtracting from this equation the value equivalent to Q_{t-1}, defined as:

$$Q_{t-1} = a + b\ (P_{t-2} + wP_{t-3} + w^2\ P_{t-4} + \dots\ ) + e_{t-1}$$

one obtains the general model of adaptive or partial adjustment, as follows:

$$Q_t = a(1-w) + w\ Q_{t-1} + b\ P_{t-1} + u_t$$

where $u_t = e_t - w\ e_{t-1}$

(a) Adaptive expectations:

Based on the general adaptive model, the model for adaptive expectations is formulated based on the following specification

$$Q_t = a + b\ P^e_t + e_t$$

where P^e_t is the expected price which is associated with the decision to produce product Q in period t. This expected price, according to the adaptive model would be expressed as follows:

$$P^e_t = P^e_{t-1} + \beta(P_{t-1} - P^e_{t-1})$$

where $0 < \beta <= 1$ is the adjustment coefficient, and e means "expected".

This expression can be rearranged and be defined as:

$$P^e_t = \beta P_{t-1} + (1-\beta)\ P^e_{t-1})$$

Redefining in the same manner the expressions for P^e_{t-1}, then for P^e_{t-2} and so on, and replacing them for P^e_t, the following equation with lagged prices is obtained:

$$P^e_t = \beta\ P_{t-1} + \beta(1-\beta)\ P_{t-2} + \beta(1-\beta)^2\ P_{t-3} + \ldots$$

which, when substituted in the expressions for Q_t and Q_{t-1}, and subtracting, results in the following equation:

$$Q_t = a\beta + b\beta\ P_{t-1} + (1-\beta)\ Q_{t-1} + u_t$$

(b) Partial adjustment:

Under a perspective of partial adjustment, the general model with lagged prices is defined with the following equation:

$$Q^*_t = a + b\ P_{t-1} + e_{t-1}$$

where Q^* represents planned production, which is not observed. In order to use this model, it is necessary to find an acceptable expression for Q^*. This expression is developed based on the definition of an adjustment coefficient δ, given as:

$$\delta = (Q_t - Q_{t-1}) / (Q^*_t - Q_{t-1}), \quad 0 < \delta \leq 1$$

from which we obtain

$$Q^*_t = (1/\delta)\ Q_t + (1 - 1/\delta)\ Q_{t-1}$$

Replacing Q^*_t and Q^*_{t-1}, respectively, and then subtracting, a specification for the model known as partial adjustment model is obtained:

$$Q_t = a\delta + b\delta\ P_{t-1} + (1-\delta)\ Q_{t-1} + \delta e_{t-1}$$

which is similar to the adaptive expectation model, except for the error term.

(c) The Nerlove specification:

The model proposed by Nerlove uses both the adaptive expectation and the partial adjustment models in an expression of the following form:

$$Q^*_t = a + b\ P^e_t + e_t$$

where Q^*_t is the production planned for time period t, the present, and P^e_t the expected price for time period t, which is also the present.

When these models are applied to equations in order to determine the area cultivated under basic grains, the adaptive expectation model offers the following functional form:

$$A_t = b_o\ \beta\ P_{t-1} + (1-\beta)A_{t-1} + [w_t - (1-\beta)w_{t-1}]$$

where w is the error term, and the partial adjustment is as follows:

$$A_t - A_{t-1} = \alpha\ (A_t^e - A_{t-1})$$

where α is the adjustment coefficient, and e implies "expected", so that:

$$A_t = b_o\ \alpha + b_1\ \alpha\ P_t + (1-\alpha)\ A_{t-1} + \alpha w_t$$

The difference between the two models is in the structure of the error term (w_t), and consequently the treatment of the problem of autocorrelation.

Nerlove's specifications allows the estimation of the short-term (c) and long-term (l) area-price elasticities (ϵ_{ap}) based on the following expressions:

$$\epsilon_{ap}^{c} = b_1\ \alpha\ (\bar{P}_t\ /\ \bar{X}_t)$$

and $$\epsilon_{ap}^{l} = b_1\ (\bar{P}_t\ /\ \bar{X}_t)$$

respectively, where $\bar{P}_t$ and $\bar{X}_t$ are the average price and area values.

(4) Application in the case of basic grains

As explained, the volume of production for each grain is the product of yield and area, then:

QQ.. = AR.. * RD..

where:

QQ.. = production rice (AZ), beans (FR), corn (MZ), and sorghum (SR)
AR.. = area cultivated with AZ, FR, MZ, and SR
RD.. = yields of AZ, FR, MZ, and SR per manzana

Since this expression is a combination of two factors it is necessary to define the equations for the area occupied by each grain (AR..) as well as the yield for each crop (RD..). A general specification of these equations to estimate the area and the yield of each crop is given as follows:

ARAZ = f (PRAZ(-1), AEAZ(-1), PRFT, ARFR, ARMZ, ARSR, D)

ARFR = f (PRFR(-1), AEFR(-1), PRFT, ARAZ, ARMZ, ARSR, D)

ARMZ = f (PRMZ(-1), AEMZ(-1), PRFT, ARAZ, ARFR, ARSR, D)

ARSR = f (PRSR(-1), AESR(-1), PRFT, ARAZ, ARFR, ARMZ, D)

where:

PR.. = real price for AZ, FR, MZ and SR
PN.. = nominal price
(-1) = the variables .. lagged one period
PRFT = real fertilizer price
PNFT = nominal fertilizer price
D = categoric variable 0-1

The expected signs for the coefficients of each explanatory variable are those suggested by economic theory. Area cultivated is supposed to increase as product prices increase (positive relation); it can decrease, however not in the same magnitude, as input prices decrease. The use of the lagged variable A_{t-1} is based on the economic concepts explained. The area cultivated reacts to past prices and factors. The coefficient's sign can be positive or negative, depending on the strength or inertia of the autocorrelation included in the model.

The specifications of the functions to estimate the yields for each grain are more complicated than those used for the area. The reason is simple. Yields depend on variables which are not under the control of the farmer, such as climate, precipitation, as well as other variables such as pests and weeds.

The formulation of the equations to estimate the yields are based on the same considerations used to formulate the functions to estimate the area, as follows:

RDAZ = f (PRAZ2, PRAZ(-1), RDAZ(-1), PRFT, ARFR, ARMZ, ARSR, D)

RDFR = f (PRFR2, PRFR(-1), RDFR(-1), PRFT, ARAZ, ARMZ, ARSR, D)

RDMZ = f (PRMZ2, PRMZ(-1), RDMZ(-1), PRFT, ARAZ, ARFR, ARSR, D)

RDSR = f (PRSR2, PRSR(-1), RDSR(-1), PRFT, ARAZ, ARFR, ARMZ, D)

where

RD.. = yield of AZ, FR, MZ and SR
PR..2 = average prices (PR..(-1) + PR..)/2

Average prices have been added to these equations in order to account for the influence of current prices (during time period t) on some decisions related to yields. If, for example, product prices increase during the period of cultivation, farmers may be disposed to increase variable expenditures buying more fertilizer and agrochemicals, or the same quantity but of superior quality.

(5) Functional form of the equations

The preceding specifications make it possible to try different functional forms to see which one gives the best statistical results, as long as the implications of each one do not contradict reality beyond reasonable limits.

For example, it is known that a log-log function (linear in logarithmic form) is a very useful vehicle to estimate a constant elasticity. Nevertheless, it is probable that in reality such constancy is not representative of a supply (production) response function, an assertion strengthened by the knowledge of irreversibility of the elasticities in this type of function.

(6) Use of cross-sectional data

It is not common to undertake supply response studies using cross-sectional data. Nevertheless, in this study the attempt is made to formulate and try a supply response model, using cross-sectional data. The data used is, however, not pure since current price data has been added to the data base. In other words, to the cross-sectional data on area, production, yield, quantities and prices of main inputs, as well as prices received by producers, observations on product prices during the previous harvest period, as well as product prices during the preceding planting period, are added to the data base (product prices lagged twice). This modification in the use of cross-sectional information allows to compensate some of the rigidity and lack of flexibility encountered when using supply response function with only cross-sectional information.

Some of the alluded rigidities have to do with the nature of the supply function. Once the area of cultivation has been decided, the expected production is given

by factors which are, up to certain degree, outside the control of the farmer, and not by the price of the products (under normal circumstances -- and not when there is a deliberate effort to decrease production in order to reduce supply and maintain prices relatively high). What this implies is that the short-term production function is completely inelastic with respect to the price of the product.

One of the benefits of formulating production functions with cross-sectional data is the possibility to analyze the differences in crop reactions depending on the size (not necessarily different sizes of farms), given changes in the explanatory variables included in the model.

Another benefit comes from the possibility that the estimated functions based on cross-sectional data may capture movements along the supply curve, under the following behavioral hypothesis: starting with a planted area and an expected production, the proportion of the harvest of each producer destined for the market compared with the proportion destined for on-farm consumption (human consumption, seed, and animal feed) will vary positively with observed product prices. This means that, if observed product market prices are relatively high, producers will be willing to sell more than otherwise, in order to improve their real incomes (income effect), and additionally be able to buy more quantities of other goods (substitution effect).

Nevertheless, even this potential benefit could be insignificant, considering that over 50% of all farms comprise 4 or less manzanas (2.8 has). This basic grains production structure leads to the anticipation that the majority of the basic grains produced is for subsistence and on-farm consumption, and only a marginal proportion is destined for the market. Consequently, the production elasticities, and above all the elasticity of the area cultivated vis a vis market prices for the products and changes in other controllable variables will be very strong (inelastic).

Keeping in mind these considerations, a general formulation of functions to estimate cultivated areas in basic grains, based on cross-sectional data is given as follows:

$$ARAZ = f\,(PRAZ,\ PRAZ(-1),\ PRAZ(-2))$$
$$ARFR = f\,(PRFR,\ PRFR(-1),\ PRFR(-2))$$
$$ARMZ = f\,(PRMZ,\ PRMZ(-1),\ PRMZ(-2))$$
$$ARSR = f\,(PRSR,\ PRSR(-1),\ PRSR(-2))$$

where:

(-1) = product prices for previous harvest (October, November, December 1991)

(-2) = product prices during previous planting time (April, May, June 1991)

The equations used to estimate the yield response to changes in variables which are considered under the control of the farmer are as follows:

RDAZ = f (PRAZ, PRFTAZ, PRSEAZ)
RDFR = f (PRFR, PRFTFR, PRSEFR)
RDMZ = f (PRMZ, PRFTMZ, PRSEMZ)
RDSR = f (PRSR, PRFTSR, PRSESR)

where:

PRFT.. = real prices of fertilizer used in cultivating AZ, FR, MZ and SR
PRSE.. = real prices of seed used in cultivating AZ, FR, MZ and SR

As with the equations specified for use with time series data, several functional form will be tried with the cross-sectional data.

C. Reflections on available data

1. Data requirements

a. Time series

A satisfactory set of time series data to estimate supply (production) response functions would consists of monthly registries on area, yield, production, use of production (on-farm consumption, seed, other on-farm use, and sales), prices received by farmers, quantities of inputs used per unit of production and prices, (seed, labor, fertilizer, pesticides, herbicides, machinery), credit per unit of production, for each grain and organized per department or per regions. To this set of basic data one would add agroclimatic information, such as monthly precipitation, temperature and humidity, per department and region.

Reliability is one of the most important characteristics of this type of data. The methods used to gather the information must be clearly established and revised periodically to adjust them to the changes production is undergoing in reality. The way in which the surveys are taken must be established with clarity and precision, and them applied by the surveyors in a rigorous statistical manner. The methods of aggregating the information must also be precise and clearly established so that the total values and averages which are recorded and published are the best possible approximations to the actual numbers.

b. Cross-sectional series

An acceptable set of cross-sectional data for each basic grain would consist of variables such as area, yield, production, use of production (on-farm consumption, seed, animal consumption, sales) quantity and cost of inputs (seed, fertilizers, pesticides, herbicides, machinery, labor, etc.), production credit (own resources, credit by sources). This information should be organized by department.

In order to obtain this type of information it is necessary to carry out cross-sectional surveys periodically. Therefore, for the type of research addressed by this study it is essential to have access to the last cross-sectional surveys. In this case the issues of representativeness and reliability also hold true.

2. Source of information

The main source of information for the data used in this study has been the Dirección General de Economía Agropecuaria (DGEA), and within it, the División de Estadística.

The historical information has been compiled from some official publications provided by DGEA, such as bulletins and annual statistical summaries. In spite of the fact that the División de Estadística assembles important information through its surveys and questionnaires, it only publishes portions of the information in aggregate form, at the regional level, annually or per harvests.

To assemble the minimum information required to estimate the formulated functions, the authors have had to recur to the original sources of data, that is to the surveys and questionnaires used by the enumerators of DGEA.

3. Description of the data obtained and its tabulation

a. Survey instruments

The DGEA gave the authors access to two of its basic data gathering instruments, namely the farm gate price survey and the survey of planting intentions. The first one is a one sheet registry in which the enumerator registers information on the products, quantities sold, prices received by producers, sales dates, and the zone or department where the sale took place. This questionnaire includes a great number of agricultural products such as grains, vegetables, fruits, meats, milk and derivatives, etc. The number of questionnaires handled by DGEA is in excess of 400. From this total a sub-sample was taken to complete 25 observations per department, per product, and during two different dates, namely during planting and during harvest.

The exactness with which the surveys are taken is not known. It seems that the surveyors are already familiar with their informants and they try to locate them in order to complete the questionnaires. There is no assurance that the surveying system might pass an analysis of representativeness or an randomness test. On the other hand, the degree of precision of the answers to the questions is not known, specially if they not been engaged in the activities related to the questions.

In reality, the planting intention surveys are designed to estimate the production cost of each product, and therefore offer the opportunity to use quantity and price data on inputs and factors of production. This survey also includes a place to note the expected price sales price (quite often filled with the actual price received by the producer). In the general section of the survey, the municipality and department where the farm is located is noted, enabling the analysts to use data desaggregated by departments.

The number of surveys handled by DGEA for basic grains oscillates between 1,300 and 1,400. From this set, a sub-sample was taken which allowed completion of more than 60 complete observations (area, yield, production, sales price) for rice, corn, and sorghum. It was not possible to achieve the same degree of

observation for beans, since in the month of February, 1992 DGEA was still completing the surveys for this grain in regions 3 and 4.

Some of the deficiencies found in the this survey include:

- the quantities sold are not registered when farmers are asked for their sales price, nor the quality of the grain (variety, moisture, foreign matter, presentation);

- no distinction is made between expected and actual sale prices;

- the quantity of production credit received and the source is not registered in the credit section of the survey;

- there is no room to register the uses made from production;

- the price surveys nor the planting intention surveys fail to register where the grain sales take place, whether at the farm gate, on the road, at the village market place and, if there, where exactly.

b. Tabulation and presentation of the data

The data gleaned from DGEA's official publications were copied and rearranged on spread-sheets. The most important arrangement of the annual data related to area, yield, production, product prices, and prices of some of the inputs increased the number of annual observations from 17 (1975-1991) to 58; this was achieved through the process of desaggregation by regions which also lead to a commensurate increase in the degrees of freedom. Nevertheless, the price data could not be desaggregated by region due to lack of information (see respective Appendix).

The price data contained in the price surveys was transferred directly to the electronic spread-sheet, thus creating individual data sets for each department. For each grain, the quantities and prices for each transaction were established according to the planting and harvest patterns of each grain, as shown in Table III-1.

TABLE III-1

AGRICULTURAL CALENDAR FOR BASIC GRAINS IN EL SALVADOR

PRODUCT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AGU	SEP	OCT	NOV	DEC	%PRODUCTION
RICE					S1	S1*				C1*	C1		=~ 90%
		S2			C2								=~ 10%
BEANS					S1m		C1	C1*					=~ 15%
								S2			C2		=~ 82%
			C3									S3	=~ 3%
CORN					S1	S1		Dobl		C1	C1		=~ 90%
								S2	S2		C2	C2	<~ 10%
	S3		C3	C3								S3	<~ 1%
SORGHUM						S1m	S1						
	C12							S2				C12	= 100%

Notes: Dobl: producers "doblan", that is break the corn plant in order to begin the in-field drying process.
S1, 2, 3: first, second or third planting.
C1, 2, 3: first, second or third harvest.
* definitely the main planting or harvest season.

Based on this calendar, and due to the fact that no prices were found for the peak planting and harvest months, the planting and harvest time periods were extended to 3 months, around the respective peak month; this arrangement is summarized in Table III-2.

TABLE III-2

SELECTED MONTHS FOR REGISTERING PRICES RECEIVED BY FARMERS DURING PLANTING AND HARVEST TIME PERIODS

	PLANTING MONTHS	HARVESTING MONTHS
RICE	MAY/JUN/JUL	SEP/OCT/NOV
BEANS	JUL/AGU/SEP	OCT/NOV/DEC
CORN	APR/MAY/JUN	OCT/NOV/DEC
SORGHUM	JUL/AGU/SEP	NOV/DEC/JAN

There were two main reasons why the producer price data was inserted according to the planting and harvest patterns of each grain. First, to obtain a weighted average price received by farmers for each grain, by department, and for the planting and harvest periods. Second, to use this information to make a statistical analysis of the behavior of prices among the different departments during two different periods of time (see Appendices). The estimated weighted average prices for each grain will be used as independent explanatory variables in the econometric analysis, using cross-sectional data.

The information contained in the planting intention surveys were first arranged in a data base program (DBase III), and subsequently transferred to a spreadsheet (Quattro). The data was organized by type of grain, however an additional identification was added for each department in order to identify them in the equations, using a category variable.

4. Improving the data base

a. Positive factors

The observations gathered by the surveys utilized by DGEA contain very valuable information, regardless of the sampling system and the quality of the questionnaire being utilized. Nevertheless, not all the information being gathered is processed and published. Only a minimum amount of all the variables compiled is published in aggregate form.

The geographic area covered by the sample, and taken to fill the surveys and questionnaires is enormous. All departments are covered, an important item which would permit an analysis and overview of the whole basic grains sub-sector, if the data were to be made available in a desaggregate form.

Another positive aspect of the statistical base is that the Division has skilled and knowledgeable technicians who are familiar with the different regions assigned to them.

b. Limitations of the data base

The processing of the data compiled by DGEA's personnel has been undertaken by the Computing Center of MOA. This Center must also process information for the entire Ministry. Furthermore, while the personnel of the Center processes the information according to instructions received for DGEA, they are not familiar at all with the nature of the information.

DGEA does not have agricultural economists with statistical skills on the staff. The lack of this type of skill is serious, since it can lead to biases in the samples, as well as errors in the tabulation, processing and presentation in regard to agronomic, technical and economic factors.

In spite of the fact that the personnel in the statistical division of DGEA is experienced, a continuous and repetitive training program should be in place in order to maintain and improve their skills in sampling methods, and technical and computational aspects.

SECTION IV

EMPIRICAL ANALYSIS AND RESULTS

A. Statistical Analysis

1. Results

This section will analyze the set of hypotheses which established a statistical relationship among the most important variables which are linked with a supply response function. For this to happen, it is assumed that the data which was made available is both accurate and reliable. In the statistical area itself, however, there are many aspects worthy of further analysis and research, especially in the area of data aggregation.

a. Correlation between quantities sold and prices

From data obtained from the surveys on producer prices, and presented in an tabular appropriate form, a series containing more than 100 observations was obtained at the national level on quantities sold by producers and prices received for each grain. Table IV-1 summarizes the results:

TABLE IV-1

ANALYTICAL RESULTS OF THE CORRELATION BETWEEN QUANTITIES SOLD AND PRICES RECEIVED BY FARMERS BY PRODUCT AND CUMULATIVE FREQUENCY OF QUANTITIES

PRODUCT	PLANTING			HARVEST		
	COVAR.	CORR.	FREQUENCY IN SALE	COVAR.	CORR.	FREQUENCY IN SALE
RICE	-82.37	-0.37	76% < 50 qq	67.7	0.14	60% < 50 qq
BEANS	-9.42	-0.01	78% < 5 qq	-33.41	-0.04	81% < 5 qq
CORN	-7.32	-0.01	77% < 10 qq	-8.58	-0.02	70% < 10 qq
SORGHUM	-7.65	-0.03	74% < 5 qq	-18.53	-0.03	39% < 5 qq

Source: Survey forms on prices received by producers, DCEA.

Except in rice during the harvest period, the co-variances and the indices of simple correlation between quantities sold and prices received are all negative. Equally, and again with the exception in rice, the correlation indices are all

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very low, indicating that there is no clear discernible association between these two variables. The indices for rice, though higher than the others, are also not strong.

Simple regression between these two variables were also tried, with the price depending on the number of quintals sold in each transaction (lot size). In all cases, the coefficient of the lot size variable was negative, except for rice during the harvest time, as expected. The coefficients of determination (in this case, equal to the square of the estimated simple correlation coefficients) were all low.

b. Price variation among departments

The annexes contain a matrix which indicates the difference in weighted average harvest prices for grains among departments. The purpose of this analysis is to estimate the possibilities of inter-departmental commerce or spatial arbitrage in grains. The differences obtained are equivalent to a gross margin. To estimate the net margin it would be necessary to subtract transportation costs per quintal between the relevant market places in each department, as well as other marketing costs, such as load/unload, deterioration of sacks, salaries, administrative overhead, and risks. The information obtained from the price surveys also allowed the estimation of the variation coefficients of the prices within each department. A summary of this analysis is provided in Table IV-2.

TABLE IV-2

AVERAGE WEIGHTED PRICES AND VARIATION COEFFICIENTS
FOR BASIC GRAINS, BY DEPARTMENTS

	RICE		BEANS		CORN		SORGHUM	
DEPARTMENTS	AVERACE PRICE	COEFFIC. VARIAC.	AVERAGE PRICE	COEFFIC. VARIAC.	AVERAGE PRICE	COEFFIC. VARIAC.	AVERAGE PRICE	COEFFIC. VARIAC.
AHUACHAPAN	65.54	4.36%	260.78	10.50%	53.22	11.36%	49.84	4.37%
CABAÑAS	60.06	12.41%	238.41	21.46%	51.01	8.29%	41.75	18.13%
CHALATENANGO	57.25	21.86%	258.53	14.13%	47.02	10.15%	42.66	9.64%
CUSCATLAN			232.84	8.34%	56.85	7.87%	57.78	3.09%
LA LIBERTAD	69.08	4.93%	277.45	3.75%	55.76	9.32%	52.08	5.22%
LA PAZ	70.08	7.17%	228.84	12.89%	56.95	10.15%	54.99	8.79%
LA UNION			275.00		58.30	12.39%	51.27	10.77%
MORAZAN			280.00		58.40	7.32%	50.28	1.22%
SAN MIGUEL	60.25	8.39%	246.77	14.75%	53.49	8.77%	56.59	11.72%
SAN SALVADOR	65.00		280.69	4.54%	53.16	12.65%	52.75	3.84%
SAN VICENTE	59.56		226.35	13.81%	55.17	7.28%	51.56	14.06%
SANTA ANA	64.76	7.24%	266.32	5.58%	55.26	12.16%	54.91	20.01%
SONSONATE	66.12	6.48%	220.90	13.32%	53.39	5.86%	51.15	5.13%
USULUTAN	63.47	2.12%	296.23	3.19%	54.40	10.76%	46.19	2.91%
TOTALS	66.02	6.10%	249.34	8.75%	54.29	5.65%	50.33	8.38%

Source: Producer price surveys, DGEA.

In general and for all grains the variation in prices in those departments where the social conflict was most felt, such as Cabañas and Chalatenango, is relatively higher than in the other departments. The price variation for sorghum in Santa Ana appears unusually high, even though this department has been at relative peace during the conflict.

c. Inter-seasonal price variation

The weighted average producer prices were estimated, by department, for the planting months -for the new agricultural cycle- and for the harvest months. The purpose of this exercise is to analyze the possibility to store profitably the different kinds of grains, from the harvest period to the following planting season (approximately 6 months). In general, the results at a national level show attractive margins, ranging from 9% for sorghum to 31% for corn.

TABLE IV-3

AVERAGE WEIGHTED BASIC GRAINS PRICES DURING THE PLANTING AND HARVESTING SEASONS AND RESPECTIVE DIFFERENCES

	RICE			BEANS			CORN			SORGHUM		
DEPARTMENTS	PLANTING PRICE	HARVEST PRICE	DIFFER %	PLANTING PRICE	HARVEST PRICE	DIFFER %	PALNTING PRICE	HARVEST PRICE	DIFFER %	PLANTING PRICE	HARVEST PRICE	DIFFER %
AHUACHAPAN	50.00	65.54	23.71%	288.88	260.78	10.78%	71.86	58.22	23.43%	50.71	49.84	1.75%
CABAÑAS	60.87	60.06	-1.35%	281.68	238.41	18.15%	67.24	51.01	31.82%	54.41	41.75	30.32%
CHALATENANGO	56.00	57.25	2.18%	278.11	258.53	7.57%	66.82	47.02	42.11%	53.77	42.66	26.04%
CUSCATLAN				290.05	232.84	24.57%	70.53	56.85	24.06%	59.00	57.78	2.11%
LA LIBERTAD	43.00	69.08	37.76%	260.78	277.45	-6.01%	67.13	55.76	20.39%	56.92	52.08	9.29%
LA PAZ	64.36	70.08	8.17%	295.43	228.84	29.10%	76.08	56.95	33.59%	63.74	54.99	15.91%
LA UNION					275.00		77.34	58.30		56.21	51.27	
MORAZAN					280.00		79.58	58.49		52.49	50.28	
SAN MIGUEL	58.47	60.25	2.95%	229.98	246.77	-6.80%	68.16	53.49	27.43%	59.20	56.59	4.61%
SAN SALVADOR	63.00	65.00	3.08%	295.98	280.69	5.45%	69.62	53.16	30.96%	53.06	52.75	0.59%
SAN VICENTE	46.31	59.56	22.24%	280.32	226.35	23.84%	73.34	55.17	32.93%	65.83	51.56	27.68%
SANTA ANA		64.76		267.72	266.32	0.53%	73.43	55.26	32.88%	51.40	54.91	-6.39%
SONSONATE		66.12		304.90	220.90	38.03%	70.73	53.39	32.48%	54.87	51.15	7.27%
USULUTAN		63.47		225.00	296.23	-24.05%	71.34	54.40	31.14%	50.88	46.19	10.15%
TOTALS	56.48	66.02	14.45%	277.98	249.34	11.48%	71.36	54.29	31.44%	54.86	50.33	9.00%

Source: Producer price surveys, DGEA.

Sorghum and beans show the lowest gross margins, namely 11.5 and el 9%, respectively. Nevertheless, the difference in prices for beans in some of the departments is very attractive, although in others it is negative. The same observation is valid for sorghum.

TABLE IV-4

FREQUENCY OF SALES WITH RESPECT TO THE NUMBER OF QUINTALS SOLD, BY PRODUCT, DURING HARVEST TIME

	SCALE QQs		No.SALES	FREQ.	ACUM. FRE.
RICE	0.1	5	10	6.37%	6.37%
	5.1	10	17	10.83%	17.20%
	10.1	20	25	15.92%	33.12%
	20.1	50	43	27.39%	60.51%
	50.1	100	39	24.84%	85.35%
	100.1	500	21	13.38%	98.73%
	500.1	5000	2	1.27%	100.00%
	TOTAL SALES		157		
BEANS	SCALE QQs		No.SALES	FREQ.	ACUM.FRE.
	0.1	1	51	26.42%	26.42%
	1.1	3	69	35.75%	62.18%
	3.1	5	37	19.17%	81.35%
	5.1	10	31	16.06%	97.41%
	10.1	20	5	2.59%	100.00%
	20.1	50	0	0.00%	100.00%
	50.1	100	0	0.00%	100.00%
	TOTAL SALES		193		
CORN	SCALE QQs		No.SALES	FREQ.	ACUM.FRE.
	0.1	1	15	4.73%	4.73%
	1.1	3	44	13.88%	18.61%
	3.1	5	43	13.56%	32.18%
	5.1	10	122	38.49%	70.66%
	10.1	20	66	20.82%	91.48%
	20.1	50	24	7.57%	99.05%
	50.1	200	3	0.95%	100.00%
	TOTAL SALES		317		
SORGHUM	SCALE QQs		No.SALES	FREQ.	ACUM.FRE.
	0.1	1	20	8.55%	8.55%
	1.1	3	34	14.53%	23.08%
	3.1	5	37	15.81%	38.89%
	5.1	10	60	25.64%	64.53%
	10.1	20	59	25.21%	89.74%
	20.1	50	19	8.12%	97.86%
	50.1	200	5	2.14%	100.00%
	TOTAL SALES		234		

TABLE IV-5

DISTRIBUTION OF LAND USE FOR BASIC GRAINS PRODUCTION
DURING THE AGRICULTURAL YEAR 1991-1992

RICE

SCALE MZ		FARMS	FREQ.	ACUM.FRE.
0.1	2	50	74.63%	74.63%
2.1	5	9	13.43%	88.06%
5.1	10	3	4.48%	92.54%
10.1	20	1	1.49%	94.03%
20.1	50	3	4.48%	98.51%
50.1	100	1	1.49%	100.00%
100	500	0	0.00%	100.00%
TOTAL FARMS		67		

BEANS

SCALE MZ		FARMS	FREQ.	ACUM.FRE.
0.1	2	126	96.92%	96.92%
2.1	5	3	2.31%	99.23%
5.1	10	1	0.77%	100.00%
10.1	20	0	0.00%	100.00%
20.1	50	0	0.00%	100.00%
50.1	100	0	0.00%	100.00%
100	500	0	0.00%	100.00%
TOTAL FARMS		130		

CORN

SCALE MZ		FARMS	FREQ.	ACUM.FRE.
0.1	2	98	73.13%	73.13%
2.1	5	29	21.64%	94.78%
5.1	10	5	3.73%	98.51%
10.1	20	1	0.75%	99.25%
20.1	50	0	0.00%	99.25%
50.1	100	1	0.75%	100.00%
100	500	0	0.00%	100.00%
TOTAL FARMS		134		

SORGHUM

SCALE MZ		FARMS	FREQ.	ACUM.FRE.
0.1	2	27	84.38%	84.38%
2.1	5	2	6.25%	90.63%
5.1	10	1	3.13%	93.75%
10.1	20	1	3.13%	96.88%
20.1	50	0	0.00%	96.88%
50.1	100	0	0.00%	96.88%
100	500	1	3.13%	100.00%
TOTAL FARMS		32		

Source: Planting intentions surveys, DGEA.

d. Frequency of quantities sold per transaction

The sub-samples obtained from the producer price surveys show that the sales at the producer level are transacted with very small quantities. The majority of the transactions (some 75%) are concentrated around lots of 50 to 100 quintals for rice, less than 5 quintals for beans, and between 10 and 20 quintals for corn and sorghum. Very few transactions in large lots were observed. On two occasions the largest lots in one transaction were observed in rice. No transaction with more than 20 quintals was observed in beans. In corn three transactions with more than 100 quintals but less than 200 were observed, and in sorghum only 5.

This sales pattern at the producer level seems to reveal very well the structure of the production of basic grains. It also seems to reconfirm the practice by farmers of selling their harvest in small lots through time, distributing their sales during the period between harvest, and as they need cash to cover other needs and perhaps capital for planting of other crops.

e. Frequency distribution of area used for basic grains production

The sub-sample taken form the planting intention surveys (approximately 1,400) consists of 363 farms totally or partially dedicated to the production of basic grains. Lots up to 2 Mz were found distributed among basic grains in the following fashion: 75% in rice, 97% in beans, 73% in corn, and 84% in sorghum. Lots of less than 5 Mz are nearly 100% in beans and 95% in corn (see Table IV-5).

There is no doubt about the dramatic concentration of lots dedicated to the production of basic grains which are less than 5 Mz. A comparison of this distribution with the one found in the study by Calderon and San Sebastián (1991), with relevant adjustments, confirms that the productive agricultural structure is characterized by a concentration of small farms and producers whose commercial production is marginal.

2. Analysis of results

a. Correlation between volumes and prices

The lack of a significant correlation between the quantities sold (lots) and prices could substantiate the idea that a large portion of producer sales, especially in corn and beans are retail or final sales, that is direct sales to the final consumer. This idea could be strengthened if more were to be known about the places where the majority of the transactions are taking place, whether a market place near the farm or at farm gate.

Reviewing this apparent anomaly with technical personnel of UAPA, the argument was put forward that little correlation is to be expected between lot size and price at the producer level. This is to be expected due to the small size of the country and the acceptable means of communication, factors which tend to decrease the significance of the assembly costs as part of the total cost of grain marketing. If this is true, then the lot size would have no influence on the price.

b. Spatial price differences

The significant weighted average price differentials between some of the departments (Appendix 14), suggest a possibility for a profitable arbitrage. This means that the possibility exists to buy grain in those departments where the grains are sold relatively cheap and sell them in those departments where the prices are relatively higher, as long as the total difference is large enough to cover transport costs as well as all other costs associated with regional marketing. Arbitrage is the economic mechanism which balances product prices over space (that is, it makes them equal after discounting marketing costs). This goal is achieved simply because the demand of a product in an area where prices are relatively low will tend to push prices up. On the other side, a greater supply of a product in an area where the price is relatively high will tend to decrease it. After a number of commercial transactions, the prices in all regions tend to be the same, discounting for transport and other marketing costs.

The strong producer price variations within each department implies differences in the composition of the costs of production. This assertion is strengthened by the fact that when the data of the selected surveys was being entered into the data base important variations in input costs were observed among various departments. These variations appear not to be only the result of transport costs associated with the distribution of agricultural inputs, but also due commercial discrimination based probably on risk considerations.

One important aspect to note is the difference in labor rates for unskilled labor. The information contained in the surveys show that labor rates vary between 10 and 20 Colones for the same task within as well as between departments. The variation within departments suggests that they are a function of the degree of skills and productivity of labor, which is legitimate, however productivity differences do not seem to be the most important reason. The variation in labor rates among departments seems to be a function of the opportunity cost of labor. In those departments where the social conflict has taken place, labor rates are consistently lower than in those departments which have enjoyed peace.

The surveys do not indicate whether the labor rate, used as a measure of the worth for labor, reflects one task or a set of tasks realized in one day or during a number of hours per day, nor are the tasks to be carried out specified. The surveys also do not distinguish between contract and family labor. On small farms of less then 2 Mz, which represent the majority of farms producing grains, it is quite possible that all labor is provided by the family.

This preliminary analysis with respect to labor could be extended to include other inputs and factors of production which would be very helpful in explaining the differences in costs, discounting for premiums in quality and transport costs within and among departments.

c. Seasonal price differences

The differences found between the average harvest and planting prices suggest a great earnings probability for grain storage. The low prices during the period

of harvest is due to the steady level of demand being overshadowed by the production overhang and subsequent supply being put in the market. On the other hand, prices during the time period immediately prior to the harvest tend to be higher than those during the harvest period because the scarcity of the product is being felt in the market place, and market agents in possession of the product need to legitimately recover their storage costs.

In the set of price data gathered, the prices for basic grains are those encountered during the planting season, as well as the prices prevalent during the time period just prior to harvest. The planting prices can be considered representative of those just prior to the harvest. Taking into account the number of months given to each season, the time period between the two seasons is approximately 6 months. In order for the gross margin percentages calculated for each grain and by department to be attractive, they must be larger than the costs of storage (grain quality control, pest management, facility depreciation, etc.) and the financial opportunity cost of capital invested in the stored grain. The analysis of the seasonal price differentials (6 months) indicate that grain storage can be done in a profitable manner.

3. Implications of results

The possibilities for economies of scale are great. As explained, grain marketing is done in small volumes, and consequently margins are also low. The potential to reduce marketing costs is made possible through larger sales and handling volumes, which would permit the application of improved handling, storage, and transportation practices and methods.

Without altering current land holding and distribution patterns, and by reenforcing property rights, a way of achieving greater transaction volumes and the economies of scale that such goal entails is through the promotion of voluntary grain producer associations. The trends towards free trade within the Central American region, and the decision to liberate the markets from all public restrictions and interventions, makes imperative the search for more efficient methods of organizing grain supply offers at the producer level.

In a parallel manner, the potential to achieve economies of scale, and the enlargement of private sector participation due to the termination of public intervention in assembly, storage, and wholesaling demands a more rigorous participation of grain producers. An activity which shows clear profit potential is grain storage, given by the differential in seasonal prices which seem to give a sound economic return to this marketing function.

Finally, the spatial price differentials indicate the presence of attractive possibilities for commercial arbitrage in basic grains. Enlargement and major agility of the internal market are linked to stable and reliable economic incentives. This incentives can be generated through reductions in transaction costs brought about by increases in volumes handled.

4. Limitations of results

As explained, the results obtained have been derived from a sub-sample of a sample of producer prices and production costs. The form in which the sub-sample

was obtained does provide an adequate representation of the data contained in the sample on producer prices and planting intentions carried out by DGEA.

Generalizations of the results of the sub-sample must be done in a cautious manner. The statistics division of DGEA uses area frame sampling to divide the country into manageable zones. However, the way the sampling is carried out and the selection of persons to be interviewed is accomplished, seem to respond more to the experience and knowledge of the DGEA technicians about the zone they are assigned.

B. Econometric Analysis

1. Results

a. Historical data on basic grains production

Following the theoretical models presented in the pervious section, and selecting a logarithmic equation as the functional form (log-log), the functions used to estimate the area under each grain are as follows:

$$LARAZ_t = \underset{(2.1922)}{5.1054} + \underset{(0.0916)}{0.2710}\ LPRAZ_{t-1} + \underset{(0.2315)}{0.5606}\ LARAZ_{t-1} - \underset{(0.1407)}{0.4721}\ LPRFTAZ_t$$

$$R^2 = 0.4989$$

$$LARFR_t = \underset{(4.5256)}{11.0134} - \underset{(0.0680)}{0.0257}\ LPRFR_{t-1} + \underset{(0.3794)}{0.0968}\ LARFR_{t-1} - \underset{(0.0927)}{0.2103}\ LPRFTFR_t$$

$$R^2 = 0.7785$$

$$LARMZ_t = \underset{(3.3632)}{2.4305} + \underset{(0.0798)}{0.0709}\ LPRMZ_{t-1} + \underset{(0.2589)}{0.8238}\ LARMZ_{t-1} - \underset{(0.0665)}{0.1022}\ LPRFTMZ_t$$

$$R^2 = 0.5857$$

$$LARSR_t = \underset{(3.0450)}{5.8749} + \underset{(0.0914)}{0.0171}\ LPRSR_{t-1} + \underset{(0.2556)}{0.5134}\ LARSR_{t-1} - \underset{(0.0821)}{0.0131}\ LPRFTSR_t$$

$$R^2 = 0.2967$$

The letter L at the beginning of the identification of each variable stands for the natural log (for example, LARAZ represents the log of the area for rice); the values within parenthesis represent the standard errors of the parameters.

The parameters in the equation used to estimate the area in rice are statistically significant at 5% level [20]. For beans, the real price and cultivated area parameters, both lagged one period, are not statistically significant at 5% level. In spite of the statistical weakness of these two variables in explaining the behavior of area planted to beans, their inclusion is considered necessary due to their economic relationship with the dependent variable. However, remembering that approximately 95% of producers cultivate less than 5 Mz of beans and that nearly 99% of the sales are done in lots of less than 5 qq, this result adds arguments in favor of the inelastic behavior of the production of beans vis a vis the price.

The bean price coefficient came out negative. This unexpected result, with an insignificant coefficient is of no major importance. In a similar manner, the real prices for corn and sorghum, lagged on period, do not explain in a significant manner the behavior of the area planted to these two crops. From an economic point of view, the price variable is important in each equation. In the sorghum equation, the coefficient for the real price of fertilizers is not significant from a statistical point of view; it is included due to its economic importance.

The values of the determination coefficients R^2, are not very high. However, considering that the original functions are exponential and not logarithmic, these values of R^2 are not totally appropriate to judge whether a curve provides a good fit or not.

The equations used to estimate the yields of the grains studied, and based on the same theoretical formulation and functional form used for the area, are as follows:

$$LRDAZ_t = \underset{(1.2738)}{3.4030} + \underset{(0.1040)}{0.1345}\ LPRAZ_{t-1} + \underset{(0.2782)}{0.3376}\ LRDAZ_{t-1} - \underset{(0.1336)}{0.3481}\ LPRFTAZ_t$$

$$R^2 = 0.5492$$

$$LRDFR_t = \underset{(0.7399)}{3.0316} + \underset{(0.2412)}{0.1825}\ LPRFR_{t-1} - \underset{(0.2848)}{0.4514}\ LRDFR_{t-1} - \underset{(0.2116)}{0.0642}\ LPRFTFR_t$$

$$R^2 = 0.1826$$

$$LRDMZ_t = \underset{(1.3668)}{4.3221} + \underset{(0.1243)}{0.06}\ LPRMZ_{t-1} - \underset{(0.3388)}{0.0969}\ LRDMZ_{t-1} - \underset{(0.1167)}{0.2476}\ LPRFTMZ_t$$

$$R^2 = 0.4145$$

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[20] The t Student value, calculated by dividing the value of the coefficient by its standard error, is greater than those shown by the tables for a significance level of 5% (95% probability).

$$LRDSR_t = 3.2443 + 0.0887\ LPRSR_{t-1} - 0.0082\ LRDSR_{t-1} - 0.1672\ LPRFTSR_t$$
$$(0.1865)\quad (0.1111)\qquad (0.0486)\qquad (0.1049)$$

$$R^2 = 0.2965$$

The equation used to estimate sorghum yields lacks the observation for the year 1987 which is considered highly outlier (anomalistic).

As explained in the previous section, the estimation of the yields is much more difficult than the estimation of the area due to the fact that a larger number of variables exist which influence the yield level but are not under the control of the farmers. The explanatory variables included in the models try to cover those elements which do influence yield levels in one way or another.

The results show that there is little statistical significance in the real prices for the products and yields, lagged one period. In the yields for rice and corn, the coefficients for the real fertilizer prices are statistically significant at the 5% level. They are not significant in the other two grains.

The values of the determination coefficient, R^2, are relatively lower than the corresponding values in the area equations.

The values for the Durbin-Watson estimator, both in the equations used to estimate the yields as well as the area of the crops do not have major significance since the equations include the dependent variable as an independent lagged variable.

With the equations to estimate area and yield of each grain, it is then possible to estimate the production, using the expression Q = A * R. Figures IV-1 through IV-4 show, for each grain, the actual and estimated production for the period 1975 through 1991.

In general, the estimated curve to actual values of production fits fairly well. The capacity of the estimated curves to capture the points of inflection in the actual values should be noted. This estimation characteristic allows to project changes in production trends with some degree of confidence. The same cannot be said with respect to the proper production values, since as previously explained, the lack of information and the relative small number of observations has limited the number of variables specified in the models. In other words, confidence intervals of the equations are relatively large.

FIGURE IV-1

ACTUAL AND ESTIMATED RICE PRODUCTION FOR THE 1975-1991 PERIOD

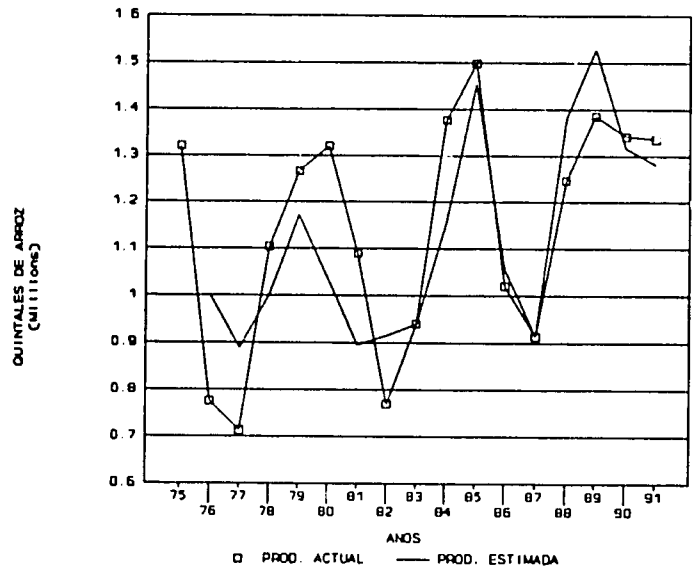


FIGURE IV-2

ACTUAL AND ESTIMATED BEAN PRODUCTION FOR THE 1975-1991 PERIOD

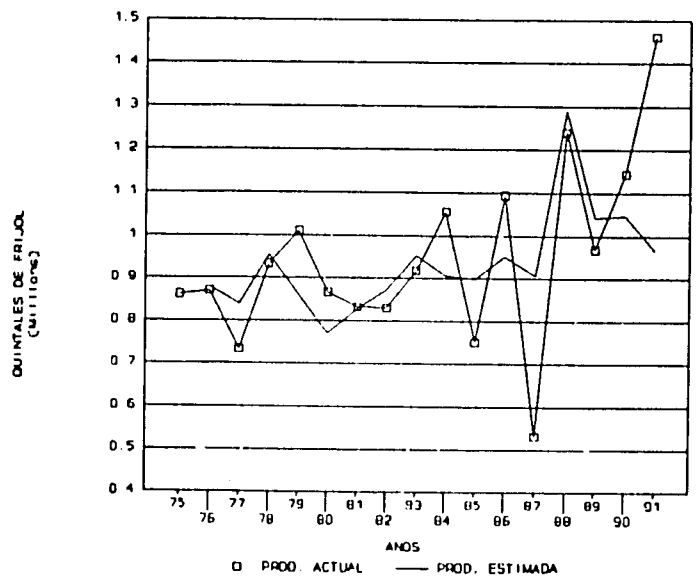


FIGURE IV-3

ACTUAL AND ESTIMATED CORN PRODUCTION FOR THE 1975-1991 PERIOD

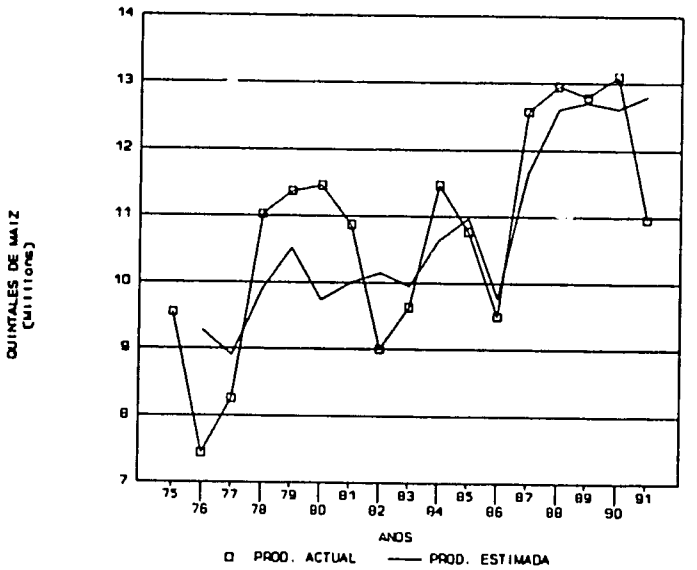
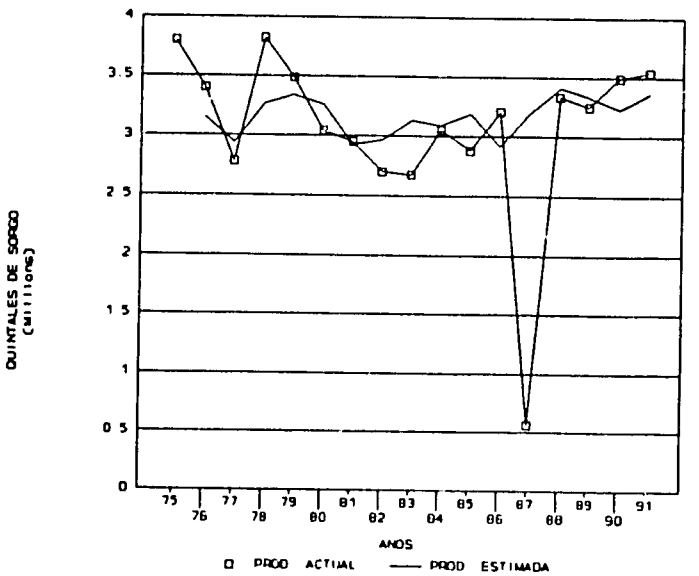


FIGURE IV-4

ACTUAL AND ESTIMATED SORGHUM PRODUCTION FOR THE 1975-1991 PERIOD



b. Production of basic grains cross-sectional data

Some econometric functions were tried which would permit to estimate the area, yield or production of basic grains with cross-sectional data. This effort was not successful.

In general, the variables included in the cross-sectional data, especially those related to production (area and yield), to product prices (actual prices from the previous planting and harvest seasons), and to input prices and labor costs do not show an apparent degree of correlation. Appendices 14 and 15 contain the co-variance and correlation matrices of the relevant variables which are included in the functions. It can be noted that the co-variance and correlation values between the dependent variable (production, area, and yield) and the independent variables are all very low.[21]

In addition to the co-variance and correlation values for the variables considered, Appendices 14 and 15 also contain the results of the regressions tried, given the available data. As can be observed, aside from a poor fitting of the estimated curves, many of the coefficients have signs which are not expected.

Plotting a dependent variable such as production (quintals produced), the area, or the yield with product prices, no discernible pattern can be found which would allow the fitting of an acceptable function. A totally inelastic supply function with respect to price was expected in the short-term. The idea which motivated the effort to formulate a function was the possibility that the quantity produced could be used as a proxy for the quantity sold (offered for sale). Obtaining some quantitative form to measure the income and substitution effects of a price increase in quantities sold was desired.

The income effect is apparent, given that a rise in price will increase the producer's income as a result of the multiplication of product and increase in the price ($I = Q * P$). This effect stimulates the producer to sell more product than previously planned, including sacrificing some product set aside for on-farm consumption. The substitution effect is felt when the producer, thanks to his improved income, can substitute the extra quantity of his product sold (reducing his on-farm consumption) with other food items which are now affordable.

The available data is insufficient to intent a definition of a supply response function which might capture and quantify these two important effects.

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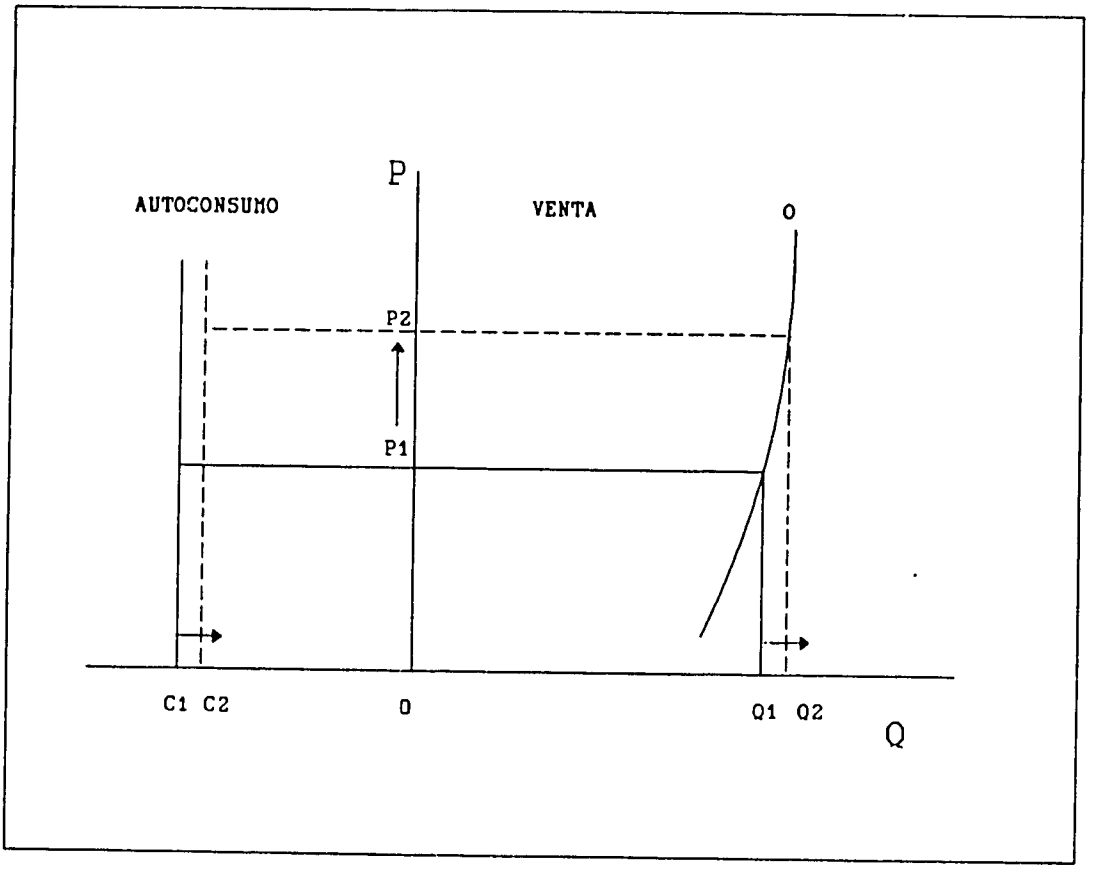
[21] Low correlation values are desired between the independent variables in order to diminish the multicolinearity effect, but it is necessary to have some degree of correlation between the dependent and explanatory variables.

FIGURE IV-5

ILLUSTRATION OF THE INCOME AND SUBSTITUTION EFFECT OF A PRICE RISE ON THE QUANTITIES AVAILABLE FOR SALE



Note:

The farm production destined for on-farm consumption and for sale is equal to C_1Q_1, which is also equal to C_2Q_2. The increase in the price of the product from P_1 to P_2 stimulates the producer to reserve less production for on-farm consumption and increase the quantity for sale (reduces C_1C_2 and increases Q_1Q_2). The increase in income from P_1Q_1 to P_2Q_2 allows him to substitute the consumption of his own product with other food items that can be purchased in the local market with his additional income.

2. Analysis of results

The log-log specification of the equations used to estimate the crop area and yield -using historical data- have the characteristical advantage of offering directly the value of the elasticities of the coefficients of the independent variables. In this case, however, the coefficients of the functions do not represent the elasticities entirely since the dependent variable is included as an independent variable, lagged one period.

The coefficient of the real price of each product is a combination of the partial adjustment coefficient β and of the very same estimator. The coefficient of the lagged dependent variable (which acts as an independent variable) is equivalent to the expression $(1-\beta)$. The value of the intercept is equal to the b_o coefficient of the regression multiplied by the adjustment coefficient β. Finally, the coefficient for the real price of fertilizers is also a combination of the coefficient b_2 and the adjustment coefficient. In general, the area equation with its structural coefficients corresponds to the following expression:[22]

$$LAR.. = b_o\ \beta + b_1\ \beta\ LPR..._{t-1} + (1-\beta)\ LAR.. + b_2\ \beta\ LPRFT.. + [w_t - (1-\beta)w_{t-1})$$

from where the coefficients -elasticities- are determined for the area equations presented in Table IV-6. As previously explained, each product is represented by its initials (AZ for rice, FR for beans, MZ for corn, and SR for sorghum, and w is the error term).

The specification of the equations used to estimate the yields is also logarithmic and similar to the one used for the area. Therefore, the coefficients can also be separated into short- and log-term elasticities, as shown in Table IV-7.

In the equations used to estimate the area, the long-term area-price elasticities for each product, as well as the area-price elasticities for fertilizers are consistently larger than the short-term elasticities, as expected. In reality, the reactions by producers to increase (decrease) the area planted, given some price stimuli (disincentive), are relatively stronger over the long-term than over the short-term. Improvements in production facilities and in the adoption process of new technologies are accelerated when the incentives appear to be sustainable. As has been explained, in the short-term these elasticities are very low and irreversible.

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[22] This general expression for the area equations is expressed in terms of logarithms in both parts, and therefore the coefficients are the elasticities themselves. Consequently, there is no need to multiply by the average price and area values, as indicated in previous section.

TABLE IV-6

DECOMPOSITION OF THE REGRESSION COEFFICIENTS INTO THEIR SHORT- AND LONG-TERM ELASTICITIES WITH RESPECT TO THE CULTIVATED AREA IN EACH PRODUCT

RICE:	0.6167, b_1,	long-term area-real price (lagged) elasticity for rice
	0.2710, $b_1 \beta$,	short-term area-price (lagged) elasticity for rice
	0.4394, β,	elasticity area(t)-area(t-1)
	-1.0744, b_2,	long-term area-price elasticity for fertilizers
	-0.4721, $b_2 \beta$,	short-term area-price elasticity for fertilizers
BEANS:	0.0285, b_1,	long-term area-real price (lagged) elasticity for beans
	-0.0257, $b_1 \beta$,	short-term area-price (lagged) elasticity for beans
	0.9032, β,	elasticity area(t)-area(t-1)
	-0.2328, b_2,	long-term area-price elasticity for fertilizers
	-0.2103, $b_2 \beta$,	short-term area-price elasticity for fertilizers
CORN:	0.4016, b_1,	long-term area-real price (lagged) elasticity for corn
	0.0708, $b_1 \beta$,	short-term area-price (lagged) elasticity for corn
	0.1763, β,	elasticity area(t)-area(t-1)
	-0.5791, b_2,	long-term area-price elasticity for fertilizers
	-0.1021, $b_2 \beta$,	short-term area-price elasticity for fertilizers
SORGHUM:	0.0351, b_1,	long-term area-real price (lagged) elasticity for sorghum
	0.0171, $b_1 \beta$,	short-term area-price (lagged) elasticity for sorghum
	0.4866, β,	elasticity area(t)-area(t-1)
	-0.0269, b_2,	long-term area-price elasticity for fertilizers
	-0.0131, $b_2 \beta$,	short-term area-price elasticity for fertilizers

Note: Due to its insignificance, the analysis of the intercept coefficient has been deleted.

TABLE IV-7

DECOMPOSITION OF THE EQUATION COEFFICIENTS USED TO ESTIMATE THE SHORT- AND LONG-TERM YIELD ELASTICITIES

RICE:	0.2030, b_1,	long-term yield-real price (lagged) elasticity for rice
	0.1345, $b_1 \beta$,	short-term yield-real price (lagged) elasticity for rice
	0.6624, β,	elasticity yield(t)-yield(t-1)
	-0.5265, b_2,	long-term yield-real price elasticity for fertilizers
	-0.3485, $b_2 \beta$,	short-term yield-real price elasticity for fertilizers
BEANS:	0.1257, b_1,	long-term yield-real price (lagged) elasticity for beans
	0.1825, $b_1 \beta$,	short-term yield-real price (lagged) elasticity for beans
	1.4514, β,	elasticity yield(t)-yield(t-1)
	-0.0443, b_2,	long-term yield-real price elasticity for fertilizers
	-0.0643, $b_2 \beta$,	short-term yield-real price elasticity for fertilizers
CORN:	0.0547, b_1,	long-term yield-real price (lagged) elasticity for corn
	0.0600, $b_1 \beta$,	short-term yield-real price (lagged) elasticity for corn
	1.0969, β,	elasticity yield(t)-yield(t-1)
	-0.2257, b_2,	long-term yield-real price elasticity for fertilizers
	-0.2476, $b_2 \beta$,	short-term yield-real price elasticity for fertilizers
SORGHUM:	0.0882, b_1,	long-term yield-real price (lagged) elasticity for sorghum
	0.0888, $b_1 \beta$,	short-term yield-real price (lagged) elasticity for sorghum
	1.0082, β,	elasticity yield(t)-yield(t-1)
	-0.1658, b_2,	long-term yield-real price elasticity for fertilizers
	-0.1672, $b_2 \beta$,	short-term yield-real price elasticity for fertilizers

Note: Due to its insignificance, the analysis of the intercept coefficient has been deleted.

Both the long-and short-term elasticities for beans and sorghum are very low. Even if real prices for these two products would increase by 100%, the area planted would increase by less than one percent. This behavior is to be expected in the very small farms from which nearly all the data was gathered to undertake this analysis. In larger farms, specially in sorghum a different behavior should be expected, with a lager elasticity quite probable.

The area elasticities in relation to the real fertilizer prices were, as expected, negative for beans and sorghum, however relatively low. The elasticities for beans came out stronger than those for sorghum, which contradicts the expected values.

The authors are not aware of similar basic grains production elasticity studies in other Central American countries or South America. As a result, it is very difficult to judge the long-term elasticities between the area and the real prices of corn and rice. They appear to be within "normal" ranges, if compared to similar elasticities in developed countries (Tomek and Robinson, 1991). The long-term area-price elasticity for corn is very low. This result is, however not surprising considering the production structure for corn in EL Salvador, and above all the small size of the farms used in the sample.

It is important to note that the rice area seems to be, over the long run, very elastic with respect to fertilizer prices. This result leads to the conclusion that the area cultivated in rice can also be used for other crops. This conclusion is strengthened by the fact that rice is not a product which can be consumed as harvested, nor constitutes a basic food product in the diet of the rural population in El Salvador.

The yield elasticities are also important, specially those associated with past yields (lagged). Except for rice, all yield elasticities are greater than unity. The lagged yield variables, acting as independent variables, reflect the factors and effects that prices of the products, fertilizers, and other items not included in the equation have had in the past. In other words, past yields summarize the effects of the factors that have had influenced in the lagged yields. The relatively high elasticity related with this variable suggests a strong inertia in the yields. Also, if high yields were achieved in the past, an elasticity greater than one suggests that high yields can also be obtained in the present. This also indicates that a strong learning curve was part of the past, in the sense that if good yields were obtained in the past, using an appropriate set of technology, then there is a strong incentive to reapply technology to recover at least the same yield levels.

In general, the yield-real price elasticities are lower than the corresponding area elasticities. This result should not be surprising, since as explained before, to mold an eminently stochastic variable -as are yields-, and subject to contingencies not controlled by farmers, to a deterministic model necessarily reduces the explicative power of the model.

3. Implications of results

Knowledge about elasticities is fundamental in the analysis of economic, macro, and sectorial policies, as well as in their impact and effect on production. Changes in relative product prices, exchange rates, real prices of imported agricultural inputs, interest rates and wages, and therefore the cost of production have a direct effect on producers' decisions as to what crop to produce, how much land to allocate to each product, and how much and what quality of input to utilize.

The advantage that these elasticities provide, especially if they can taken as a constant within a reasonable range of observations, is that they can estimate very quickly the percentage change in the quantities produced, given a percentage change in relevant variables. Thus for example, given a long-term area-price elasticity for corn of 0.40, an increase in the real price in corn of 10% would lead to an increase in cultivated area of 4% over two or more years (long term).[23]

Assuming the same percentage increase in the real price, a 0.5% increase is to be expected in the yields since the long-term yield-price elasticity is 0.05. Summarizing the expected changes in area and yields, the expected increase in the production of white corn would be 4.52% (4% in area increase, 0.5% increase in yield, and 0.02% due to the combined action).

Remembering the relations presented in the previous section, and with the appropriate changes, the production elasticity with respect to price is the sum of the elasticities for the area and yield with respect to price:

$$\epsilon_{qp} = \epsilon_{ap} + \epsilon_{rp}$$

When using the area and yield elasticities of each product, it is important to watch out for the time period assumed for the elasticity and the impact that is expected in the dependent variable. In supply function has factors that induce a movement in the quantity and price variables along the function, and factors which will induce a movement of the function to the right (increase in production) or a movement to the left (decrease in production). Price changes induce a movement along the function; changes in other relevant variables, such as fertilizer prices, induce movement of the function itself. The elasticities of these movements as well as the changes brought about by increases in product prices are not reversible, and therefore not symmetrical.

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[23] The log-log model does not allow a definition of the elasticity for one year (short-term), two, three, etc. years (long-term). The coefficient of the lagged area variable represents the effects that the variable have had on yield. A polinomial distribution model of the lagged variables could desaggregate in more detail the short- and long-term elasticities.

4. Limitations of results

The time series analysis of the supply response functions, and examples of their application are somewhat limited due to the reduced number of observations used in the sample. Only 17 annual observations were available, which is a small sample, statistically speaking. This fact enlarges the confidence intervals of the estimated parameter coefficients.

Even though the real prices for other agricultural inputs were obtained, it was not possible to obtain them for all years in the time series analyzed, forcing a specification of the equations for area and yield which left out some variables which could be very relevant. This deficiency could very well cause some bias in the estimators. Nevertheless, if one assumes that the correlation coefficients between real fertilizer prices and the prices of other inputs (except labor costs) are high, then the real fertilizer price could be accepted as representative of the prices for all other inputs. In this manner one could assume that the estimators are not biased due to the omission of a relevant variable, and furthermore that the variances of these estimators could in fact have decreased since the presence of multicollinearity in the matrix of independent variables was decreased.

The analysis was realized with individual functions for each product. The limitations in the annual time series observations used the analysis did not permit joining the equations of the products in a set of simultaneous equations to facilitate the effects of changes in production (area and yield) in one product on the production of the three others. This deficiency does not allow the analysis of the interrelationships that exist between the production of one grain and the others.

SECTION V

SUMMARY AND CONCLUSIONS

A. Considerations in Regard to the Data

The econometric models and studies, as presented in this report are as good, and as useful as the data used. In order to obtain good estimations from an econometric model, the data used in the model has to represent, as precise as possible, the real conditions which are being studied.

For this study, the raw data was obtained from surveys conducted by DGEA, namely the Quantity and Price Surveys, and the Planting Intention Surveys. The first offered information on prices, quantities, dates, and products sold by department. The Planting Intention Surveys provided information on inputs and yields for each grain, by department. This information not only provided a large geographical coverage, but also a set of basic information on costs, production, and prices.

The time series data used in the study was already summarized, and most of it published by DGEA in its Anuarios de Estadísticas Agropecuarias and its Revista Semestral. Another set of national data, which included some important variables was taken form other publications or obtained directly from DGEA staff members.

It is always possible to improve econometric analysis and estimations by improving the quality and quantity of the information used in the models. Such improvement is related to inclusion of additional variables and data for which there was no information in certain years. There are certain areas where improvement in the information would be of great benefit for future supply response function type of work (as well as other policy related analysis). Some thoughts about how such improvements could come about are as follows:

- collect data on a monthly basis, or at least on a quarterly basis, rather than annually;

- collect information on the quality of grain marketed, when price and volume data is being gathered;

- collect sales volume data and prices received by producers with the Planting Intention Surveys;

- the actual sampling method is based on the area frame sampling system; a collection of a minimum amount of socio-economic data would facilitate a better formulation of the samples by type of producer, farming system, and size of farm;

- installation of a data processing system which would allow different ways of processing and presenting the information such as by department, by key variables, or by any other criteria which the analyst considers useful;

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- installation of a data processing system which would permit an efficient information processing operation, and a rapid transfer of the data to analytical programs, as well as to models with a specific application such as statistical and econometric models;

- if the persons surveyed under the area frame sampling system are not pre-selected with a random selection process, then it is necessary to install such standard selection system in order to assure that the information being gathered is random, and that any bias is reduced to a minimum.

B. Conclusions in Relation to the Statistics

Some of the statistical analysis undertaken, such as the estimation of the correlations, co-variances, and comparisons of arithmetic means used a sub-sample which came from the surveys on prices and quantities, and to a lesser extent from the planning intention surveys. It must be emphasized that these results must be interpreted with caution. The surveys are based on area sampling and not on political division, that is by departments. Therefore, the conclusions based on departmental summaries cannot be generalized without great caution, nor can they be applied to zones, where, for different reasons the surveys were not carried out. Consequently, these results should be used more as indicators rather than conclusive and final figures. Additionally, the sub-sample was not obtained in a completely random fashion, which again does restrain the use and interpretation of the estimators.

Some tentative conclusions can be provided, based on the statistical analysis of the data obtained:

- a frequency analysis of the data indicates a predominance of small lots in the area cultivated. This finding is in complete agreement with the findings of the land tenure studies. All this findings can be used to support a policy to stimulate the formation of associations or cooperatives which will tend to facilitate the use of economies of scale in the production and marketing of these products;

- The statistical analysis also indicates the predominance of small volumes (less than 10 qq) in the sales transactions of basic grains. A positive correlation between prices and volumes sold could not be established without ambiguity. This suggests that there is some potential to introduce economies of scale in the assembly process, storage, and distribution, and therefore, the potential to reduce marketing costs.

- a strong and significant difference was found between the average prices during planting and harvesting seasons; this suggests that storage can be a profitable activity. This result offers a justification to formulate a privatization policy for associated services, as well as the public grain handling and storage facilities, and demonstrates the profit potential that this activity offers to the private sector;

- a significant difference was also found in the average prices among departments during the harvest time. While the existence of significant spatial price differences are apparent, the lack of information on

transportation costs makes it impossible to analyze whether and arbitrage opportunity in the grain markets exists during the harvest time.

C. Conclusions in Regard to the Econometric Analysis

As with the results of the statistical analysis, the results of the econometric analysis should be used with caution. The time series analysis was done based on an annual series of data; as a result the number of observations was limited, which reduces the confidence which can be put on the estimators and coefficients. The results do not represent a conclusive behavior or coefficients, rather they are indications of trends and changes that have occurred in production.

The cross-sectional data was obtained from one year's observation, which provided 14 observations, one per department. The data was too dispersed and without any discernible pattern which would have permitted some acceptable functional application. In other words, the data did not permit the establishment of reasonable causal relations. Nevertheless, the scarcity of publications of cross-sectional studies on production should be pointed out (to define supply curves rather than supply response curves), especially in developing countries.

From the econometric study, the following tentative conclusions can be presented:

- the results of the functions applied to the production of basic grains do correspond to the expected values and signs. Consequently, the elasticity numbers can be useful as guides for analysis and policy formulation, however as indicators and not as precise estimators;

- as far as we know, this is the first formulation of supply response functions for basic grains in El Salvador. Therefore, there are no previous estimates of elasticities with which a comparison of those found in this study could be made. Therefore, though the estimated elasticities do fall within a normal range, it is not possible to compare them with results of other studies in order to judge them and determine their proximity to reality;

- the estimated elasticities are less than unity, and therefore, they are inelastic. This is to be expected from a production function for a system characterized by low commercial production, or to the contrary by a large component of subsistence agriculture.

- the elasticities measure the observable percentage changes in a variable, say in the area cultivated with corn, given a change in an independent variable, say in the price of corn. Therefore, an elasticity of 0.6 percent between the cultivated area and the price of corn implies that a 1 percent increase in the price of corn will lead to a 0.6 percent increase in the area planted to corn. The use of these elasticity numbers offer an invaluable tool to analyze and formulate economic policies since their impact can be assessed before the policies are implemented (say, what is going to happen to corn production if prices are altered by a given policy, the import price band for example);

- for example, a strong relationship between domestic and international prices for grains has been established through the import price band. This implies that changes in the factors which determine the import price band, such as the ad valorem import tariff will change the import prices, and through their behavior the national prices as well. Consequently, the impact of a policy which affects the performance of national corn production via an import policy tool (the import price band) can be measured using the elasticities estimated in this study.

This study on supply response functions of basic grains in El Salvador represents an attempt to stimulate research and formulation of policies, based of objective numbers in regard to their potential impacts. There are many reasons why this type of research should be continued and deepened. The results of this study can be linked with those of other studies, such as the demand study (next in line), the agrochemical industry and seed studies, etc., which form the basis for a set of critical tools useful in the process for sound policy analysis and formulation. On the other hand, the supply response function study is not the type of study that is undertaken once, but on the contrary it represents an on-going and evolutionary process, very similar to changes in economic policies, and in the evolution of factors which affect the decisions taken by agricultural producers. The ultimate objective of this type of study is to provide decision makers with information and guidance to enable them to analyze potential impacts of policy decisions to be taken, and on the other hand to evaluate the changes in expectations by economic agents in regard to their production decisions. It is very valuable to be able to quantify, even in broad terms, and a priory the potential effects of policy decisions in order to asses whether the expected impacts coincide precisely with the objectives of the change in policy.

SECTION VI

FUTURE RESEARCH AND ANALYSIS PERSPECTIVES

A. Human Resources and Equipment

The suggestions on possibilities for empirical research and sub-sectoral analysis which are outlined in this Section are based on the clear need for institutional development in the offices in charge of processing and analyzing statistical information. It is indispensable to improve the Statistical Division of DGEA, in at least these three important areas:

1. Increasing level of skills of technical personnel

The technicians working in the Statistical Division of DGEA are experienced surveyors with a good knowledge of basic grains production situation in El Salvador. These attributes are a valuable asset which should be taken advantage. Unfortunately, this very fact can also lead to overconfidence in their skills and knowledge in the area where they work on daily basis, and lead them to complete the surveys and questionnaires without the statistical rigor needed for a survey.

The scientific rigor and the professional interest of the personnel can be enhanced with the following suggestions:

- implementing short-term courses in statistical topics, such as description methods, analysis of variance, regression, sampling; agricultural economics, grain markets, micro-economic principles, simple linear programming. This short courses should be organized by level, according to the needs of the survey teams, data processors and statistical analysts, and economic analysts. Even though the technical personnel might not apply this knowledge directly to their work, it is both important and morally stimulating for them to understand the result of their work, its application, and the impact that can be obtained from gathering and processing information;

- augmenting the training in the application of micro computers and programs relevant for the entry and statistical analysis of information, such as data bases, electronic worksheets, and statistics; in similar fashion it is stimulating for the technical personnel to periodically or routinely be able to use these modern tools of analysis;

- proposing common and shared objectives, which in order to be achieved will require the enthusiastic participation of everyone, including the idea that the division will not only generate information useful for specialized analysts, but that the opportunity exists for the very same technicians to use their own numbers to improve their publications, and in general, improve their contribution for a better understanding of the agricultural sector in their country.

The objective of these recommendations is to improve the skills of the personnel of the division as well as to increase their moral and enthusiasm for their work.

2. Equipment and programs

Until now a great portion of the processing and assembly of the data generated by DGEA is being done by the computing center of MAG. This process has certain disadvantages. One of then is the time it takes to process the data and the subsequent delays in the publication of the statistics. Another serious disadvantage of this arrangement is the lack of flexibility for adopting changes in the way the data is being processed. For example, if someone wishes to obtain the data desaggregated by department, or by regions, or by size of holding, based on the information contained in the surveys of DGEA, it would be necessary to explain to the personnel of the computing center what is needed and how to do it. For reasons typical of how bureaucracies function this task would take a considerable amount of time. A final disadvantage is the problem of access to old survey material that has been processed.

It is recommended that the data processing system of the DGEA be strengthened by adding additional micro computers in order to enable staff to undertake their own data processing procedures, be able to obtain final results in less time, and facilitate changes in the way the data is being processed and published.

Together with the computers the appropriate software should also be made available. At least the following two programs should be introduced, namely a data base program to enter the raw survey data and to manipulate and assemble it in different ways, and a statistical analysis program.

We have observed that the staff uses and electronic worksheet to enter the survey data. Aside from the difficulty in entering such raw data in a worksheet, and its subsequent management and processing, the risk of entry errors is very high. A data management program such as DBase not only reduces the task but also the possibility of data entry errors.

It is also recommended that DGEA be provided with a good statistical program, compatible with the data management program, so that the interchange of data between the two programs is made easy. There are several of these in the market, from very simple to quite sophisticated ones. Simple programs include Microstat and ABstat; more complicated programs include SAS, SPSS, SYSTAT and Statgraphics.

B. Data Gathering Process

The method used by DGEA to obtain raw data is known as area frame sampling, which has been used extensively in the U.S.. The establishment of area frames require agro-ecological and socio-economic surveys and the selection of a variable or a set of classifying variables to determine the segments. The area frames used by DGEA for its statistical work is not current. Furthermore, the predominant variable used to classify the areas and the segments has been the agronomic use of the soil [24].

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[24] A description of this methodology is contained in the Marco Muestral por Probabilidad de Area en El Salvador, MAG-DGEA, División de Estadísticas Agropecuarias, San Salvador, July 1980.

It is probable that the age of the area frame, and above all the exclusive use of the soil use as the only variable in the conformation of the sample frames, have resulted in an exaggerated deviation towards small farms in the survey results. The statistical and econometric analysis undertaken has permitted very little observation about commercial farms -less than 5 in each grain in more than 80 cases for each-. Practically there is no information on relatively large farms, which would be considered commercial farms.

Based on conversations with DGEA personnel and careful revision of the planting intention and producer price surveys used in this study, it looks as if the data is gathered based on a selection of cases which happens by chance rather than based on a rigorous random sample of the survey units. It is important that this process be reviewed to assure that the selection of cases to be surveyed is a random one, if the random selection process has been established as the norm for the selection process. Emphasis is made on this issue, since the peace process allows coverage of the whole country.

In the process of summarizing the information for this study the opportunity was given to review carefully the survey forms utilized to gather the raw data. They appear to be adequate and they seem to contain the information required to undertake the types of studies such as the one undertaken here.

Our suggestion to improve the surveys is that some portions of the survey form for planting intentions be reorganized to allow registry of production as well as the uses of the product such as on-farm human consumption, seed, other on-farm uses, and sales; other important factors such as quality of the product (variety, humidity, foreign matter, if possible), price by quality, and site of sales.

With respect to the questionnaire on producer prices, aside from registering the quantity and price of the product, it is important to include the quality and the site where the sale took place.

C. Extension and Refinement of Analysis

As previously explained, the econometric study was concentrated on formulating individual supply response functions for each grain. Even in this simple process, the strong limitations of the reduced number of observations, as well as the reduced number of some key variables for which there is complete and reliable information, was noticeable.

The use of available information, nevertheless resulted in an important contribution from the point of view of formulation and analysis of economic policies, and above all a concrete illustration of methodology for future research of this type. Nevertheless, it should be emphasized that the estimated indicators can only serve as guidelines to orient analytical research and direct economic policy actions.

There is ample room for future research in econometric analysis. The study of supply response functions for basic grains requires that the equations be treated as a system of simultaneous or near-simultaneous equations. A system of functions of this kind would allow analysis of the grain sub-sector as a whole system. Various models or functional specifications allow for such an approach,

such as a system of simultaneous equations, or a system of seemingly unrelated equations, to mention two. The equation solving methods are also varied such as two steps regression, three steps regression, maximum likelihood, and generalized regression. The range for empirical research is really big and achievable, assuming the necessary data is available. It would be also interesting to try non-linear regression models, especially with cross-sectional data to measure the income and substitution effects of an increase in product prices.

SECTION VII

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APPENDIX 1

TERMS OF REFERENCE

3. STUDY: IMPACT OF MACRO POLICY CHANGES AND STRUCTURAL REFORM PROGRAMS ON FARMING PATTERNS AND SUPPLY RESPONSE OF BASIC GRAINS AND BEANS

OBJECTIVES:

In light of the on-going macro changes and structural reform programs taking place, device a programmatic approach that would allow measurement of changes in farming patterns and supply response of basic food grains and beans in the near future.

RATIONALE:

Due to policy changes and structural adjustment programs taking place, agricultural production supply patterns will adjust in years to come. The relational shift between real prices for farm products and input costs will encourage farmers to change their production patterns and, therefore their supply response for individual commodities. Even with higher real prices for basic grains and beans, farmers may elect to switch some of their grain production resources (say land or labor) to higher value commodities (if technical factors permit) if the factor cost to product value relationship is more favorable than in grains and beans. In other words, higher real grain prices does not necessarily imply greater production levels, unless nothing else can be grown.

UTILIZATION OF RESULTS:

This information would be used by the GOES, USAID/El Salvador, other donors and financial agencies in planning and coordinating the implementation of a quantitative methodology that would enable policy planners (1) to assess potential impacts of policy changes on grain and bean production, and (2) monitor supply response between crop cycles as factors of production and product prices change.

STEPS TO BE FOLLOWED IN IMPLEMENTING THE ACTIVITY:

1. Conduct literature review prior to field work.

2. Conduct an in-country appraisal mission to (1) review literature base available at USAID and host government institutions, (2) review current statistical bases being kept that may contain the needed analytical information, (3) review technical and professional skills of researches at public and private institutions that are or would be capable of conducting such continuous research, (4) develop a programmatic approach for the application of appropriate analytical methodologies (such as optimization tools of policy analysis matrix) to measure changes in production patterns and supply response and (5) develop follow-up technical assistance and training components to upgrade data bases, train personnel and implement recommended analytical processes and dissemination of information.

3. Develop (1) conclusions and (2) action recommendations to assure timely and effective execution of programmatic approach for development of appropriate analytical methodologies, follow-up technical assistance and training.

4. Provide GOES and USAID officials with final team report in English one week before departure.

5. Conduct seminar/workshop with public sector officials and USAID personnel prior to departure. Results of presentation and discussion feedback will be included in final English report.

6. Translate and type report in Spanish (in the USA).

7. Submit final Spanish report to USAID/El Salvador.

APPENDIX 2

CONTACTOS

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3. DGEA
   Ing. Julio Gonzalez, Sub-Director
   Sr. Franklin Mena

4. US/AID
   Dr. Ken Ellis, RDO, Chief
   Dr. Mike Wise, RDO, Project Officer

APPENDIX 3

WEEKLY HOUSEHOLD EXPENSES

GASTOS MENSUAL DE HOGAR, 1990-91

Composición del Gasto	Nacional Total (Colones)	% del Total	Promedio Hogares (Colones)
Total de Gastos	1,406,907,346	100.00	2,621.89
Alimentos, Bebidas Y Tobaco *	531,702,845	37.79	990.87
Maiz y productos de maiz	37,760,013	2.69	70.37
Arroz	11,308,442	0.80	21.07
Sorgo	216,356	0.02	0.40
Frijoles	19,681,136	1.40	36.68
Vivienda	313,533,935	22.29	584.30
Vestimenta y Calzado	94,670,892	6.73	176.43
Gastos Varios y Diversos	481,025,122	33.19	870.29

* Incluendo granos basicos

Fuente: Encuestra Nacional de Ingresos y Gastos de Hogares
MIPLAN - UIM

FILE: GASTOS.WQ1

APPENDIX 4

COSTS OF PRODUCTION

COSTOS DE PRODUCCION DE MAICILLO NACIONAL

COSECHA 1990/1991

Superficie : 1 Mz.
Producción : 23.90 QQ.

	CANTIDAD	COSTO	TOTAL
INSUMOS			260.58
Semilla	19.00 Lbs.	12.99	
Sulfato de Amonio	2.29 QQ.	106.82	
Insecticidas		49.50	
Herbicidas		91.27	
	JORN./PASES	COSTO	TOTAL
PREPARACION DE TIERRA			62.37
Chapoda Manual	5	62.37	
SIEMBRA			52.75
Siembra manual	4	52.75	
LABORES DE CULTIVO			266.29
Primera Fertilización	1	13.27	
Segunda Fertilización	1	12.56	
Primera Limpia	7	96.53	
Segunda Limpia	6	83.05	
Aplicación de Pesticidas	4	60.88	
COSECHA			238.55
Corte	8	109.87	
Aporreo y Aventado	8	98.87	
Secado y Ensacado	2	29.81	
Transporte Interno	23.90 QQ.		38.55
Sub-Total			919.09
Administración 3%			27.57
Sub-Total			946.66
Imprevistos 5%			47.33
Sub-Total			993.99
Intereses 17%			126.73
Sub-Total			1,120.72
Arrendamiento			126.54
COSTO TOTAL			1,247.26
COSTO UNITARIO			52.19

COSTOS DE PRODUCCION DE MAIZ NACIONAL

COSECHA 1990/1991

Superficie : 1 Mz.
Producción : 34.52 QQ.

	CANTIDAD	COSTO	TOTAL
INSUMOS			640.50
Semilla	30.00 Lbs.	24.99	
Formula 16-20-0	2.83 QQ.	218.34	
Sulfato de Amonio	4.50 QQ.	213.11	
Insecticidas		64.87	
Herbicidas		119.19	
	JORN./PASES	COSTO	TOTAL
PREPARACION DE TIERRA			270.12
Chapoda Manual	7	90.70	
Arado (bueyes)	1	34.20	
Rastra Pesada (tractor)	1	110.12	
Surqueado (bueyes)	1	35.10	
SIEMBRA			50.30
Siembra manual	4	50.30	
LABORES DE CULTIVO			329.81
Primera Fertilización	2	25.53	
Segunda Fertilización	2	24.98	
Tercera Fertilización	1	12.40	
Primera Limpia	6	76.76	
Segunda Limpia	6	73.01	
Primer Cultivo (bueyes)	1	28.05	
Segundo Cultivo (bueyes)	1	29.02	
Aplicación de Pesticidas	5	60.06	
COSECHA			330.36
Dobla	6	69.62	
Tapizca	8	102.66	
Destuce y Desgranado manual	10	127.80	
Secado y Ensacado	2	30.28	
Transporte Interno	34.52 QQ.		44.43
Sub-Total			1,665.52
Administración 3%			49.97
Sub-Total			1,715.49
Imprevistos 5%			85.77
Sub-Total			1,801.26
Intereses 17%			229.66
Sub-Total			2,030.67
Arrendamiento			135.95
COSTO TOTAL			2,166.62
COSTO UNITARIO			62.76

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COSTOS DE PRODUCCION DE MAIZ HIBRIDO

COSECHA 1990/1991

Superficie : 1 Mz.
Producción : 50.35 QQ.

	CANTIDAD	COSTO	TOTAL
INSUMOS			829.03
Semilla	33.00 Lbs.	70.42	
Formula 16-20-0	3.98 QQ.	285.52	
Sulfato de Amonio	4.89 QQ.	215.69	
Insecticidas		114.43	
Herbicidas		132.82	
Otros		10.15	
	JORN./PASES	COSTO	TOTAL
PREPARACION DE TIERRA			446.19
Chapoda Manual	5	64.34	
Arado (bueyes)	1	45.83	
Rastra Liviana (tractor)	1	93.20	
Rastra Pesada (tractor)	2	202.92	
Surqueado (bueyes)	1	39.90	
SIEMBRA			52.96
Siembra manual	4	52.96	
LABORES DE CULTIVO			405.49
Primera Fertilización	2	29.76	
Segunda Fertilización	2	27.12	
Tercera Fertilización	1	11.85	
Primera Limpia	7	90.69	
Segunda Limpia	7	87.29	
Primer Cultivo (bueyes)	1	44.91	
Segundo Cultivo (bueyes)	1	36.90	
Aplicación de Pesticidas	6	76.97	
COSECHA			381.78
Dobla	6	76.21	
Tapizca	8	105.74	
Destuce y Desgranado Manual	13	169.67	
Secado y Ensacado	2	30.16	
Transporte Interno	50.35 QQ.		61.50
Sub-Total			2,176.95
Administración 3%			65.31
Sub-Total			2,242.26
Imprevistos 5%			112.11
Sub-Total			2,354.37
Intereses 17%			300.18
Sub-Total			2,654.55
Arrendamiento			151.60
COSTO TOTAL			2,806.15
COSTO UNITARIO			55.73

COSTOS DE PRODUCCION FRIJOL MAYO

COSECHA 1990/1991

Superficie : 1 Mz.
Producción : 11.40 QQ.

	CANTIDAD	COSTO	TOTAL
INSUMOS			648.23
Semilla	110.0 Lbs.	266.07	
Formula 16-20-0	2.0 QQ.	162.05	
Foliares		20.03	
Insecticidas		99.45	
Herbicidas		84.04	
Fungicidas		16.59	
	JORN./PASES	COSTO	TOTAL
PREPARACION DE TIERRA			342.34
Chapoda Manual	10	124.41	
Arado (bueyes)	1	24.83	
Rastra Liviana (tractor)	1	96.40	
Surqueado (bueyes)	1	96.70	
SIEMBRA			111.37
Siembra manual	9	111.37	
LABORES DE CULTIVO			275.73
Primera Fertilización	2	24.03	
Segunda Fertilización	1	12.94	
Primera Limpia	6	81.14	
Segunda Limpia	4	40.94	
Aplicación de Pesticidas	7	116.68	
COSECHA			262.45
Corte manual	11	133.73	
Aporreo y Aventado	8	98.42	
Secado y Ensacado	2	30.30	
Transporte Interno	11.40 QQ.		41.70
Sub-Total			1,681.82
Administración 3%			50.45
Sub-Total			1,732.27
Imprevistos 5%			86.61
Sub-Total			1,818.89
Intereses 17%			231.91
Sub-Total			2,050.80
Arrendamiento			164.47
COSTO TOTAL			2,215.27
COSTO UNITARIO			194.32

COSTOS DE PRODUCCION DE FRIJOL AGOSTO

COSECHA 1990/1991

Superficie : 1 Mz.
Producción : 12.23 QQ.

	CANTIDAD	COSTO	TOTAL
INSUMOS			783.00
Semilla	95.00 Lbs.	294.63	
Formula 16-20-0	2.27 QQ.	188.18	
Foliares		17.18	
Insecticidas		110.71	
Herbicidas		148.73	
Fungicidas		23.57	
	JORN./PASES	COSTO	TOTAL
PREPARACION DE TIERRA			119.34
Chapoda Manual	9	119.34	
SIEMBRA			138.22
Siembra manual	9	138.22	
LABORES DE CULTIVO			328.49
Primera Fertilización	2	29.21	
Segunda Fertilización	2	24.10	
Primera Limpia	8	101.97	
Segunda Limpia	5	72.39	
Aplic. de Pesticidas, foliar	8	100.82	
COSECHA			269.07
Corte o Arrancado	11	156.22	
Aporreo y Aventado	7	92.42	
Secado y Ensacado	2	20.43	
Transporte Interno	12.23 QQ.		23.47
Sub-Total			1,661.59
Administración 3%			49.85
Sub-Total			1,711.44
Imprevistos 5%			85.57
Sub-Total			1,797.01
Intereses 17%			229.12
Sub-Total			2,026.13
Arrendamiento			138.46
COSTO TOTAL			2,164.59
COSTO UNITARIO			176.99

COSTOS DE PRODUCCION DE ARROZ

COSECHA 1990/1991

Superficie : 1 Mz.
Producción : 68.13 QQ. Granza.

	CANTIDAD	COSTO	TOTAL
INSUMOS			1,420.48
Semilla	2.40 QQ.	325.85	
Formula 16-20-0	3.60 QQ.	278.24	
Sulfato de Amonio	4.40 QQ.	206.66	
Foliares		23.28	
Insecticidas		202.54	
Herbicidas		293.40	
Fungicidas		90.51	
	JORN./PASES	COSTO	TOTAL
PREPARACION DE TIERRA			509.47
Chapoda Manual	7	71.86	
Arado (bueyes)	1	52.98	
Rastra Liviana (tractor)	2	174.60	
Rastra Pesada (tractor)	2	166.80	
Surqueado (bueyes)	1	43.23	
SIEMBRA			60.81
Siembra manual	4	60.61	
LABORES DE CULTIVO			679.51
Primera Fertilización	2	25.32	
Segunda Fertilización	2	26.35	
Tercera Fertilización	2	26.61	
Primera Limpia	15	191.47	
Segunda Limpia	13	167.34	
Tercera Limpia	6	95.05	
Primer Cultivo (bueyes)	1	22.39	
Segundo Cultivo (bueyes)	1	25.60	
Aplicación de Pesticidas	7	99.38	
COSECHA			379.65
Corte manual	14	191.80	
Aporreo y Aventado	10	137.93	
Secado y Ensacado	4	49.92	
Transporte Interno	68.13 QQ.		73.30
Sub-Total			3,123.22
Administración 3%			93.70
Sub-Total			3,216.92
Imprevistos 5%			160.85
Sub-Total			3,377.76
Intereses 17%			430.66
Sub-Total			3,808.43
Arrendamiento			216.68
COSTO TOTAL			4,025.11
COSTO UNITARIO			59.08

FILE: RICECOST.WQ1

APPENDIX 5

BASIC GRAINS HARVEST BY MONTH

Volumen Cosechado de Granos Básicos, Según Mes

Cosecha 1990 - 1991

Quintales

Mes	Maíz	Sorgo	Frijol	Arroz
Enero	64,300	1,939,600	7,100	10,800
Febrero	25,100	140,600	48,400	0
Marzo	0	0	26,900	0
Abril	13,100	0	0	109,000
Mayo	39,300	0	0	128,300
Junio	26,300	0	0	0
Julio	21,200	26,000	64,700	0
Agosto	1,253,300	54,700	63,000	33,600
Septiembre	1,179,600	8,900	8,200	481,700
Octubre	3,353,800	200,800	72,800	354,700
Noviembre	5,846,700	210,700	807,400	208,300
Diciembre	1,277,500	910,500	46,900	14,700

Fuente: Política Agrícola, Vol. I, Aug 1991.

FILE: COSECHA.WQ1

APPENDIX 6

SEASONAL PRICE INDEXES

INDICES DE ESTACIONALIDAD - ARROZ

MESES	INDICE ESTACION Si	ERROR ESTANDAR se	Si 68%	Si 95%
ENE	0.97	0.0595	1.03	1.09
FEB	0.99	0.0393	1.03	1.07
MAR	0.99	0.0604	1.05	1.11
ABR	1.02	0.0368	0.99	0.95
MAY	1.02	0.0391	0.98	0.94
JUN	1.04	0.0862	0.95	0.87
JUL	1.07	0.0940	0.97	0.88
AGO	1.05	0.0540	1.00	0.94
SEP	1.02	0.0416	0.98	0.94
OCT	0.97	0.0586	1.03	1.09
NOV	0.94	0.0669	1.00	1.07
DIC	0.91	0.0765	0.99	1.07

INDICES DE ESTACIONALIDAD - FRIJOLES

MESES	INDICE ESTACION Si	ERROR ESTANDAR se	Si 68%	Si 95%
ENE	0.94	0.0730	1.01	1.08
FEB	0.94	0.0714	1.01	1.08
MAR	1.01	0.0675	0.94	0.87
ABR	1.05	0.1206	0.93	0.81
MAY	1.04	0.1184	0.92	0.81
JUN	1.12	0.1482	0.97	0.82
JUL	1.14	0.2375	0.90	0.66
AGO	0.95	0.1253	1.08	1.20
SEP	0.99	0.1547	1.14	1.30
OCT	1.02	0.2244	0.80	0.57
NOV	0.91	0.0918	1.01	1.10
DIC	0.89	0.0735	0.96	1.04

INDICES DE ESTACIONALIDAD - MAIZ

MESES	INDICE ESTACION Si	ERROR ESTANDAR se	Si 68%	Si 95%
ENE	0.92	0.0473	0.96	1.01
FEB	0.91	0.0412	0.95	0.99
MAR	0.97	0.0745	1.04	1.12
ABR	1.05	0.0964	0.95	0.86
MAY	1.07	0.0915	0.98	0.89
JUN	1.10	0.0905	1.01	0.91
JUL	1.11	0.0901	1.02	0.93
AGO	1.16	0.1491	1.01	0.86
SEP	1.03	0.1201	0.91	0.79
OCT	0.91	0.0772	0.99	1.06
NOV	0.90	0.0674	0.96	1.03
DIC	0.89	0.0572	0.95	1.00

INDICES DE ESTACIONALIDAD - SORGO

MESES	INDICE ESTACION Si	ERROR ESTANDAR se	Si 68%	Si 95%
ENE	0.88	0.0790	0.96	1.04
FEB	0.86	0.0695	0.92	0.99
MAR	0.88	0.0638	0.95	1.01
ABR	0.90	0.0675	0.97	1.04
MAY	0.93	0.0312	0.96	0.99
JUN	0.99	0.0549	1.05	1.10
JUL	1.02	0.0445	0.98	0.93
AGO	1.10	0.0724	1.03	0.96
SEP	1.10	0.0617	1.04	0.98
OCT	1.10	0.1097	0.99	0.88
NOV	1.17	0.1813	0.98	0.80
DIC	1.07	0.0994	0.97	0.87

APPENDIX 7

NATIONAL AREA, PRODUCTION AND YIELD

RICE AREA, PRODUCTION AND YIELD

Crop Year	Area (Mz)	Production (qq/Mz)	Yield (qq/Mz)
61-62	12,710	388,700	30.6
62-63	15,519	557,233	35.9
63-64	12,234	448,597	36.7
64-65	21,150	718,971	34.0
65-66	18,900	758,123	40.1
66-67	28,178	1,096,179	38.9
67-68	40,000	1,692,240	42.3
68-69	39,000	1,730,700	44.4
69-70	15,300	775,700	50.7
70-71	17,000	961,550	56.6
71-72	20,920	1,192,300	57.0
72-73	15,700	774,600	49.3
73-74	13,600	809,500	59.5
74-75	15,900	697,700	43.9
75-76	24,200	1,320,000	54.5
76-77	19,710	776,100	39.4
77-78	17,800	712,600	40.0
78-79	19,850	1,104,500	55.6
79-80	21,100	1,266,200	60.0
80-81	24,000	1,320,000	55.0
81-82	19,800	1,089,790	55.0
82-83	16,000	770,000	48.1
83-84	18,000	940,000	52.2
84-85	21,900	1,376,000	62.8
85-86	24,700	1,497,600	60.6
86-87	17,200	1,020,400	59.3
87-88	16,700	914,550	54.8
88-89	19,700	1,245,900	63.2
89-90	22,200	1,385,200	62.4
YEAR	AREA	PRODUCTION	YIELD
61-65	15,403	528,375	34
71-75	16,530	868,525	52
81-85	18,925	1,043,948	55
86-90	18,950	1,141,513	60

Source: DGEA

FILE: RICE.WQ1

SORGHUM AREA, PRODUCTION AND YIELD

	AREA (Mz)			PRODUCTION (QQ)			YIELDS (QQ/Mz)		
Crop Year	National	Improved	Total	National	Improved	Total	National	Improved	Total
61-62			140,470			1,835,510			13.1
62-63			150,189			2,429,235			16.2
63-64			143,453			2,117,024			14.8
64-65			124,455			1,907,450			15.3
65-66			158,700			2,295,900			14.5
66-67			153,719			2,493,049			16.2
67-68			148,400			2,350,000			15.8
68-69			162,500			2,700,200			16.6
69-70			162,575			2,784,100			17.1
70-71			177,400			3,199,700			18.0
71-72			180,000			3,400,000			18.9
72-73			186,400			3,170,000			17.0
73-74			170,000			3,400,000			20.0
74-75			182,000			2,850,000			15.7
75-76			189,100			3,800,000			20.1
76-77			178,500			3,399,200			19.0
77-78	176,455	12,344	188,799	2,440,635	344,364	2,784,999	13.8	27.9	14.8
78-79	183,742	11,658	195,400	3,486,979	330,721	3,817,700	19.0	28.4	19.5
79-80	192,430	12,570	205,000	3,140,945	344,055	3,485,000	16.3	27.4	17.0
80-81	160,233	10,467	170,700	2,740,689	300,211	3,040,900	17.1	28.7	17.8
81-82	154,915	10,025	164,940	2,658,594	291,686	2,950,280	17.2	29.1	17.9
82-83	161,807	8,193	170,000	2,503,333	196,667	2,700,000	15.5	24.0	15.9
83-84	145,170	12,830	158,000	2,375,140	301,960	2,677,100	16.4	23.5	16.9
84-85	147,500	18,500	166,000	2,433,000	620,900	3,053,900	16.5	33.6	18.4
85-86	145,000	18,400	163,400	2,419,100	463,700	2,882,800	16.7	25.2	17.6
86-87	150,200	21,300	171,500	2,630,200	576,600	3,206,800	17.5	27.1	18.7
87-88	150,500	28,200	178,700	458,740	105,460	564,200	3.0	3.7	3.2
88-89	147,400	26,800	174,200	2,748,800	583,900	3,332,700	18.6	21.8	19.1
89-90	141,700	29,200	170,900	2,606,600	643,100	3,249,700	18.4	22.0	19.0
YEAR			AREA			PRODUCTION			YIELD
61-65			139,642			2072304.8			14.8
71-75			179,600			3205000.0			17.9
81-90			164,735			2845320.0			17.3
86-90			173,825			2588350.0			15.0

Source: DGEA

FILE: SORGHUM.WQ1

AREA, PRODUCTION, AND YIELD OF WHITE CORN

Crop Year	AREA (Mz) National	AREA (Mz) Hybrid	AREA (Mz) Total	PRODUCTION (qq) National	PRODUCTION (qq) Hybrid	PRODUCTION (qq) Total	YIELD (qq/Mz) National	YIELD (qq/Mz) Hybrid	YIELD (qq/Mz) Total
61-62	210,700	11,095	221,795	2,750,855	393,810	3,144,665	13.1	35.5	14.2
62-63	260,302	22,292	282,594	3,750,589	878,592	4,629,181	14.4	39.4	16.4
63-64	219,448	27,238	246,686	3,411,530	1,090,135	4,501,665	15.5	40.0	18.2
64-65	217,017	19,775	236,792	3,451,601	713,850	4,165,451	15.9	36.1	17.6
65-66	241,640	34,180	275,820	3,278,275	1,134,900	4,413,175	13.6	33.2	16.0
66-67	247,060	49,540	296,600	3,930,329	1,850,401	5,780,730	15.9	37.4	19.5
67-68	244,215	29,880	274,095	3,469,900	1,070,100	4,540,000	14.2	35.8	16.6
68-69	233,840	51,510	285,350	3,605,150	1,993,750	5,598,900	15.4	38.7	19.6
69-70	179,340	97,960	277,300	2,613,900	3,450,600	6,064,500	14.6	35.2	21.9
70-71	196,620	97,580	294,200	3,760,310	4,132,690	7,893,000	19.1	42.4	26.8
71-72	200,300	100,000	300,300	3,895,000	4,305,000	8,200,000	19.4	43.1	27.3
72-73	167,320	125,480	292,800	2,111,725	3,035,715	5,147,440	12.6	24.2	17.6
73-74	146,125	141,125	287,250	3,054,040	5,761,600	8,815,640	20.9	40.8	30.7
74-75	135,775	166,325	302,100	1,917,900	5,750,600	7,668,500	14.1	34.6	25.4
75-76	143,535	208,165	351,700	2,388,210	7,160,590	9,548,800	16.6	34.4	27.2
76-77	136,517	197,983	334,500	1,944,977	5,499,123	7,444,100	14.2	27.8	22.3
77-78	154,266	195,513	349,779	2,181,164	6,074,005	8,255,169	14.1	31.1	23.6
78-79	166,800	210,800	377,600	2,946,400	8,074,200	11,020,600	17.7	38.3	29.2
79-80	133,468	260,832	394,300	1,947,337	9,417,163	11,364,500	14.6	36.1	28.8
80-81	141,546	275,454	417,000	1,946,709	9,501,039	11,447,748	13.8	34.5	27.5
81-82	121,058	273,942	395,000	1,778,320	9,089,495	10,867,815	14.7	33.2	27.5
82-83	104,951	236,049	341,000	1,462,710	7,537,290	9,000,000	13.9	31.9	26.4
83-84	101,645	243,355	345,000	1,447,315	8,185,685	9,633,000	14.2	33.6	27.9
84-85	103,110	244,590	347,700	2,094,500	9,367,000	11,461,500	20.3	38.3	33.0
85-86	104,510	257,590	362,100	1,942,200	8,827,000	10,769,200	18.6	34.3	29.7
86-87	112,370	255,730	368,100	2,025,440	7,474,560	9,500,000	18.0	29.2	25.8
87-88	139,800	258,700	398,500	2,821,590	9,754,300	12,575,890	20.2	37.7	31.6
88-89	148.100	254,700	402,800	3,686,800	9,269,400	12,956,200	24.9	36.4	32.2
89-90	152,700	242,000	394,700	3,968,400	8,825,900	12,794,300	26.0	36.5	32.4
90-91	171,600	231,000	402,600			0	0.0	0.0	0.0

YEAR	AREA	PRODUCTION	YIELD
61-65	246,967	4,110,241	17
71-75	295,613	7,457,895	25
81-85	357,175	10,240,579	29
86-90	391,025	11,956,598	30

Source: DGEA

FILE: CORN.WQ1

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BEAN AREA, PRODUCTION AND YIELD

Crop Year	Area (Mz)	Production (qq/Mz)	Yield (qq/Mz)
61-62	30,700	227,815	7.4
62-63	47,044	398,959	8.5
63-64	39,690	314,400	7.9
64-65	30,541	269,082	8.8
65-66	33,600	359,700	10.7
66-67	37,761	336,120	8.9
67-68	40,595	380,120	9.4
68-69	45,270	462,400	10.2
69-70	46,965	571,460	12.2
70-71	51,600	649,500	12.6
71-72	57,000	750,000	13.2
72-73	56,850	595,700	10.5
73-74	64,440	814,700	12.6
74-75	73,470	732,200	10.0
75-76	79,800	861,800	10.8
76-77	75,540	870,100	11.5
77-78	75,125	733,540	9.8
78-79	74,000	933,000	12.6
79-80	78,700	1,011,330	12.9
80-81	75,000	866,500	11.6
81-82	71,000	831,820	11.7
82-83	79,400	830,000	10.5
83-84	80,500	918,300	11.4
84-85	82,500	1,056,000	12.8
85-86	83,300	751,200	9.0
86-87	87,100	1,093,900	12.6
87-88	89,300	531,000	5.9
88-89	96,100	1,240,000	12.9
89-90	91,600	968,900	10.6
YEAR	AREA	PRODUCTION	YIELD
61-65	36,994	302,564	8
71-75	62,940	723,150	12
81-85	78,350	909,030	12
86-90	91,025	958,450	10

Source: DGEA

FILE BEAN.WQ1

APPENDIX 8

REGIONAL AREA, PRODUCTION AND YIELD - CORN

CORN AREA PLANTED BY REGION, 1975-1991

YEAR	REGION 1 MANZANA	REGION 2 MANZANA	REGION 3 MANZANA	REGION 4 MANZANA	NATION MANZANA
1975	91,050	81,055	44,605	132,996	349,706
1976	88,495	69,886	42,424	126,491	327,296
1977	150,836	86,617	50,780	140,819	429,052
1978	77,415	92,573	54,753	152,859	377,600
1979	95,537	104,480	64,199	130,084	394,300
1980	105,090	111,720	67,770	132,420	417,000
1981	112,439	111,168	53,953	117,440	395,000
1982	114,898	68,700	54,752	102,650	341,000
1983	110,185	70,320	54,645	69,810	304,960
1984	109,700	72,800	56,300	106,900	345,700
1985	112,990	85,400	57,900	103,100	359,390
1986	107,925	89,450	59,485	111,240	368,100
1987	113,600	99,900	66,800	118,200	398,500
1988	117,000	104,500	64,300	117,000	402,800
1989	115,100	98,500	58,500	122,600	394,700
1990	102,600	91,300	64,200	144,500	402,600
1991	104,600	90,500	69,000	165,300	429,400
AVERAGE	107,615	89,933	57,904	123,201	378,653

YEAR	REGION I	REGION II	REGION III	REGION VI	NATIONAL
1975-79	100,667	86,922	51,352	136,650	375,591
1980-83	110,653	90,477	57,780	105,580	364,490
1984-87	111,054	86,888	60,121	109,860	367,923
1988-91	109,825	96,200	64,000	137,350	407,375

Source: DGEA-MAG

FILE: MAIZ-ARE.WQ1

CORN PRODUCTION BY REGION, 1975-1991

YEAR	REGION 1 QQ	REGION 2 QQ	REGION 3 QQ	REGION 4 QQ	NATION QQ
1975	2,886,450	2,431,350	1,311,995	2,735,040	9,364,835
1976	2,493,575	1,738,970	1,007,881	2,183,017	7,423,443
1977	2,021,830	2,577,478	1,103,881	2,551,977	8,255,166
1978	2,701,870	3,381,290	1,470,760	3,466,680	11,020,600
1979	3,459,725	3,470,732	2,034,696	2,416,280	11,381,433
1980	3,472,918	3,552,866	2,047,118	2,366,845	11,439,747
1981	3,259,258	3,329,898	1,904,040	2,374,619	10,867,815
1982	3,191,050	2,266,050	1,567,450	1,966,450	8,991,000
1983	3,854,800	2,707,200	1,294,970	1,776,030	9,633,000
1984	3,873,500	3,029,100	1,845,200	2,713,700	11,461,500
1985	3,392,300	3,100,100	1,978,800	2,298,000	10,769,200
1986	3,028,625	2,752,325	1,777,900	1,941,150	9,500,000
1987	3,940,400	805,000	2,245,000	2,595,500	9,585,900
1988	4,090,600	3,719,300	2,027,100	3,119,200	12,956,200
1989	4,097,600	3,617,700	1,853,400	3,225,600	12,794,300
1990	3,917,800	3,213,800	1,996,600	3,972,000	13,100,200
1991	3,290,900	2,829,800	1,888,000	2,730,500	10,739,200
AVERAGE	3,351,365	2,854,292	1,726,752	2,613,682	10,546,091

YEAR	REGION I	REGION II	REGION III	REGION VI	NATIONAL
1975-79	2,712,690	2,719,964	1,385,843	2,670,599	9,489,095
1980-83	3,444,507	2,964,004	1,703,395	2,120,986	10,232,891
1984-87	3,558,706	2,421,631	1,961,725	2,387,088	10,329,150
1988-91	3,849,225	3,345,150	1,941,275	3,261,825	12,397,475

Source: DGEA-MAG

FILE: MAIZ-PRO.WQ1

CORN YIELD BY REGION, 1975-1991

YEAR	REGION 1 QQ/MZ	REGION 2 QQ/MZ	REGION 3 QQ/MZ	REGION 4 QQ/MZ	NATION QQ/MZ
1975	31.7	30.0	29.4	20.6	26.8
1976	28.2	24.9	23.8	17.3	22.7
1977	13.4	29.8	21.7	18.1	19.2
1978	34.9	36.5	26.9	22.7	29.2
1979	36.2	33.2	31.7	18.6	28.9
1980	33.0	31.8	30.2	17.9	27.4
1981	29.0	30.0	35.3	20.2	27.5
1982	27.8	33.0	28.6	19.2	26.4
1983	35.0	38.5	23.7	25.4	31.6
1984	35.3	41.6	32.8	25.4	33.2
1985	30.0	36.3	34.2	22.3	30.0
1986	28.1	30.8	29.9	17.5	25.8
1987	34.7	8.1	33.6	22.0	24.1
1988	35.0	35.6	31.5	26.7	32.2
1989	35.6	36.7	31.7	26.3	32.4
1990	38.2	35.2	31.1	27.5	32.5
1991	31.5	31.3	27.4	16.5	25.0
AVERAGE	31.6	31.9	29.6	21.4	27.9

YEAR	REGION I	REGION II	REGION III	REGION VI	NATIONAL
1975-79	28.9	30.9	26.7	19.4	25.4
1980-83	31.2	33.3	29.5	20.7	28.2
1984-87	32.0	29.2	32.6	21.8	28.2
1988-91	35.1	34.7	30.4	24.2	30.5

Source: DGEA-MAG

FILE: MAIZ-REN.WQ1

APPENDIX 9

REGIONAL AREA, PRODUCTION AND YIELD - BEANS

BEAN PRODUCTION BY REGION, 1975-1991

YEAR	REGION 1 QQ	REGION 2 QQ	REGION 3 QQ	REGION 4 QQ	NATION QQ
1975	305,900	179,055	243,145	133,700	861,800
1976	310,365	180,374	244,827	134,534	870,100
1977	189,412	115,564	280,868	147,695	733,539
1978	267,790	307,603	235,637	121,970	933,000
1979	349,268	301,928	203,471	156,663	1,011,330
1980	311,465	257,078	165,193	132,764	866,500
1981	298,999	271,789	158,581	102,451	831,820
1982	343,350	232,848	157,475	96,327	830,000
1983	459,840	266,520	121,040	70,900	918,300
1984	476,100	340,000	143,800	96,100	1,056,000
1985	318,800	270,900	87,300	74,200	751,200
1986	489,200	401,650	126,000	77,050	1,093,900
1987	239,600	185,200	57,200	49,000	531,000
1988	520,100	480,200	153,800	85,900	1,240,000
1989	297,400	482,900	103,300	85,300	968,900
1990	450,000	452,600	171,800	71,000	1,145,400
1991	637,700	477,900	219,800	74,200	1,409,600
AVERAGE	368,546	306,124	169,014	100,574	944,258

YEAR	REGION I	REGION II	REGION III	REGION VI	NATIONAL
1975-79	284,547	216,905	241,590	138,912	881,954
1980-83	353,414	257,059	150,572	100,611	861,655
1984-87	380,925	299,438	103,575	74,088	858,025
1988-91	476,300	473,400	162,175	79,100	1,190,975

Source: DGEA-MAG

FILE: FRIJ-PRO.WQ1

BEAN AREA PLANTED BY REGION, 1975-1991

YEAR	REGION 1 MANZANAS	REGION 2 MANZANAS	REGION 3 MANZANAS	REGION 4 MANZANAS	NATION MANZANAS
1975	28,090	15,495	22,205	14,010	79,800
1976	26,596	14,668	21,020	13,262	75,546
1977	19,064	11,194	27,064	17,801	75,123
1978	18,951	25,640	20,526	8,883	74,000
1979	24,638	37,393	15,331	11,338	88,700
1980	23,645	25,830	14,598	10,927	75,000
1981	22,384	24,552	13,819	10,345	71,100
1982	32,290	23,594	14,616	8,900	79,400
1983	35,360	25,550	10,500	9,090	80,500
1984	36,300	26,800	10,300	9,100	82,500
1985	36,100	29,800	8,900	8,500	83,300
1986	38,100	31,600	9,380	8,020	87,100
1987	39,100	31,600	10,500	8,100	89,300
1988	39,700	36,800	11,300	8,300	96,100
1989	35,500	39,400	9,400	7,300	91,600
1990	32,800	37,100	13,300	6,300	89,500
1991	45,500	37,100	17,100	6,900	106,600
AVERAGE	31,419	27,889	14,698	9,828	83,833

YEAR	REGION I	REGION II	REGION III	REGION VI	NATIONAL
1975-79	23,468	20,878	21,229	13,059	78,634
1980-83	28,420	24,882	13,383	9,816	76,500
1984-87	37,400	29,950	9,770	8,430	85,550
1988-91	38,375	37,600	12,775	7,200	95,950

Source: DGEA-MAG

FILE: FRIJ-ARE.WQ1

BEAN YIELD BY REGION, 1975-1991

YEAR	REGION 1 QQ/MZ	REGION 2 QQ/MZ	REGION 3 QQ/MZ	REGION 4 QQ/MZ	NATION QQ/MZ
1975	10.9	11.6	11.0	9.5	10.8
1976	11.7	12.3	11.6	10.1	11.5
1977	9.9	10.3	10.4	8.3	9.8
1978	14.1	12.0	11.5	13.7	12.6
1979	14.2	8.1	13.3	13.8	11.4
1980	13.2	10.0	11.3	12.2	11.6
1981	13.4	11.1	11.5	9.9	11.7
1982	10.6	9.9	10.8	10.8	10.5
1983	13.0	10.4	11.5	7.8	11.4
1984	13.1	12.7	14.0	10.6	12.8
1985	8.8	9.1	9.8	8.7	9.0
1986	12.8	12.7	13.4	9.6	12.6
1987	6.1	5.9	5.4	6.0	5.9
1988	13.1	13.0	13.6	10.3	12.9
1989	8.4	12.3	11.0	11.7	10.6
1990	13.7	12.2	12.9	11.3	12.8
1991	14.0	12.9	12.9	10.8	13.2
AVERAGE	11.8	11.0	11.5	10.3	11.2

YEAR	REGION I	REGION II	REGION III	REGION VI	NATIONAL
1975-79	12.2	10.8	11.5	11.1	11.2
1980-83	12.5	10.3	11.3	10.2	11.3
1984-87	10.2	10.1	10.7	8.7	10.1
1988-91	12.3	12.6	12.6	11.0	12.4

Source: DGEA-MAG

FILE: FRIJ-RND.WQ1

APPENDIX 10

REGIONAL AREA, PRODUCTION AND YIELD - RICE

RICE PRODUCTION BY REGION, 1975-1991

YEAR	REGION 1 QQ	REGION 2 QQ	REGION 3 QQ	REGION 4 QQ	NATION QQ
1975	350,400	275,935	384,465	309,202	1,320,002
1976	205,899	162,453	226,078	181,995	776,425
1977	112,145	163,453	167,819	269,181	712,598
1978	205,700	251,400	212,000	435,400	1,104,500
1979	441,904	305,154	379,860	139,282	1,266,200
1980	248,575	297,416	112,107	661,902	1,320,000
1981	224,605	265,800	82,715	516,670	1,089,790
1982	222,458	183,716	65,754	298,092	770,020
1983	298,100	306,600	164,500	170,800	940,000
1984	316,300	436,500	355,300	268,800	1,376,900
1985	323,800	494,700	302,100	376,800	1,497,400
1986	154,000	467,800	216,100	182,500	1,020,400
1987	104,250	403,200	256,600	150,500	914,550
1988	98,100	622,300	376,400	149,100	1,245,900
1989	89,200	662,900	415,800	217,300	1,385,200
1990	79,900	756,000	305,800	199,400	1,341,100
1991	75,800	780,100	178,400	83,800	1,118,100
AVERAGE	208,890	402,084	247,165	271,219	1,129,358

YEAR	REGION I	REGION II	REGION III	REGION IV	NATIONAL
1975-79	263,210	231,679	274,044	267,012	1,035,945
1980-83	248,435	263,383	106,269	411,866	1,029,953
1984-87	224,588	450,550	282,525	244,650	1,202,313
1988-91	85,750	705,325	319,100	162,400	1,272,575

Source: DGEA-MAG

FILE: ARRO-PRO.WQ1

RICE AREA PLANTED BY REGION, 1975-1991

YEAR	REGION 1 MANZANAS	REGION 2 MANZANAS	REGION 3 MANZANAS	REGION 4 MANZANAS	NATION MANZANAS
1975	6,300	4,871	7,129	5,900	24,200
1976	5,130	3,968	5,807	4,805	19,710
1977	2,632	4,243	4,045	6,877	17,797
1978	3,680	4,350	4,300	7,520	19,850
1979	6,710	4,895	6,900	2,595	21,100
1980	4,464	5,311	1,853	12,372	24,000
1981	4,030	4,746	1,366	9,658	19,800
1982	4,367	3,835	1,269	6,529	16,000
1983	5,020	5,250	3,400	4,330	18,000
1984	5,100	6,300	5,900	4,600	21,900
1985	5,200	7,400	5,300	6,800	24,700
1986	2,800	6,900	3,900	3,600	17,200
1987	1,800	5,600	5,300	4,000	16,700
1988	1,600	8,300	7,100	2,700	19,700
1989	1,400	9,800	7,200	3,800	22,200
1990	1,200	10,800	4,800	3,600	20,400
1991	1,400	12,100	4,000	2,900	20,400
AVERAGE	3,696	6,392	4,681	5,446	20,215

YEAR	REGION I	REGION II	REGION III	REGION IV	NATIONAL
1975-79	4,890	4,465	5,636	5,539	20,531
1980-83	4,470	4,786	1,972	8,222	19,450
1984-87	3,725	6,550	5,100	4,750	20,125
1988-91	1,400	10,250	5,775	3,250	20,675

Source: DGEA-MAG

FILE: ARRO-ARE.WQ1

RICE YIELD BY REGION, 1975-1991

YEAR	REGION 1 QQ/MZ	REGION 2 QQ/MZ	REGION 3 QQ/MZ	REGION 4 QQ/MZ	NATION QQ/MZ
1975	55.6	56.6	53.9	52.4	54.5
1976	40.1	40.9	38.9	37.9	39.4
1977	42.6	38.5	41.5	39.1	40.0
1978	55.9	57.8	49.3	57.9	55.6
1979	65.9	62.3	55.1	53.7	60.0
1980	55.7	56.0	60.5	53.5	55.0
1981	55.7	56.0	60.6	53.5	55.0
1982	50.9	47.9	51.8	45.7	48.1
1983	59.4	58.4	48.4	39.4	52.2
1984	62.0	69.3	60.2	58.4	62.9
1985	62.3	66.9	57.0	55.4	60.6
1986	55.0	67.8	55.4	50.7	59.3
1987	57.9	72.0	48.4	37.6	54.8
1988	61.3	75.0	53.0	55.2	63.2
1989	63.7	67.6	57.8	57.2	62.4
1990	66.6	70.0	63.7	55.4	65.7
1991	54.1	64.5	44.6	28.9	54.8
AVERAGE	56.8	60.4	52.9	48.9	55.5

YEAR	REGION I	REGION II	REGION III	REGION IV	NATIONAL
1975-79	52.0	51.2	47.7	48.2	49.9
1980-83	55.4	54.6	55.3	48.0	52.6
1984-87	59.3	69.0	55.3	50.5	59.4
1988-91	61.4	69.3	54.8	49.2	61.5

Source: DGEA-MAG

FILE: ARRO-RND.WQ1

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APPENDIX 11

REGIONAL AREA, PRODUCTION AND YIELD - SORGHUM

SORGHUM PRODUCTION BY REGION, 1975-1991

YEAR	REGION 1 QQ	REGION 2 QQ	REGION 3 QQ	REGION 4 QQ	NATION QQ
1975	600,200	697,845	722,155	1,729,800	3,750,000
1976	522,149	700,262	671,945	1,504,844	3,399,200
1977	393,885	724,048	359,102	1,807,963	3,284,998
1978	569,080	657,365	635,350	1,655,905	3,517,700
1979	564,570	703,970	592,450	1,624,010	3,485,000
1980	492,626	614,262	516,953	1,417,059	3,040,900
1981	665,059	566,377	385,230	1,333,614	2,950,280
1982	828,775	257,685	322,613	1,290,927	2,700,000
1983	1,284,200	463,600	225,100	704,200	2,677,100
1984	1,400,900	510,800	277,700	864,500	3,053,900
1985	1,032,400	680,000	280,100	890,300	2,882,800
1986	1,172,900	593,800	403,600	1,036,500	3,206,800
1987	374,100	56,900	62,200	71,000	564,200
1988	1,229,700	889,200	302,700	911,100	3,332,700
1989	1,216,200	743,700	383,600	906,200	3,249,700
1990	1,386,300	731,100	441,700	932,700	3,491,800
1991	1,411,200	712,800	570,200	846,700	3,540,900
AVERAGE	890,838	606,101	420,747	1,148,666	3,066,352

YEAR	REGION I	REGION II	REGION III	REGION IV	NATIONAL
1975-79	529,977	696,698	596,200	1,664,504	3,487,380
1980-83	817,665	475,481	362,474	1,186,450	2,842,070
1984-87	995,075	460,375	255,900	715,575	2,426,925
1988-91	1,310,850	769,200	424,550	899,175	3,403,775

Source: DGEA-MAG

FILE: SORG-PRO.WQ1

SORGHUM AREA PLANTED BY REGION, 1975-1991

YEAR	REGION 1 MANZANAS	REGION 2 MANZANAS	REGION 3 MANZANAS	REGION 4 MANZANAS	NATION MANZANAS
1975	28,300	38,278	33,422	89,100	189,100
1976	27,380	32,592	32,327	86,201	178,500
1977	22,327	40,003	21,136	105,333	188,799
1978	30,690	35,310	37,595	91,805	195,400
1979	27,060	38,745	35,260	103,935	205,000
1980	22,532	32,262	29,360	86,546	170,700
1981	30,917	31,989	22,353	79,741	165,000
1982	51,452	17,348	22,005	79,195	170,000
1983	61,700	23,100	14,990	58,210	158,000
1984	65,400	25,500	15,400	59,700	166,000
1985	56,000	34,000	16,300	57,100	163,400
1986	54,300	32,100	21,900	63,200	171,500
1987	54,200	40,700	27,900	55,900	178,700
1988	57.700	46,800	18,800	50,900	174,200
1989	59,000	38,000	22,700	51,200	170,900
1990	66,100	33,200	28,300	57,100	184,700
1991	57,600	32,400	35,200	50,700	175,900
AVERAGE	45,450	33,666	25,585	72,110	176,812

YEAR	REGION I	REGION II	REGION III	REGION IV	NATIONAL
1975-79	27,151	36,986	31,948	95,275	191,360
1980-83	41,650	26,175	22,177	75,923	165,925
1984-87	57,475	33,075	20,375	58,975	169,900
1988-91	60,100	37,600	26,250	52,475	176,425

Source: DGEA-MAG

FILE: SORG-ARE.WQ1

SORGHUM YIELD BY REGION, 1975-1991

YEAR	REGION 1 QQ/MZ	REGION 2 QQ/MZ	REGION 3 QQ/MZ	REGION 4 QQ/MZ	NATION QQ/MZ
1975	21.2	18.2	21.6	19.4	19.8
1976	19.1	21.5	20.8	17.5	19.0
1977	17.6	18.1	17.0	17.2	17.4
1978	18.5	18.6	16.9	18.0	18.0
1979	20.9	18.2	16.8	15.6	17.0
1980	21.9	19.0	17.6	16.4	17.8
1981	21.5	17.7	17.2	16.7	17.9
1982	16.1	14.9	14.7	16.3	15.9
1983	20.8	20.1	15.0	12.1	16.9
1984	21.4	20.0	18.0	14.5	18.4
1985	18.4	20.0	17.2	15.6	17.6
1986	21.6	18.5	18.4	16.4	18.7
1987	6.9	1.4	2.2	1.3	3.2
1988	21.3	19.0	16.1	17.9	19.1
1989	20.6	19.6	16.9	17.7	19.0
1990	21.0	22.0	15.6	16.3	18.9
1991	24.5	22.0	16.2	16.7	20.1
AVERAGE	19.6	18.2	16.4	15.6	17.3

YEAR	REGION I	REGION II	REGION III	REGION IV	NATIONAL
1975-79	19.5	18.9	18.6	17.5	18.3
1980-83	20.1	17.9	16.1	15.4	17.1
1984-87	17.1	15.0	14.0	11.9	14.5
1988-91	21.8	20.6	16.2	17.2	19.3

Source: DGEA-MAG

FILE: SORG-RND.WQ1

APPENDIX 12

HISTORIC COSTS OF PRODUCTION AND RETURNS

HISTORIC COSTS AND RETURNS OF CORN PRODUCTION

PRODUCTION/MANZANA - DGEA DATA

YEAR	CPI	NOMINAL FERTILIZER 16-20-0 QUANTITY	16-20-0 COST/QQ	16-20-0 TOT COST	AMONIUM SULFATE QUANTITY	AMONIUM SULFATE COST/QQ	AMONIUM SULFATE TOT COST	NOMINAL TOT FERT COST	REAL TOT FERT COST	NOMINAL PESTICIDES INSECT COST	HERBIC COST	FUNGIC COST
HYBRID												
1978	100.00											
1979	114.84											
1980	136.15	4.40	22.30	98.12	4.40	15.00	66.00	164.12	120.54			
1981	152.01	4.40	30.49	134.16	4.40	20.64	90.82	224.98	148.00			
1982	172.44	4.40	34.09	150.00	4.40	24.55	108.02	258.02	149.63			
1983	197.87	4.40	34.09	150.00	4.40	24.55	108.02	258.02	130.40			
1984	217.30	4.40	28.18	123.99	4.40	17.27	75.99	199.98	92.03			
1985	286.68	4.40	28.00	123.20	4.40	17.50	77.00	200.20	69.83			
1986	373.70	4.40	32.20	141.68	4.40	20.13	88.57	230.25	61.61			
1987	446.96	4.40	56.82	250.00	4.40	33.64	148.00	398.00	89.05			
1988	528.53	4.40	47.00	206.80	4.40	27.50	121.00	327.80	62.02			
1989	652.55	4.40	56.80	249.92	4.40	29.50	129.80	379.72	58.19			
1990	778.80	4.34	44.19	191.79	4.72	36.63	172.90	364.69	46.83	85.45	111.49	14.91
1991	855.66	3.98	71.74	285.52	4.89	44.11	215.69	501.21	58.58	114.43	132.82	10.15

HISTORIC COSTS AND RETURNS OF CORN PRODUCTION

PRODUCTION/MANZANA - DGEA DATA

YEAR	NOMINAL TOT PEST COST	REAL TOT PEST COST	NOMINAL SEED COST	REAL SEED COST	NOMINAL LABOR COST	REAL LABOR COST	HYBRID AVG YIELD QQ	REAL TOTAL COST	NOMINAL FARM GATE	REAL FARM GATE	REAL RETURN MZ	RETURN MINUS INP COSTS
HYBRID												
1978							31.07		19.39	19.39	602.45	
1979							38.30		15.13	13.17	504.60	
1980	88.00	64.63	24.00	17.63	475.32	349.11	36.10	551.92	17.41	12.79	461.62	-90.30
1981	100.00	65.79	27.59	18.15	542.32	356.77	34.49	588.70	18.49	12.16	419.53	-169.18
1982	100.00	57.99	28.50	16.53	542.	314.50	33.18	538.65	21.35	12.38	410.81	-127.84
1983	120.00	60.65	28.50	14.40	547.	276.61	31.93	482.05	26.33	13.31	424.88	-57.17
1984	100.00	46.02	29.61	13.63	562.7	258.78	33.64	410.45	25.00	11.50	387.02	-23.43
1985	98.00	34.18	28.50	9.94	645	225.05	36.79	339.01	23.46	8.18	301.07	-37.95
1986	112.70	30.16	28.50	7.63	660.18	176.66	34.27	276.06	36.50	9.77	334.72	58.66
1987	193.45	43.28	42.00	9.40	862.77	193.03	29.23	334.75	40.33	9.02	263.75	-71.01
1988	217.00	41.06	49.50	9.37	911.20	172.40	37.71	284.85	36.20	6.85	258.28	-26.56
1989	220.00	33.71	60.00	9.19	1058.27	162.17	36.40	263.27	49.19	7.54	274.39	11.11
1990	211.85	27.20	53.77	6.90	1143.90	146.88	36.50	227.81	61.44	7.89	287.95	60.14
1991	257.40	30.08	70.42	8.23	1347.92	157.53	38.40	254.42	70.76	8.27	317.55	63.14

Source: Costs of Production for Basic Grains, D.G.E.A.-M.A.G.

FILE: CORNIMP.WQ1

HISTORIC COSTS AND RETURNS OF BEAN PRODUCTION

PRODUCTION/MANZANA - DGEA DATA

		NOMINAL FERTILIZER						NOMINAL	REAL	NOMINAL PESTICIDES		
			16-20-0			AMONIUM SULFATE		TOT FERT	TOT FERT	INSECT	HERBIC	FUNGIC
YEAR	CPI	QUANTITY	COST/QQ	TOT COST	QUANTITY	COST/QQ	TOT COST	COST	COST	COST	COST	COST
1978	100.00											
1979	114.84											
1980	136.15	4.40		98.12				98.12	72.07			
1981	152.01	4.40	30.18	132.79				132.79	87.36			
1982	172.44											
1983	197.87	4.40	34.09	150.00				150.00	75.81			
1984	217.30	4.40	30.00	132.00				132.00	60.75			
1985	286.68	2.20	28.00	61.60				61.60	21.49			
1986	373.70	2.20	32.20	70.84				70.84	18.96			
1987	446.96	2.20	56.82	125.00		FOLLIATE	9.29	134.29	30.05	147.52	54.00	
1988	528.53	2.20	56.82	125.00		FOLLIATE	9.29	134.29	25.41	147.52	54.00	
1989	652.55	2.20	56.80	124.96		FOLLIATE	18.00	142.96	21.91	140.00	60.00	
1990	778.80	2.74	58.11	159.21	1.31		80.10	239.31	30.73	102.57	66.57	12.61
1991	855.66	2.27	82.90	188.18		FOLLIATE	17.18	205.36	24.00	110.71	148.73	23.57
1992		2.27	101.14	229.58		FOLLIATE	21.99	251.57		141.71	190.37	30.17

HISTORIC COSTS AND RETURNS OF BEAN PRODUCTION

PRODUCTION/MANZANA - DGEA DATA

YEAR	NOMINAL TOT PEST COST	REAL TOT PEST COST	NOMINAL SEED COST	REAL SEED COST	NOMINAL LABOR COST	REAL LABOR COST	NATIONAL AVG YIELD QQ	REAL INPUTS COST	NOMINAL FARM GATE	REAL FARM GATE	REAL RETURN MZ	RETURN MINUS INP COST
1978							9.80		59.15	59.15	579.67	NA
1979							12.60		46.68	40.65	512.16	NA
1980	115.00	84.47	84.00	61.70	446.23	327.75	12.90	545.98	73.36	53.88	695.07	145.[illegible]0
1981	131.00	86.18	150.00	98.68	575.04	378.29	11.60	650.50	88.97	58.53	678.94	28.43
1982							11.70		74.10	42.97		NA
1983	157.20	79.45	180.00	90.97	575.04	290.62	10.50	536.84	60.35	30.50	320.25	-216.59
1984	78.60	36.17	150.00	69.03	449.64	206.92	11.40	372.87	63.70	29.31	334.18	-38.68
1985	101.00	35.23	137.50	47.96	439.32	153.24	12.80	257.93	78.16	27.26	348.98	91.05
1986	116.15	31.08	137.50	36.79	439.32	117.56	9.00	204.39	100.00	26.76	240.83	36.44
1987	201.52	45.09	170.00	38.03	655.09	146.57	12.60	259.73	103.92	23.25	292.96	33.22
1988	201.52	38.13	170.00	32.16	655.09	123.95	5.90	219.65	235.77	44.61	263.19	43.54
1989	200.00	30.65	350.00	53.64	763.27	117.89	12.90	224.08	177.05	27.13	350.00	125.92
1990	181.75	23.34	179.87	23.10	740.91	95.13	10.60	172.30	227.33	29.19	309.41	137.12
1991	283.01	33.08	294.63	34.43	878.59	102.68	12.23	194.19	279.49	32.66	399.48	205.29
1992	362.25		294.63				12.23					

Source: Costs of Production for Basic Grains, D.G.E.A.-M.A.G.

FILE: BEANIMP.WQ1

HISTORIC COSTS AND RETURNS OF RICE PRODUCTION

PRODUCTION/MANZANA - DGEA DATA

		NOMINAL FERTILIZER						NOMINAL	REAL	NOMINAL PESTICIDES		
			16-20-0		AMONIUM SULFATE			TOT FERT	TOT FERT	INSECT	HERBIC	FUNGIC
YEAR	CPI	QUANTITY	COST/QQ	TOT COST	QUANTITY	COST/QQ	TOT COST	COST**	COST	COST	COST	COST
1978	100.00											
1979	114.84											
1980	136.15	4.40	22.30	98.12	4.40	15.00	66.00	164.12	120.54	110.00	70.00	
1981	152.01	4.40	29.36	129.18	4.40	19.64	86.42	215.60	141.83	150.00	85.00	
1982	172.44											
1983	197.87	4.40	34.09	150.00	4.40	24.55	108.02	258.02	130.40	180.00	102.00	
1984	217.30	4.40	30.00	132.00	4.40	18.64	82.02	214.02	98.49	199.20	127.51	
1985	286.68	4.40	28.00	123.20	4.40	17.50	77.00	200.20	69.83	150.00	85.00	
1986	373.70	4.40	32.20	141.68	4.40	20.13	88.57	230.25	61.61	51.75	92.00	57.50
1987	446.96	4.40	56.82	250.00	4.40	33.64	148.00	398.00	89.05	362.25	171.23	
1988	528.53	4.40	56.82	250.00	4.40	33.64	148.00	398.00	75.30	362.25	171.23	
1989	652.55	4.40	56.80	249.92	4.40	29.50	129.80	379.72	58.19	302.00	125.00	
1990	778.80	4.48	56.32	252.31	4.85	37.88	183.70	436.01	55.98	148.35	282.44	104.87
1991	855.66	3.60	77.29	278.24	4.40	46.97	206.66	508.18	59.39	202.51	293.40	90.51

HISTORIC COSTS AND RETURNS OF RICE PRODUCTION

PRODUCTION/MANZANA - DGEA DATA

YEAR	NOMINAL TOT PEST COST	REAL TOT PEST COST	NOMINAL SEED COST	REAL SEED COST	NOMINAL LABOR COST	REAL LABOR COST	YIELD QQ	REAL TOTAL COST	NOMINAL FARM GATE	REAL FARM GATE	REAL RETURN MZ	RETURN MINUS INP COSTS
1978							40.00		34.11	34.11	1364.40	NA
1979							55.60		35.58	30.98	1722.61	NA
1980	180.00	132.21	130.00	95.48	644.24	473.18	60.00	821.42	30.16	22.15	1329.12	507.70
1981	235.00	154.60	160.00	105.26	702.60	462.21	55.00	863.89	31.64	20.81	1144.79	280.90
1982							55.00		33.00	19.14		NA
1983	282.00	142.52	140.00	70.75	712.60	360.14	48.10	703.81	36.45	18.42	886.06	182.25
1984	326.71	150.35	200.00	92.04	732.94	337.29	52.20	678.17	33.00	15.19	792.73	114.56
1985	235.00	81.97	160.00	55.81	770.04	268.61	62.80	476.22	33.50	11.69	733.85	257.63
1986	201.25	53.85	120.00	32.11	740.92	198.27	60.60	345.84	24.80	6.64	402.16	56.32
1987	533.48	119.36	210.00	46.98	1166.89	261.07	59.30	516.46	71.31	15.95	946.10	429.64
1988	533.48	100.94	210.00	39.73	1166.89	220.78	54.80	436.75	61.82	11.70	640.97	204.22
1989	427.00	65.44	212.50	32.56	1375.24	210.75	63.20	366.94	45.66	7.00	442.22	75.28
1990	535.66	68.78	227.11	29.16	1565.17	200.97	62.40	354.90	57.34	7.36	459.43	104.53
1991	586.42	68.53	325.85	38.08	1702.74	199.00	68.13	365.00	110.28	12.89	878.08	513.08

** 1991 INCLUDES C 23.28 AND 1992 INCLUDES C 29.80 FOLLIAR FERTILIZER

Source: Costs of Production of Basic Grains, D.G.E.A.-M.A.G.

FILE: RICEIMP.WQ1

HISTORIC COSTS AND RETURNS OF SORGHUM PRODUCTION

PRODUCTION/MANZANA - DGEA DATA

YEAR	CPI	NOMINAL FERTILIZER 16-20-0 QUANTITY	16-20-0 COST/QQ	16-20-0 TOT COST	AMONIUM SULFATE QUANTITY	AMONIUM SULFATE COST/QQ	AMONIUM SULFATE TOT COST	NOMINAL TOT FERT COST	REAL TOT FERT COST	NOMINAL PESTICIDES INSECT COST	HERBIC COST	FUNGIC COST
TRADITIONAL												
1978	100.0D											
1979	114.84											
198D	136.15											
1981	152.01											
1982	172.44											
1983	197.87				3.00	24.55	73.65	73.65	37.22			
1984	217.30	3.00	30.00	90.00	3.00	18.64	55.92	145.92	67.15			
1985	286.68	3.00	28.00	84.00	3.00	17.50	52.50	136.50	47.61			
1986	373.70											
1987	446.96											
1988	528.53	2.20	56.82	125.00	2.20	33.64	74.00	199.00	37.65	170.00	41.60	
1989	652.55											
1990	778.80	1.75	54.13	94.73	2.02	39.21	79.20	173.93	22.33	51.14	90.89	
1991	855.66				2.29	46.65	106.82	106.82	12.48	49.50	91.27	

HISTORIC COSTS AND RETURNS OF SORGHUM PRODUCTION

PRODUCTION/MANZANA - DGEA DATA

YEAR	NOMINAL TOT PEST COST	REAL TOT PEST COST	NOMINAL SEED COST	REAL SEED COST	NOMINAL LABOR COST	REAL LABOR COST	YIELD QQ	REAL TOTAL INPUTS	NOMINAL FARM GATE QQ	REAL FARM GATE QQ	REAL RETURN MZ	RETURNS MINUS INP COST
TRADITIONAL												
1978							14.80		17.49	17.49		NA
1979							19.50		16.80	14.63		NA
1980							17.00		19.66	14.44		NA
1981							17.80		21.39	14.07		NA
1982							17.90		21.58	12.51		NA
1983	84.00	42.45	22.50	11.37	614.96	310.79	15.90	401.83	24.50	12.38	196.87	-204.96
1984	104.60	48.14	21.00	9.66	597.80	275.10	16.90	400.06	21.00	9.66	163.32	-236.73
1985	95.00	33.14	17.50	6.10	621.80	216.90	18.40	303.75	22.71	7.92	145.76	-157.99
1986							17.60		30.00	8.03		NA
1987							18.70		38.29	8.57		NA
1988	211.60	40.04	23.00	4.35	815.39	154.28	3.20	236.31	39.94	7.56	24.18	-212.13
1989							19.10		40.55	6.21		NA
1990	142.03	18.24	8.72	1.12	589.67	75.72	19.00	117.40	50.37	6.47	122.89	5.48
1991	140.77	16.45	12.99	1.52	658.51	76.96	23.90	107.41	46.36	5.42	129.49	22.08

Source: Costs of Production of Basic Grains, D.G.E.A.-M.A.G.

FILE: SORGIMP.WQ1

APPRENDIX 13

PRICE AND QUANTITIES SURVEY SAMPLE

DEPARTAMENTO: AHUACHAPAN

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		SORGO JUL/AGO/SEP		SORGO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	30.0	70.0	2.0	57.0	4.0	55.0	14.0	52.5	20.0	50.0	450.0	68.0	1.5	325.0	6.0	240.0
2	12.0	72.5	10.0	60.0	2.0	51.0	14.0	52.5			175.0	65.0	1.0	325.0	0.5	389.0
3	9.0	72.5	40.0	60.0	2.0	50.0	32.0	52.0			90.0	65.0	1.0	270.0	3.0	250.0
4	3.0	73.5	15.0	58.0	3.0	52.0	20.0	52.0			30.0	65.0	2.0	300.0	7.0	255.0
5	6.0	72.0	12.0	70.0	10.0	48.0	20.0	52.5			20.0	58.0	4.0	300.0	4.0	287.5
6	5.0	73.5	21.0	68.0	6.0	49.0	30.0	50.0			31.0	64.0	1.5	300.0	0.8	296.0
7	3.0	73.0	8.0	60.0	4.0	55.0	10.0	48.5			62.0	64.0	1.0	240.0		
8	7.0	75.0	1.5	70.0			130.0	47.5			80.0	65.0	2.0	255.0		
9	10.0	75.0	9.0	75.0			17.0	50.0			120.0	68.0	6.0	282.5		
10	12.0	75.0	1.0	75.0			7.0	50.0			100.0	60.0				
11	6.0	76.0	60.0	52.5			25.0	50.0			64.0	60.0				
12	50.0	69.0	10.0	50.0			15.0	50.0								
13	12.0	70.0	5.0	50.0			12.0	55.0								
14	10.0	74.0	3.0	50.0												
15	8.0	75.0	16.0	56.0												
16	4.0	74.0	12.0	54.0												
17	7.0	73.0	10.0	55.0												
18	6.0	71.0	6.0	55.0												
19	8.0	73.5														
20	10.0	70.0														
21	5.0	70.0														
22	8.0	80.0														
23	12.0	72.0														
24	8.0	73.0														
25	10.0	67.5														
WAVG	18,757	71.86	14,061	58.22	1,572	50.71	17,244	49.84	1,000	50.00	80,087	65.54	5,778	288.88	5,542	260.78
VARS		7.45		43.75		8.15		4.74		0.00		8.15		498.67		749.61
SDTS		2.73		6.61		2.85		2.18		0.00		2.85		22.33		27.38
C.V.		3.80%		11.36%		5.63%		4.37%		0.00%		4.36%		7.73%		10.50%
N		261.00		241.50		31.00		346.00		20.00		1,222.00		20.00		21.25

DEPARTAMENTO: CABAÑAS

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		SORGO JUL/AGO/SEP		SORGO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	16.0	62.5	6.0	50.0	1.0	55.0	1.0	36.0	1.8	66.7	20.0	50.0	1.0	300.0	10.0	200.0
2	4.5	42.0	5.0	51.0	1.0	57.5	3.0	38.0	1.0	72.2	8.0	47.5	2.0	275.0	10.0	202.0
3	1.0	58.0	20.0	52.0	1.0	60.0	10.0	36.0	1.0	60.0	10.0	66.0	1.5	300.0	4.0	200.0
4	1.0	60.0	60.0	52.0	1.0	55.0	3.0	36.0	1.0	60.0	32.0	65.0	3.0	280.0	6.0	200.0
5	1.0	56.0	7.0	55.0	5.0	47.5	5.0	40.0	4.0	65.0	17.0	65.0	1.0	300.0	4.0	204.0
6	2.2	78.7	8.0	54.0	3.0	48.0	2.0	40.0	12.0	60.0	1.0	60.0	1.0	310.0	2.0	200.0
7	1.0	81.0	14.0	55.0	1.0	52.0	1.0	42.0	8.0	60.0			1.0	300.0	1.0	210.0
8	0.6	81.0	5.0	54.4	1.5	52.0	1.0	40.0	8.0	60.0			2.0	300.0	1.0	200.0
9	0.5	83.0	4.0	52.0	3.0	52.0	1.3	44.0	4.0	60.0			3.0	250.0	1.0	325.0
10	38.0	62.5	6.0	52.0	12.0	50.0	1.1	44.0	10.0	60.0			2.5	275.0	1.0	300.0
11	24.0	62.0	10.0	53.0	0.2	55.0	1.6	60.0					1.0	280.0	1.0	320.0
12	18.0	64.0	1.2	50.0	0.2	55.0	1.0	37.5					2.0	260.0	6.0	300.0
13	15.0	66.0	8.0	55.0	2.0	60.0	1.0	60.0					1.0	300.0	10.0	310.0
14	12.0	64.0	15.0	54.0	14.0	55.0	2.0	50.0					2.0	300.0	1.6	300.0
15	12.0	71.0	2.0	40.0	6.0	57.5	2.0	52.0					2.5	300.0		
16	6.0	72.0	1.3	36.0	0.4	55.0							1.5	300.0		
17	22.0	72.0	0.5	38.0	0.6	60.0							6.0	300.0		
18	5.0	64.0	3.0	40.0	2.4	55.0							0.2	275.0		
19	20.0	75.0	1.0	50.0	0.5	57.5							4.0	270.0		
20	12.0	75.0	6.0	41.0	1.0	60.0							1.5	275.0		
21	20.0	72.0	8.0	48.0	0.4	57.5							0.4	275.0		
22	10.0	70.0	3.0	50.0	0.5	58.0							2.4	250.0		
23	0.6	62.0	14.0	42.0	3.0	60.0							2.6	260.0		
24	2.0	70.0	1.0	42.5	0.5	66.7							1.6	275.0		
25	18.0	70.0			11.0	57.5							1.0	275.0		
WAVG	17,642	67.24	10,659	51.01	3,929	54.41	1,501	41.75	3,092	60.87	5,285	60.00	13,436	281.68	13,971	238.41
VARS		36.47		17.88		15.92		57.28		5.83		55.57		340.4		2,617.39
SDTS		6.04		4.23		3.99		7.57		2.42		7.45		18.45		51.16
C.V.		8.98%		8.29%		7.33%		18.13%		3.97%		12.41%		6.55%		21.46%
N		262.35		208.95		72.20		35.95		50.80		88.00		47.70		58.60

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DEPARTAMENTO: CHALATENANGO

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		SORGO JUL/AGO/SEP		SORGO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	12.0	70.0	20.0	45.0	3.0	52.5	12.0	50.0	70.0	53.0	70.0	36.0	2.0	280.0	2.0	180.0
2	6.0	71.0	2.0	50.0	6.0	55.0	8.0	42.5	70.0	50.0	45.0	45.0	2.0	280.0	5.0	190.0
3	10.0	71.0	10.0	45.0	3.0	55.0	25.0	38.0	60.0	50.0	40.0	45.0	3.0	285.0	1.0	260.0
4	15.0	72.0	10.0	50.0	2.0	58.0	12.0	37.0	80.0	50.0	80.0	38.0	4.0	280.0	2.0	165.0
5	10.0	71.0	15.0	50.0	6.0	56.0	6.0	38.0	20.0	55.0	38.0	40.0	3.0	280.0	1.5	265.0
6	18.0	70.0	16.0	50.0	5.0	60.0	12.0	40.0	6.0	54.0	40.0	40.0	2.0	270.0	2.0	260.0
7	6.0	72.0	16.0	42.5	1.0	58.0	14.0	42.0	65.0	54.0	25.0	42.5	1.0	245.0	4.0	250.0
8	5.0	72.0	35.0	45.0	4.0	58.0	16.0	42.5	80.0	63.0	35.0	60.0	1.0	265.0	2.0	260.0
9	10.0	70.0	16.0	45.0	4.0	60.0	12.0	42.0	160.0	65.0	50.0	65.0	2.0	262.0	3.0	262.5
10	7.0	72.5	10.0	46.0	5.0	57.5	14.0	43.0	30.0	55.0	40.0	66.0	1.0	300.0	2.0	275.0
11	2.0	60.0	8.0	47.0	5.0	46.0	8.0	40.0	50.0	60.0	20.0	64.0	4.0	290.0	4.0	252.0
12	10.0	65.0	23.0	40.0	2.0	60.0	14.0	39.0	90.0	50.0	10.0	66.0	2.0	290.0	3.0	250.0
13	7.0	70.0	50.0	45.0	5.0	55.0	10.0	40.0			110.0	63.0	1.0	300.0	3.0	290.0
14	5.0	70.0	15.0	45.0	3.0	55.0	6.0	40.0			60.0	58.0	4.0	280.0	2.0	295.0
15	4.0	72.0	6.0	55.0	1.0	60.0	15.0	44.0			70.0	60.0	2.0	295.0	2.0	250.0
16	2.0	71.0	4.0	53.0	4.0	55.0	4.0	50.0			50.0	65.0	4.0	276.0	2.0	250.0
17	16.0	50.0	10.0	55.0	6.0	60.0	5.0	49.5			75.0	68.0	2.0	274.0	2.0	262.5
18	1.0	55.0	9.0	62.0	2.0	55.0	12.0	50.0			100.0	77.0	5.0	278.0	3.0	290.0
19	8.0	55.0	5.0	61.0	5.0	57.0	10.0	50.0			45.0	64.0	4.0	275.0	2.0	250.0
20	6.0	55.0	18.0	50.0	12.0	52.0	18.0	45.0			80.0	62.0	3.0	300.0	4.0	290.0
21					6.0	52.0							1.3	290.0	2.0	295.0
22					8.0	45.0							0.5	295.0	2.0	262.5
23					6.0	45.0							2.0	185.0	1.0	295.0
24					3.0	50.0							4.0	290.0	4.0	300.0
25					2.0	49.0							0.5	230.0	2.0	300.0
WAVG	10,691	66.82	14,011	47.02	5,861	53.77	9,940	42.66	43,734	56.00	61,998	57.25	16,756	278.11	16,158	258.53
VARS		55.31		22.78		23.50		16.90		37.75		156.56		428.71		1,333.8
SDTS		7.44		4.77		4.85		4.11		6.14		12.51		20.71		36.52
C.V.		11.13%		10.15%		9.02%		9.64%		10.97%		21.86%		7.45%		14.13%
N		160.00		298.00		109.00		233.00		781.00		1,083.00		60.25		62.50

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DEPARTAMENTO: CUSCATLAN

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		SORGO JUL/AGO/SEP		SORGO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	3.0	72.0	0.8	70.0	6.0	65.0	2.0	55.0					6.0	300.0	0.4	250.0
2	5.0	70.0	1.2	67.5	4.0	50.0	5.0	58.0					2.5	250.0	6.0	225.0
3	6.0	72.0	18.0	55.0			2.0	60.0					2.0	310.0	2.0	250.0
4	4.0	50.0	10.0	57.5									0.4	277.0	1.0	283.0
5	5.0	50.0	2.0	62.0									0.5	305.0	0.5	282.0
6	2.0	72.0	25.0	60.0									6.0	280.0	2.0	220.0
7	1.0	83.0	2.0	48.5									1.0	280.0	2.0	225.0
8	10.0	70.0	3.0	48.0									2.0	290.0	2.0	225.0
9	5.0	71.0	2.0	50.0									1.0	280.0	2.0	220.0
10	7.0	72.5	2.0	52.5									0.5	305.0	0.3	288.0
11	5.0	70.0	2.0	47.0									2.0	300.0		
12	2.0	72.5											2.0	300.0		
13	6.0	72.0											2.0	295.0		
14	8.0	80.0											2.0	300.0		
15	4.0	75.0														
16	4.0	75.0														
17	2.0	73.0														
18	0.5	67.0														
19	0.5	78.0														
20	0.4	67.0														
21																
22																
23																
24																
25																
WAVG	5,670	70.53	3,866	56.85	590	59.00	520	57.78	ERR	ERR	ERR	ERR	8,684	290.05	4,226	232.84
VARS		65.70		20.02		60.00		3.19		ERR		ERR		247.19		377.02
SDTS		8.11		4.47		7.75		1.79		ERR		ERR		15.72		19.42
C.V.		11.49%		7.87%		13.13%		3.09%		ERR		ERR		5.42%		8.34%
N		80.40		68.00		10.00		9.00		0.00		0.00		29.94		18.15

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DEPARTAMENTO: LA PAZ

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		SORGO JUL/AGO/SEP		SORGO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	1.0	84.0	1.0	55.0	4.0	55.0	4.0	56.0	0.4	75.0	6.0	65.0	3.0	300.0	0.5	250.0
2	1.0	84.0	2.0	55.0	4.0	56.0	20.0	50.0	62.0	65.0	12.0	65.0	2.0	280.0	1.0	225.0
3	0.5	83.0	4.0	54.0	12.0	62.5	20.0	50.0	4.0	60.0	5.0	65.0	3.5	285.0	1.0	250.0
4	2.0	84.0	5.0	54.0	4.0	60.0	2.0	60.0	6.0	60.0	10.0	63.0	0.5	320.0	0.5	220.0
5	1.0	84.0	10.0	66.0	6.0	60.0	2.0	60.0			8.0	64.0	0.2	300.0	1.0	250.0
6	16.0	80.0	18.0	65.0	4.0	72.0	32.0	50.0			2.0	63.0	0.5	327.0	2.0	220.0
7	24.0	82.0	8.0	67.2	17.0	70.0	4.0	55.0			18.0	65.0	0.2	350.0	12.0	222.0
8	32.0	72.0	4.0	66.0	2.0	72.0	6.0	50.0			10.0	63.5	3.0	300.0	14.0	223.0
9	8.0	75.0	6.0	67.0	0.4	77.8	11.0	50.0			8.0	50.0			4.0	220.0
10	25.0	75.0	3.0	44.5	2.0	50.0	4.0	65.0			3.0	54.0			7.0	217.0
11	12.0	75.0	6.0	50.0	1.0	48.0	2.0	66.0			14.0	65.0			1.0	248.0
12	1.0	83.0	4.0	45.0			1.0	67.0			20.0	66.0			2.0	220.0
13	2.0	83.0	6.0	55.5			51.8	58.0			133.0	65.0			5.0	218.0
14	0.6	83.0	18.0	56.0			21.5	59.0			60.0	75.0			4.0	215.0
15	0.4	82.0	8.0	55.5			13.0	58.6			90.0	72.0			2.0	350.0
16	13.0	72.0	14.0	55.0			1.0	52.0			80.0	70.0			1.0	350.0
17	6.0	77.0	3.0	55.3			1.0	50.0			200.0	75.0				
18	12.0	72.0	21.0	55.0			0.5	52.0								
19			7.0	55.5			2.0	50.0								
20			3.0	58.0			4.0	60.0								
21			7.0	56.0			1.0	58.0								
22			4.0	57.5			2.0	65.0								
23			6.0	56.7			3.0	66.0								
24			8.0	51.0												
25			12.0	50.0												
WAVG	11,982	76.08	10,706	56.95	3,595	63.74	11,482	54.99	4,657	64.36	47,585	70.08	3,811	295.43	13,273	228.84
VARS		16.72		33.39		44.82		23.36		3.59		25.3		200.18		869.8
SDTS		4.09		5.78		6.70		4.83		1.89		5.03		14.15		29.49
C.V.		5.38%		10.15%		10.50%		8.79%		2.94%		7.17%		4.79%		12.89%
N		157.50		188.00		56.40		208.80		72.36		679.00		12.90		58.00

DEPARTAMENTO: LA UNION

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN CANTID.	MAIZ ABR/MAY/JUN PRECIO	MAIZ OCT/NOV/DIC CANTID.	MAIZ OCT/NOV/DIC PRECIO	SORGO JUL/AGO/SEP CANTID.	SORGO JUL/AGO/SEP PRECIO	SORGO NOV/DIC/ENE CANTID.	SORGO NOV/DIC/ENE PRECIO	ARROZ MAY/JUN/JUL CANTID.	ARROZ MAY/JUN/JUL PRECIO	ARROZ SEP/OCT/NOV CANTID.	ARROZ SEP/OCT/NOV PRECIO	FRIJOL JUL/AGO/SEP CANTID.	FRIJOL JUL/AGO/SEP PRECIO	FRIJOL OCT/NOV/DIC CANTID.	FRIJOL OCT/NOV/DIC PRECIO
1	2.0	75.0	2.0	60.0	2.0	67.5	2.0	50.0							1.0	275.0
2	16.0	77.5	8.0	55.0	0.5	64.0	2.0	52.0								
3	2.0	75.0	12.0	60.0	4.0	65.0	6.0	57.5								
4	10.0	87.5	5.0	58.0	4.0	52.5	6.0	57.5								
5	6.0	87.5	10.0	60.0	2.0	65.0	4.0	57.5								
6	2.0	90.0	8.0	61.0	1.0	55.0	6.0	60.0								
7	12.0	90.0	4.0	59.0	4.0	57.5	4.0	62.0								
8	2.0	80.0	6.0	67.5	2.0	55.0	4.0	55.0								
9	6.0	65.0	8.0	67.5	4.0	55.0	6.0	57.5								
10	16.0	80.0	2.0	70.0	2.0	55.0	12.0	48.0								
11	2.0	80.0	4.0	67.5	4.0	55.0	9.0	45.0								
12	2.0	80.0	10.0	67.5	6.0	55.0	14.0	48.0								
13	12.0	70.0	4.0	65.0	2.0	55.0	5.0	48.0								
14	2.0	75.0	2.0	65.0	0.5	64.0	6.0	45.0								
15	4.0	75.0	6.0	50.0	4.0	65.0	8.0	45.0								
16	2.0	75.0	10.0	52.0	1.0	56.0	1.0	54.0								
17	10.0	76.0	5.0	50.0	6.0	50.0	3.0	52.0								
18	10.0	75.0	10.0	50.0	6.0	50.0	4.0	50.0								
19	10.0	75.0	24.0	57.5	2.0	55.0										
20	6.0	70.0	10.0	50.0	2.0	72.5										
21	7.0	71.0	7.0	77.5	4.0	72.5										
22	3.0	70.0	9.0	55.0	2.0	57.5										
23	2.0	71.0	15.0	50.0	8.0	47.5										
24	4.0	75.0			1.5	50.0										
25	8.0	75.0			3.0	47.0										
WAVG	12,219	77.34	10,552	58.30	4,356	56.21	5,230	51.27	ERR	ERR	ERR	ERR	ERR	ERR	275	275.00
VARS		42.78		52.17		54.39		30.52		ERR		ERR		ERR		ERR
SDTS		6.54		7.22		7.38		5.52		ERR		ERR		ERR		ERR
C.V.		8.46%		12.39%		13.12%		10.77%		ERR		ERR		ERR		ERR
N		158.00		181.00		77.50		102.00		0.00		0.00		0.00		1.00

DEPARTAMENTO: LIBERTAD

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		MAICILLO JUL/AGO/SEP		MAICILLO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	6.0	80.0	9.0	50.0	2.0	60.0	17.0	56.0	8.0	48.0	30.0	68.0	1.0	250.0	16.0	270.0
2	1.8	78.0	4.0	47.0	4.0	52.0	43.0	55.0	12.0	42.0	60.0	67.0	0.5	250.0	1.0	240.0
3	6.0	75.0	5.0	50.0	9.0	60.0	18.0	58.0	14.0	41.0	90.0	68.0	5.0	276.0	4.0	262.0
4	1.8	83.0	1.0	50.0	2.0	50.0	10.0	51.0			85.0	67.0	8.0	300.0	2.0	264.0
5	2.0	80.0	7.0	50.0	5.0	60.0	2.0	50.0			68.0	67.0	0.8	275.0	1.0	300.0
6	2.0	77.5	23.0	61.0	3.0	58.0	16.0	52.0			108.0	68.0	2.0	286.0	2.0	300.0
7	1.0	71.0	12.0	60.0	5.0	54.0	6.0	50.0			208.0	68.0	1.0	285.0	3.0	270.0
8	8.0	65.0	20.0	60.0	4.0	52.0	12.0	52.5			47.0	66.0	0.5	290.0	8.0	275.0
9	12.0	75.0	14.0	55.0	4.0	54.0	5.0	51.0			233.0	68.0	1.0	250.0	1.5	272.0
10	6.0	70.0	8.0	52.5	5.0	65.0	18.0	50.0			68.0	66.0	2.0	250.0	6.0	285.0
11	8.0	55.0	6.0	60.0	1.0	55.0	15.0	50.0			400.0	68.0	6.0	260.0	3.0	290.0
12	12.0	55.0	22.0	60.0	3.0	52.5	22.0	55.0			80.0	67.0	2.0	262.0	1.0	275.0
13	10.0	56.0	14.0	62.0	3.0	65.0	24.0	50.0			60.0	70.0	6.0	285.0	1.0	275.0
14	10.0	55.0	12.0	70.0	2.0	65.0	8.0	45.0			20.0	70.0	1.0	225.0	6.0	290.0
15	4.0	56.3	3.0	60.0	2.0	64.0	10.0	52.0			50.0	68.0	2.0	225.0	6.0	280.0
16	8.0	56.6	12.0	55.0	5.0	68.0	18.0	51.0			70.0	70.0	4.0	225.0	4.0	282.0
17	12.0	72.0	15.0	52.0	1.0	64.0	15.0	50.0			24.0	60.0	5.0	260.0	3.0	285.0
18	6.0	70.0	12.0	55.0	2.0	55.0	6.0	52.5			32.0	62.0	3.0	155.0	4.0	282.0
19	10.0	72.0	1.0	53.0	3.0	53.0	10.0	50.0			80.0	60.0	3.0	280.0		
20	8.0	71.0	20.0	53.0	2.0	50.0	4.0	52.5			100.0	58.0	5.0	285.0		
21	10.0	71.0	32.0	50.5	4.0	55.0	10.0	50.0			200.0	60.0	[illegible]	270.0		
22	10.0	70.0	8.0	51.0	2.0	55.0	15.0	50.0			180.0	60.0	12.0	250.0		
23	8.0	72.0	12.0	51.5	3.0	54.0	10.0	51.0			1971.8	68.0	8.0	260.0		
24	1.0	70.0	14.0	52.5	2.0	52.0	10.0	51.0			3396.8	72.0	1.0	270.0		
25	7.0	70.0	2.0	50.0	8.0	50.0	8.0	50.0			10.0	68.0	13.0	255.0		
WAVG	11,452	67.13	16,059	55.76	4,896	56.92	17,291	52.08	1,462	43.00	529,969	69.08	24,461	260.78	20,115	277.45
VARS		68.45		27.03		30.93		7.39		8.12		11.6		738.6		105.44
SDTS		8.27		5.20		5.56		2.72		2.85		3.40		27.18		10.27
C.V.		12.33%		9.32%		9.77%		5.22%		6.63%		4.93%		10.42%		3.70%
N		170.60		288.00		86.00		332.00		34.00		7,671.60		93.80		72.50

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DEPARTAMENTO: MORAZAN

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		SORGO JUL/AGO/SEP		SORGO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	4.0	80.0	4.0	50.0	8.0	57.5	3.0	50.0							0.3	280.0
2	4.0	75.0	6.0	52.0	1.0	50.0	6.0	50.0								
3	2.0	70.0	6.0	60.0	2.0	48.0	4.0	50.0								
4	6.0	75.0	6.0	62.0	2.0	60.0	6.0	50.0								
5	10.0	80.0	4.0	60.0	0.3	60.0	1.0	50.0								
6	0.8	80.0	4.0	55.0	2.0	55.0	2.0	52.0								
7	8.0	85.0	4.0	62.0	0.5	60.0	3.0	51.0								
8	0.3	80.0	4.0	65.[illegible]	2.0	57.5										
9	2.0	80.0	7.0	60.0	0.5	50.0										
10	10.0	80.0	1.0	67.5	2.0	48.0										
11	12.0	80.0	10.0	64.0	3.0	50.0										
12	10.0	80.0	5.0	60.0	4.0	50.0										
13	2.0	80.0	6.0	62.0	8.0	52.5										
14			8.0	60.0	2.0	50.0										
15			12.0	50.0	4.0	47.0										
16			6.0	60.0	4.0	50.0										
17			8.0	55.0												
18			6.0	60.0												
19			6.0	57.0												
20			8.0	59.0												
21			4.0	60.0												
22			4.0	58.0												
23			5.0	60.0												
24																
25																
WAVG	5,650	79.58	7,838	58.49	2,375	52.49	1,257	50.28	ERR	ERR	ERR	ERR	ERR	ERR	70	280.00
VARS		9.10		18.32		16.04		0.38		ERR		ERR		ERR		0.00
SDTS		3.02		4.28		4.01		0.61		ERR		ERR		ERR		ERR
C.V.		3.79%		7.32%		7.63%		1.22%		ERR		ERR		ERR		ERR
N		71.00		134.00		45.25		25.00		0.00		0.00		0.00		0.25

DEPARTAMENTO: SAN SALVADOR

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		SORGO JUL/AGO/SEP		SORGO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	16.0	68.0	2.0	49.0	4.0	55.0	4.0	55.0	5.0	63.0	10.0	65.0	10.0	300.0	5.0	260.0
2	2.0	70.0	15.0	65.0	5.0	52.0	2.0	56.0					4.0	300.0	3.0	265.0
3	5.0	67.5	10.0	67.0	2.0	55.0	15.0	50.0					1.2	277.0	1.0	282.0
4	15.0	65.0	14.0	64.0	3.0	55.0	12.0	55.0					5.0	300.0	0.3	280.0
5	2.0	67.5	3.0	50.0	4.0	55.0	16.0	52.0					0.5	310.0	8.0	270.0
6	8.0	70.0	1.0	48.0	3.0	53.0	15.0	50.0					3.0	302.0	2.0	280.0
7	5.0	72.0	8.0	60.0	10.0	52.0	20.0	52.0					3.0	300.0	4.0	300.0
8	2.0	72.5	4.0	65.0	3.0	57.5	6.0	52.5					5.0	290.0	2.0	290.0
9	10.0	72.0	1.0	50.0	5.0	55.0	10.0	52.0					2.0	300.0	2.0	280.0
10	5.0	72.5	10.0	50.0	2.0	55.0	8.0	50.0					6.0	305.0	6.0	290.0
11	3.0	72.0	15.0	50.0	2.0	50.0	22.0	50.0					0.5	276.0	1.0	300.0
12	2.0	75.0	2.0	52.0	1.0	50.0	4.0	55.0					2.0	300.0	6.0	290.0
13	2.0	75.5	12.0	50.0	1.0	50.0	13.0	52.5					2.0	300.0	1.0	285.0
14	4.0	72.5	12.0	45.0	4.0	53.0	6.0	55.0					3.0	275.0	2.0	284.0
15	2.0	78.0	20.0	50.0	8.0	55.0	12.0	53.0					2.0	290.0	0.3	280.0
16	4.0	75.0	20.0	50.0	4.0	54.0	10.0	55.0					1.0	290.0		
17	10.0	70.0	25.0	52.5	6.0	50.0	25.0	52.5					3.0	280.0		
18	7.0	72.0	3.0	48.0	5.0	50.0	5.0	50.0								
19	6.0	70.0	16.0	50.0	1.0	50.0	9.0	56.0								
20	23.0	70.0	6.0	45.0	1.0	50.0	15.0	55.0								
21	10.0	70.0	4.0	43.0			8.0	54.5								
22	6.0	72.0	4.0	48.5			4.0	54.0								
23	5.0	65.0	3.0	50.0			12.0	53.0								
24	8.0	66.0					12.0	56.0								
25	10.0	67.0					2.0	57.0								
WAVG	11,975	69.62	11,164	53.16	3,980	53.06	14,083	52.75	315	63.00	650	65.00	15,746	295.98	12,210	280.69
VARS		7.79		45.21		4.78		4.10		0.00		0.00		79.54		162.71
SDTS		2.79		6.72		2.19		2.02		0.00		ERR		8.92		12.76
C.V.		4.01%		12.65%		4.12%		3.84%		0.00%		ERR		3.01%		4.54%
N		172.00		210.00		75.00		267.00		5.00		10.00		53.20		43.50

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DEPARTAMENTO: SAN MIGUEL

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		MAICILLO JUL/AGO/SEP		MAICILLO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	6.0	65.0	5.0	62.5	2.0	60.0	3.0	55.0	8.0	48.0	65.0	62.0	2.0	275.0	4.0	200.0
2	18.0	65.0	12.0	62.5	1.0	65.0	2.0	57.0	6.0	47.0	45.0	60.0	6.0	175.5	8.0	200.0
3	12.0	75.0	3.0	65.0	8.0	67.5	5.0	60.0	30.0	50.0	60.0	55.0	7.0	187.5	10.0	200.0
4	10.0	75.0	15.0	62.5	1.0	50.0	8.0	62.0	8.0	48.0	90.0	52.0	4.0	187.5	6.0	290.0
5	12.0	75.0	8.0	50.0	7.0	50.0	8.0	60.0	16.0	65.0	45.0	66.0	10.0	187.0	1.0	285.0
6	9.0	78.0	4.0	52.5	2.0	50.0	2.0	62.5	20.0	66.5	20.0	62.0	4.0	187.0	5.0	280.0
7	4.0	60.0	6.0	52.5	11.0	47.5	6.0	63.0	18.0	65.0	70.0	63.0	4.0	275.0	1.0	225.0
8	10.0	65.0	6.0	50.0	1.0	52.0	2.0	60.0	12.0	67.5	27.0	60.0	9.0	275.0	6.0	250.0
9	8.0	62.5	12.0	54.0	2.0	50.0	0.4	61.0			30.0	60.0	16.0	275.0	0.4	255.0
10	4.0	60.0	4.0	54.0	4.0	67.5	2.0	57.0			22.5	60.0			7.0	260.0
11	4.0	65.0	6.0	54.0	4.0	52.5	2.0	60.0			24.0	60.0			2.0	250.0
12	6.0	75.0	3.0	54.0	4.0	65.0	6.0	45.0			28.5	60.0			4.0	275.0
13	8.0	65.0	35.0	50.0	2.0	65.0	7.0	45.0			15.0	60.0			8.0	280.0
14	2.0	65.0	42.0	51.0	4.0	65.0	4.0	46.0			30.0	60.0			2.0	290.0
15	4.0	70.0	28.0	62.0	6.0	65.0	0.5	60.0			12.0	60.0				
16	8.0	70.0	12.0	50.0	6.0	65.0	0.3	80.0			15.0	63.5				
17	4.0	70.0	8.0	50.0	2.0	65.0	2.0	56.0			38.0	62.0				
18	2.0	70.0	20.0	51.0	4.0	65.0	3.0	55.0			42.0	63.0				
19	18.0	70.0	10.0	50.0	4.0	65.0	4.0	62.5			40.0	63.0				
20	8.0	70.0	25.0	50.0	6.0	47.0	6.0	60.0			45.0	62.0				
21	12.0	70.0	8.0	52.0	4.0	65.0	0.4	66.0			38.0	70.0				
22	2.0	65.0	12.0	52.0	6.0	65.0	4.0	55.0			7.5	37.0				
23	10.0	63.0	6.0	52.0	4.0	65.0					7.0	43.0				
24	6.0	45.0	10.0	53.0	5.0	66.0					3.0	65.0				
25	2.0	65.0	8.0	53.0	6.0	49.0					2.0	65.0				
WAVG	12,882	68.16	16,474	53.49	6,276	59.20	4,384	56.59	6,900	58.47	49,498	60.25	14,259	229.98	15,882	246.77
VARS		41.09		21.99		65.81		43.95		71.91		25.55		2,071.33		1,323.95
SDTS		6.41		4.69		8.11		6.63		8.48		5.06		45.51		36.39
C.V.		9.40%		8.77%		13.70%		11.72%		14.50%		8.39%		19.79%		14.75%
N		189.00		308.00		106.00		77.47		118.00		821.50		62.00		64.36

DEPARTAMENTO: SONSONATE

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		MAICILLO JUL/AGO/SEP		MAICILLO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	20.0	70.0	1.0	57.0	4.0	48.0	24.0	52.0			50.0	60.0	1.0	260.0	4.0	275.0
2	3.0	72.0	6.0	56.0	2.0	50.0	18.0	53.0			200.0	62.0	6.0	275.0	2.0	200.0
3	2.0	73.5	6.0	56.0	1.0	50.0	6.0	52.0			150.0	70.0	4.0	272.5	5.0	200.0
4	10.0	70.0	10.0	56.0	4.0	51.0	30.0	50.0			70.0	70.0	10.0	262.0	8.0	210.0
5	20.0	70.0	6.0	57.0	5.0	50.0	16.0	51.5			120.0	67.0	8.0	265.0	1.0	200.0
6	8.0	70.0	6.0	56.0	4.0	48.0	60.0	49.3			100.0	70.0	8.0	275.0	4.0	200.0
7	4.0	71.0	8.0	56.0	24.0	55.0	24.0	51.5			60.0	72.0	4.0	262.5	2.0	190.0
8	2.0	70.0	6.0	52.0	1.0	51.0	75.0	50.0			30.0	60.0	1.0	245.0	5.0	200.0
9	2.0	70.0	12.0	52.0	6.0	57.5	4.0	50.0			25.0	60.0	6.0	270.0	2.0	200.0
10	5.0	69.0	8.0	50.0	10.0	60.0	11.0	52.5			20.0	62.0	2.0	275.0	6.0	200.0
11	3.0	70.0	15.0	50.0	12.0	60.0	5.0	68.0			25.0	60.0	5.0	262.5	4.0	200.0
12	6.0	70.0	7.0	52.0	16.0	58.0	28.0	57.0					2.0	250.0	0.5	200.0
13	8.0	72.5	16.0	50.0	10.0	57.0	4.0	50.0					2.0	285.0	6.0	200.0
14	6.0	70.0	5.0	50.0	6.0	52.5	16.0	50.0					1.0	275.0	4.0	250.0
15	4.0	70.0	8.0	50.0	6.0	52.0	6.0	51.5					0.3	270.0	8.0	250.0
16	12.0	72.5	1.0	52.5	12.0	52.5	10.0	51.0							4.0	200.0
17	6.0	73.0	12.0	50.0	12.0	52.0	10.0	50.0							4.0	200.0
18	10.0	72.0	6.0	55.0	13.0	55.0	6.0	50.0							8.0	200.0
19	10.0	70.0	8.0	56.0	15.0	57.0	12.0	52.0							2.0	200.0
20	4.0	72.5	4.0	55.0	2.0	52.0	12.0	50.0							2.0	270.0
21	2.0	65.0	0.7	61.0	3.0	51.0	4.0	51.0							3.0	265.0
22	0.3	72.0	12.0	60.0	3.0	50.0	5.0	50.0							10.0	268.0
23	4.0	68.0	10.0	55.0	2.0	60.0	14.0	50.0								
24	2.0	70.0	10.0	55.0	2.0	61.0	10.0	51.0								
25	6.0	74.0	8.6	50.9	4.0	50.0	24.0	50.0								
WAVG	11,264	70.73	10,267	53.39	9,822	54.87	22,200	51.15	ERR	ERR	56,200	66.12	16,130	267.72	20,875	220.90
VARS		2.32		9.79		12.01		6.88		ERR		18.36		58.4		865.7
SDTS		1.52		3.13		3.47		2.62		ERR		4.28		7.64		29.42
C.V.		2.15%		5.86%		6.32%		5.13%		ERR		6.48%		2.85%		13.32%
N		159.25		192.32		179.00		434.00		0.00		850.00		60.25		94.50

DEPARTAMENTO: SANTA ANA

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		SORGO JUL/AGO/SEP		SORGO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	26.0	74.0	3.0	55.0	2.0	50.0	18.0	52.0			70.0	70.0	0.5	320.0	6.0	235.0
2	35.0	75.0	10.0	48.0	2.0	49.0	9.0	53.0			60.0	64.0	1.5	260.0	2.0	260.0
3	3.0	71.0	12.0	62.0	2.0	50.0	90.0	52.0			120.0	58.0	0.8	310.0	0.5	260.0
4	3.0	70.0	10.0	63.0	0.3	65.0	12.0	52.5			15.0	68.0	0.5	285.0	0.3	250.0
5	2.0	71.0	25.0	64.0	3.0	50.0	16.0	93.0			25.0	69.0	75.0	320.0	4.0	278.0
6	14.0	72.5	15.0	70.0	3.0	52.0	24.0	51.0			150.0	68.0	0.5	320.0	3.0	258.0
7	6.0	73.0	2.0	50.0	2.0	50.0	24.0	50.0			32.0	60.0	0.5	310.0	2.0	260.0
8	8.0	70.0	6.0	50.0	20.0	50.0	6.0	50.0					0.8	250.0	2.0	262.0
9	8.0	70.0	3.0	52.0	4.0	49.0	4.0	52.5					2.0	245.0	2.0	275.0
10	4.0	74.0	4.0	48.0	6.0	48.5	4.0	55.0					2.0	235.0	2.0	260.0
11	10.0	74.0	6.0	50.0	10.0	52.5	4.0	55.0					0.5	312.0	4.0	265.0
12	6.0	72.0	10.0	48.5	6.0	60.0							1.0	280.0	2.0	260.0
13	4.0	70.0	10.0	55.0	0.5	60.0							0.5	295.0	4.0	265.0
14	8.0	70.0	6.0	53.0									2.0	280.0	2.0	265.0
15	24.0	72.5	10.0	50.0									2.0	290.0	2.0	287.5
16	10.0	75.0	8.0	50.0									6.0	310.0	1.0	290.0
17	6.0	70.0	10.0	52.0									6.0	275.0	5.0	287.5
18	7.0	80.0	8.0	55.0									5.0	270.0	2.0	287.5
19	10.0	78.0	8.0	50.0									6.0	275.0	4.0	285.0
20			8.0	50.0									4.0	290.0	2.0	290.0
21			6.0	50.0									4.0	278.0	4.0	285.0
22			8.0	55.0											16.0	255.0
23			8.0	52.0											4.0	265.0
24			10.0	50.0											0.5	300.0
25			6.0	55.0											2.0	260.0
WAVG	14,245	73.43	11,716	55.26	3,122	51.40	11,585	54.91	ERR	ERR	30,565	64.76	36,893	304.90	20,853	266.32
VARS		5.94		45.19		11.41		120.69		ERR		21.97		524.39		239.06
SDTS		2.44		6.72		3.38		10.99		ERR		4.69		22.90		15.46
C.V.		3.32%		12.16%		6.57%		20.01%		ERR		7.24%		7.51%		5.81%
N		194.00		212.00		60.75		211.00		0.00		472.00		121.00		78.30

DEPARTAMENTO: SAN VICENTE

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		SORGO JUL/AGO/SEP		SORGO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	2.0	70.0	6.0	60.0	3.0	67.0	1.0	70.0	38.0	60.0	13.0	50.0	12.0	277.5	1.1	222.2
2	2.0	84.0	20.0	52.5	5.0	61.0	4.0	71.0	46.0	60.0	8.6	47.0	16.0	278.0	0.7	211.1
3	4.0	84.0	10.0	55.0	2.0	55.0	4.0	70.0	10.0	50.0	43.0	47.5	11.0	300.0	0.9	250.0
4	4.3	71.8	2.0	60.0	3.0	66.5	6.0	62.0	10.0	50.0	12.0	65.0	7.0	277.0	1.0	250.0
5	8.6	69.5	5.0	57.5	2.5	77.5	1.0	60.0	60.0	40.0	18.0	66.0	10.0	278.0	3.0	260.0
6	12.0	75.0	3.0	55.0	1.0	77.0	4.0	60.0	11.0	42.0	30.0	65.0	4.0	276.0	15.0	205.0
7	3.0	74.0	6.0	55.0			4.0	55.0	150.0	41.0	14.0	65.0	11.0	278.0	10.0	200.0
8	10.0	73.0	10.0	55.0			6.0	56.0			10.0	65.0	16.0	277.0	2.0	206.0
9	6.0	74.0	15.0	55.0			8.0	54.0			15.0	65.0	6.0	277.0	6.0	200.0
10	1.0	74.0	3.0	56.0			10.0	55.0			7.0	65.0	12.0	278.0	2.0	277.0
11	3.0	73.0	9.0	70.0			8.6	51.0			3.0	73.0	10.0	277.5	1.0	275.0
12	2.0	74.0	3.0	71.0			4.3	51.0			6.0	72.0	7.0	278.0	4.0	275.0
13	1.0	75.0	2.0	68.0			3.0	51.0			4.0	70.0	3.5	277.0	1.0	280.0
14	2.2	69.4	2.0	60.0			10.0	46.5					0.4	361.0	2.0	277.0
15	1.0	68.0	7.0	55.0			0.9	72.0					0.5	361.0	4.0	250.0
16	8.6	69.4	4.0	50.0			0.4	75.0					0.5	388.0	0.5	275.0
17	2.2	69.4	0.9	55.0			13.2	45.4					2.0	277.5	1.0	260.0
18	2.0	67.0	1.5	50.0			26.4	45.4					15.0	277.0		
19	4.0	73.0	9.0	53.5			15.4	48.0					1.0	300.0		
20	4.0	73.0	11.0	55.0			8.8	47.3					7.0	288.0		
21	2.0	72.0	17.0	54.5									3.0	280.0		
22	16.0	70.0	32.0	53.7									1.0	275.0		
23	9.0	72.5	18.0	53.5									8.0	275.0		
24	14.0	72.0	20.0	54.0												
25	67.0	75.0	26.0	53.3												
WAVG	14,000	73.34	13,373	55.17	1,086	65.83	7,165	51.56	15,052	46.31	10,936	59.56	45,955	280.32	12,494	226.35
VARS		8.39		16.11		53.03		52.54		70.49		76.98		113.7		976.9
SDTS		2.90		4.01		7.28		7.25		8.40		8.77		10.66		31.26
C.V.		3.95%		7.28%		11.06%		14.06%		18.13%		14.73%		3.80%		13.81%
N		190.90		242.40		16.50		138.96		325.00		183.60		163.94		55.20

DEPARTAMENTO: USULUTAN

CAMPANA AGRICOLA 1990-1991

PRECIOS Y CANTIDADES DURANTE 1990

No.	MAIZ ABR/MAY/JUN		MAIZ OCT/NOV/DIC		SORGO JUL/AGO/SEP		SORGO NOV/DIC/ENE		ARROZ MAY/JUN/JUL		ARROZ SEP/OCT/NOV		FRIJOL JUL/AGO/SEP		FRIJOL OCT/NOV/DIC	
	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO	CANTID.	PRECIO
1	5.0	75.0	5.0	50.0	6.0	60.0	18.0	47.5			1.5	62.0	2.0	225.0	0.3	300.0
2	6.0	76.0	10.0	50.0	8.0	62.0	12.0	45.0			3.0	62.0	6.0	225.0	0.5	310.0
3	10.0	75.0	7.0	50.0	20.0	55.0	18.0	45.0			6.0	62.0			2.0	300.0
4	20.0	80.0	8.0	50.0	16.0	57.0	8.0	47.5			40.0	62.0			1.0	285.0
5	2.0	75.0	12.0	51.0	10.0	55.0	20.0	45.0			30.0	55.0			4.0	300.0
6	4.0	72.0	24.0	52.0	90.0	45.0	8.0	48.0			28.0	62.0			3.0	285.0
7	20.0	62.5	180.0	51.0	10.0	45.0	6.0	48.0			18.0	65.0			1.5	285.0
8	20.0	62.5	30.0	50.0	12.0	60.0					20.0	65.0			2.0	310.0
9	20.0	62.5	28.0	51.5	8.0	65.0					16.0	63.0			1.0	300.0
10	16.0	62.5	9.0	50.0							12.0	62.0				
11	16.0	62.0	14.0	52.0							80.0	63.0				
12	20.0	62.5	18.0	51.0							75.0	65.0				
13	20.0	62.5	15.0	65.0							14.0	64.0				
14	10.0	77.5	16.0	66.0							25.0	62.0				
15	20.0	77.5	22.0	65.0							230.0	63.0				
16	20.0	77.5	30.0	65.0							180.0	64.0				
17	20.0	77.5	8.0	65.0							120.0	62.0				
18	10.0	90.0	10.0	60.0							96.0	62.0				
19	16.0	90.0	3.0	60.0							80.0	62.0				
20	2.0	72.5	7.0	62.0							90.0	65.0				
21	10.0	74.0	2.0	60.0							120.0	66.0				
22	20.0	72.5	5.0	65.0												
23	10.0	70.0	4.0	56.0												
24	18.0	70.0	5.0	56.0												
25	16.0	70.0	4.0	56.0												
WAVG	25,041	71.34	25,896	54.40	9,158	50.88	4,157	46.19	ERR	ERR	81,532	63.47	1,800	225.00	4,518	296.23
VARS		69.17		34.25		48.31		1.81		ERR		1.8		0.00		89.17
SDTS		8.32		5.85		6.95		1.35		ERR		1.35		0.00		9.44
C.V.		11.66%		10.76%		13.66%		2.91%		ERR		2.12%		0.00%		3.19%
N		351.00		476.00		180.00		90.00		0.00		1,284.50		8.00		15.25

APPENDIX 14

AREA, PRODUCTION, YIELD AND PRICE BY REGION AND YEAR

DATOS ANUALES Y POR REGIONES SOBRE

MAIZ

NO.	REG	YEAR	AREA MZ	PRODUCC. QQ	RENDMTO QQ/MZ	PRECIO NOMINAL	IPC	PRECIO REAL
	REG	YR	ARMZ	QQMZ	RDMZ	PNMZ	IPC	PRMZ
1	1	1975	91050	2886450	31.70	15.33	69.19	22.16
2	2	1975	81055	2431350	30.00	15.33	69.19	22.16
3	3	1975	44605	1311995	29.41	15.33	69.19	22.16
4	4	1975	132996	2735040	20.56	15.33	69.19	22.16
5	1	1976	88495	2493575	28.18	13.84	74.06	18.69
6	2	1976	69886	1738970	24.88	13.84	74.06	18.69
7	3	1976	42424	1007881	23.76	13.84	74.06	18.69
8	4	1976	126491	2183017	17.26	13.84	74.06	18.69
9	1	1977	150836	2021830	13.40	19.63	82.81	23.70
10	2	1977	86617	2577478	29.76	19.63	82.81	23.70
11	3	1977	50780	1103881	21.74	19.63	82.81	23.70
12	4	1977	140819	2551977	18.12	19.63	82.81	23.70
13	1	1978	77415	2701870	34.90	19.39	100.00	19.39
14	2	1978	92573	3381290	36.53	19.39	100.00	19.39
15	3	1978	54753	1470760	26.86	19.39	100.00	19.39
16	4	1978	152859	3466680	22.68	19.39	100.00	19.39
17	1	1979	95537	3459725	36.21	15.13	114.84	13.17
18	2	1979	104480	3470732	33.22	15.13	114.84	13.17
19	3	1979	64199	2034696	31.69	15.13	114.84	13.17
20	4	1979	130084	2416280	18.57	15.13	114.84	13.17
21	1	1980	105090	3472918	33.05	17.41	136.15	12.79
22	2	1980	111720	3552866	31.80	17.41	136.15	12.79
23	3	1980	67770	2047118	30.21	17.41	136.15	12.79
24	4	1980	132420	2366845	17.87	17.41	136.15	12.79
25	1	1981	112439	3259258	28.99	18.49	152.01	12.16
26	2	1981	111168	3329898	29.95	18.49	152.01	12.16
27	3	1981	53953	1904040	35.29	18.49	152.01	12.16
28	4	1981	117440	2374619	20.22	18.49	152.01	12.16
29	1	1982	114898	3191050	27.77	21.35	172.44	12.38
30	2	1982	68700	2266050	32.98	21.35	172.44	12.38
31	3	1982	54752	1567450	28.63	21.35	172.44	12.38
32	4	1982	102650	1966450	19.16	21.35	172.44	12.38
33	1	1983	110185	3854800	34.98	26.33	197.87	13.31
34	2	1983	70320	2707200	38.50	26.33	197.87	13.31
35	3	1983	54645	1294970	23.70	26.33	197.87	13.31
36	4	1983	69810	1776030	25.44	26.33	197.87	13.31
37	1	1984	109700	3873500	35.31	25.00	217.30	11.50

DATOS ANUALES Y POR REGIONES SOBRE

MAIZ (cont.)

NO.	REG	YEAR	AREA MZ	PRODUCC. QQ	RENDMTO QQ/MZ	PRECIO NOMINAL	IPC	PRECIO REAL
	REG	YR	ARMZ	QQMZ	RDMZ	PNMZ	IPC	PRMZ
38	2	1984	72800	3029100	41.61	25.00	217.30	11.50
39	3	1984	56300	1845200	32.77	25.00	217.30	11.50
40	4	1984	106900	2713700	25.39	25.00	217.30	11.50
41	1	1985	112990	3392300	30.02	23.46	286.68	8.18
42	2	1985	85400	3100100	36.30	23.46	286.68	8.18
43	3	1985	57900	1978800	34.18	23.46	286.68	8.18
44	4	1985	103100	2298000	22.29	23.46	286.68	8.18
45	1	1986	107925	3028625	28.06	36.50	373.70	9.77
46	2	1986	89450	2752325	30.77	36.50	373.70	9.77
47	3	1986	59485	1777900	29.89	36.50	373.70	9.77
48	4	1986	111240	1941150	17.45	36.50	373.70	9.77
49	1	1987	113600	3940400	34.69	40.33	446.96	9.02
50	2	1987	99900	805000	8.06	40.33	446.96	9.02
51	3	1987	66800	2245000	33.61	40.33	446.96	9.02
52	4	1987	118200	2595500	21.96	40.33	446.96	9.02
53	1	1988	117000	4090600	34.96	36.20	528.53	6.85
54	2	1988	104500	3719300	35.59	36.20	528.53	6.85
55	3	1988	64300	2027100	31.53	36.20	528.53	6.85
56	4	1988	117000	3119200	26.66	36.20	528.53	6.85
57	1	1989	115100	4097600	35.60	49.19	652.55	7.54
58	2	1989	98500	3617700	36.73	49.19	652.55	7.54
59	3	1989	58500	1853400	31.68	49.19	652.55	7.54
60	4	1989	122600	3225600	26.31	49.19	652.55	7.54
61	1	1990	102600	3917800	38.19	61.44	778.80	7.89
62	2	1990	91300	3213800	35.20	61.44	778.80	7.89
63	3	1990	64200	1996600	31.10	61.44	778.80	7.89
64	4	1990	144500	3972000	27.49	61.44	778.80	7.89
65	1	1991	104600	3290900	31.46	70.76	855.66	8.27
66	2	1991	90500	2829800	31.27	70.76	855.66	8.27
67	3	1991	69000	1888000	27.36	70.76	855.66	8.27
68	4	1991	165300	2730500	16.52	70.76	855.66	8.27

DATOS ANUALES Y POR REGION SOBRE

SORGO

NO.	REG	YEAR	AREA MZ	PRODUCC. QQ	RENDMTO QQ/MZ	PRECIO NOMINAL	IPC	PRECIO REAL
	REG	YR	ARSR	QQSR	RDSR	PNSR	IPC	PRSR
1	1	1975	28300	600200	21.21	12.88	69.19	18.62
2	2	1975	38278	697845	18.23	12.88	69.19	18.62
3	3	1975	33422	722155	21.61	12.88	69.19	18.62
4	4	1975	89100	1729800	19.41	12.88	69.19	18.62
5	1	1976	27380	522149	19.07	9.14	74.06	12.34
6	2	1976	32592	700262	21.49	9.14	74.06	12.34
7	3	1976	32327	671945	20.79	9.14	74.06	12.34
8	4	1976	86201	1504844	17.46	9.14	74.06	12.34
9	1	1977	22327	393885	17.64	16.68	82.81	20.14
10	2	1977	40003	724048	18.10	16.68	82.81	20.14
11	3	1977	21136	359102	16.99	16.68	82.81	20.14
12	4	1977	105333	1807963	17.16	16.68	82.81	20.14
13	1	1978	30690	569080	18.54	17.49	100.00	17.49
14	2	1978	35310	657365	18.62	17.49	100.00	17.49
15	3	1978	37595	635350	16.90	17.49	100.00	17.49
16	4	1978	91805	1655905	18.04	17.49	100.00	17.49
17	1	1979	27060	564570	20.86	16.80	114.84	14.63
18	2	1979	38745	703970	18.17	16.80	114.84	14.63
19	3	1979	35260	592450	16.80	16.80	114.84	14.63
20	4	1979	103935	1624010	15.63	16.80	114.84	14.63
21	1	1980	22532	492626	21.86	19.66	136.15	14.44
22	2	1980	32262	614262	19.04	19.66	136.15	14.44
23	3	1980	29360	516953	17.61	19.66	136.15	14.44
24	4	1980	86546	1417059	16.37	19.66	136.15	14.44
25	1	1981	30917	665059	21.51	21.39	152.01	14.07
26	2	1981	31989	566377	17.71	21.39	152.01	14.07
27	3	1981	22353	385230	17.23	21.39	152.01	14.07
28	4	1981	79741	1333614	16.72	21.39	152.01	14.07
29	1	1982	51452	828775	16.11	21.58	172.44	12.51
30	2	1982	17348	257685	14.85	21.58	172.44	12.51
31	3	1982	22005	322613	14.66	21.58	172.44	12.51
32	4	1982	79195	1290927	16.30	21.58	172.44	12.51
33	1	1983	61700	1284200	20.81	24.50	197.87	12.38
34	2	1983	23100	463600	20.07	24.50	197.87	12.38
35	3	1983	14990	225100	15.02	24.50	197.87	12.38
36	4	1983	58210	704200	12.10	24.50	197.87	12.38
37	1	1984	65400	1400900	21.42	21.00	217.30	9.66
38	2	1984	25500	510800	20.03	21.00	217.30	9.66
39	3	1984	15400	277700	18.03	21.00	217.30	9.66

DATOS ANUALES Y POR REGION SOBRE

SORGO (cont.)

NO.	REG	YEAR	AREA MZ	PRODUCC. QQ	RENDMTO QQ/MZ	PRECIO NOMINAL	IPC	PRECIO REAL
	REG	YR	ARSR	QQSR	RDSR	PNSR	IPC	PRSR
40	4	1984	59700	864500	14.48	21.00	217.30	9.66
41	1	1985	56000	1032400	18.44	22.71	286.68	7.92
42	2	1985	34000	680000	20.00	22.71	286.68	7.92
43	3	1985	16300	280100	17.18	22.71	286.68	7.92
44	4	1985	57100	890300	15.59	22.71	286.68	7.92
45	1	1986	54300	1172900	21.60	30.00	373.70	8.03
46	2	1986	32100	593800	18.50	30.00	373.70	8.03
47	3	1986	21900	403600	18.43	30.00	373.70	8.03
48	4	1986	63200	1036500	16.40	30.00	373.70	8.03
49	1	1987	54200	374100	6.90	38.29	446.96	8.57
50	2	1987	40700	56900	1.40	38.29	446.96	8.57
51	3	1987	27900	62200	2.23	38.29	446.96	8.57
52	4	1987	55900	71000	1.27	38.29	446.96	8.57
53	1	1988	57700	1229700	21.31	39.94	528.53	7.56
54	2	1988	46800	889200	19.00	39.94	528.53	7.56
55	3	1988	18800	302700	16.10	39.94	528.53	7.56
56	4	1988	50900	911100	17.90	39.94	528.53	7.56
57	1	1989	59000	1216200	20.61	40.55	652.55	6.21
58	2	1989	38000	743700	19.57	40.55	652.55	6.21
59	3	1989	22700	383600	16.90	40.55	652.55	6.21
60	4	1989	51200	906200	17.70	40.55	652.55	6.21
61	1	1990	66100	1386300	20.97	50.37	778.80	6.47
62	2	1990	33200	731100	22.02	50.37	778.80	6.47
63	3	1990	28300	441700	15.61	50.37	778.80	6.47
64	4	1990	57100	932700	16.33	50.37	778.80	6.47
65	1	1991	57600	1411200	24.50	46.36	855.66	5.42
66	2	1991	32400	712800	22.00	46.36	855.66	5.42
67	3	1991	35200	570200	16.20	46.36	855.66	5.42
68	4	1991	50700	846700	16.70	46.36	855.66	5.42

DATOS ANUALES Y POR REGIONES SOBRE

FRIJOL

NO.	REG	ANOS	AREA MZ	PRODUCC. QQ	RENDMTO QQ/MZ	PRECIO NOMINAL	IPC	PRECIO REAL
	REG	YR	ARFR	QQFR	RDFR	PNFR	IPC	PRFR
1	1	1975	28090	305900	10.89	45.27	69.19	65.43
2	2	1975	15495	179055	11.56	45.27	69.19	65.43
3	3	1975	22205	243145	10.95	45.27	69.19	65.43
4	4	1975	14010	133700	9.54	45.27	69.19	65.43
5	1	1976	26596	310365	11.67	43.58	74.06	58.84
6	2	1976	14668	180374	12.30	43.58	74.06	58.84
7	3	1976	21020	244827	11.65	43.58	74.06	58.84
8	4	1976	13262	134534	10.14	43.58	74.06	58.84
9	1	1977	19064	189412	9.94	56.45	82.81	68.17
10	2	1977	11194	115564	10.23	56.45	82.81	68.17
11	3	1977	27064	280868	10.38	56.45	82.81	68.17
12	4	1977	17801	147695	8.30	56.45	82.81	68.17
13	1	1978	18951	267790	14.13	59.15	100.00	59.15
14	2	1978	25640	307603	12.00	59.15	100.00	59.15
15	3	1978	20526	235637	11.48	59.15	100.00	59.15
16	4	1978	8883	121970	13.73	59.15	100.00	59.15
17	1	1979	24638	349268	14.18	46.68	114.84	40.65
18	2	1979	37393	301928	11.02	46.68	114.84	40.65
19	3	1979	15331	203471	13.27	46.68	114.84	40.65
20	4	1979	11338	156663	13.82	46.68	114.84	40.65
21	1	1980	23645	311465	13.17	73.36	136.15	53.88
22	2	1980	25830	257078	9.95	73.36	136.15	53.88
23	3	1980	14598	165193	11.32	73.36	136.15	53.88
24	4	1980	10927	132764	12.15	73.36	136.15	53.88
25	1	1981	22384	298999	13.36	88.97	152.01	58.53
26	2	1981	24552	271789	11.07	88.97	152.01	58.53
27	3	1981	13819	158581	11.48	88.97	152.01	58.53
28	4	1981	10345	102451	9.90	88.97	152.01	58.53
29	1	1982	32290	343350	10.63	74.10	172.44	42.97
30	2	1982	23594	232848	9.87	74.10	172.44	42.97
31	3	1982	14616	157475	10.77	74.10	172.44	42.97
32	4	1982	8900	96327	10.82	74.10	172.44	42.97
33	1	1983	35360	459840	13.00	60.35	197.87	30.50
34	2	1983	25550	266520	10.43	60.35	197.87	30.50
35	3	1983	10500	121040	11.53	60.35	197.87	30.50
36	4	1983	9090	70900	7.80	60.35	197.87	30.50
37	1	1984	36300	476100	13.12	63.70	217.30	29.31
38	2	1984	26800	340000	12.69	63.70	217.30	29.31
39	3	1984	10300	143800	13.96	63.70	217.30	29.31
40	4	1984	9100	96100	10.56	63.70	217.30	29.31
41	1	1985	36100	318800	8.83	78.16	286.68	27.26
42	2	1985	29800	270900	9.09	78.16	286.68	27.26

DATOS ANUALES Y POR REGIONES SOBRE

FRIJOL (cont.)

NO.	REG	ANOS	AREA MZ	PRODUCC. QQ	RENDMTO QQ/MZ	PRECIO NOMINAL	IPC	PRECIO REAL
	REG	YR	ARFR	QQFR	RDFR	PNFR	IPC	PRFR
43	3	1985	8900	87300	9.81	78.16	286.68	27.26
44	4	1985	8500	74200	8.73	78.16	286.68	27.26
45	1	1986	38100	489200	12.84	100.00	373.70	26.76
46	2	1986	31600	401650	12.71	100.00	373.70	26.76
47	3	1986	9380	126000	13.43	100.00	373.70	26.76
48	4	1986	8020	77050	9.61	100.00	373.70	26.76
49	1	1987	39100	239600	6.13	103.92	446.96	23.25
50	2	1987	31600	185200	5.86	103.92	446.96	23.25
51	3	1987	10500	57200	5.45	103.92	446.96	23.25
52	4	1987	8100	49000	6.05	103.92	446.96	23.25
53	1	1988	39700	520100	13.10	235.77	528.53	44.61
54	2	1988	36800	480200	13.05	235.77	528.53	44.61
55	3	1988	11300	153800	13.61	235.77	528.53	44.61
56	4	1988	8300	85900	10.35	235.77	528.53	44.61
57	1	1989	35500	297400	8.38	177.05	652.55	27.13
58	2	1989	39400	482900	12.26	177.05	652.55	27.13
59	3	1989	9400	103300	10.99	177.05	652.55	27.13
60	4	1989	7300	85300	11.68	177.05	652.55	27.13
61	1	1990	32800	450000	13.72	227.33	778.80	29.19
62	2	1990	37100	452600	12.20	227.33	778.80	29.19
63	3	1990	13300	171800	12.92	227.33	778.80	29.19
64	4	1990	6300	71000	11.27	227.33	778.80	29.19
65	1	1991	45500	637700	14.02	279.49	855.66	32.66
66	2	1991	37100	477900	12.88	279.49	855.66	32.66
67	3	1991	17100	219800	12.85	279.49	855.66	32.66
68	4	1991	6900	74200	10.75	279.49	855.66	32.66

DATOS ANUALES Y POR REGIONES SOBRE

ARROZ

NO.	REG	YEAR	AREA MZ	PRODUCC. QQ	RENDMTO QQ/MZ	PRECIO NOMINAL	IPC	PRECIO REAL
	REG	YR	ARAZ	QQAZ	RDAZ	PNAZ	IPC	PRAZ
1	1	1975	6300	350400	55.62	20.95	69.19	30.28
2	2	1975	4871	275935	56.65	20.95	69.19	30.28
3	3	1975	7129	384465	53.93	20.95	69.19	30.28
4	4	1975	5900	309202	52.41	20.95	69.19	30.28
5	1	1976	5130	205899	40.14	28.63	74.06	38.66
6	2	1976	3968	162453	40.94	28.63	74.06	38.66
7	3	1976	5807	226078	38.93	28.63	74.06	38.66
8	4	1976	4805	181995	37.88	28.63	74.06	38.66
9	1	1977	2632	112145	42.61	37.80	82.81	45.65
10	2	1977	4243	163453	38.52	37.80	82.81	45.65
11	3	1977	4045	167819	41.49	37.80	82.81	45.65
12	4	1977	6877	269181	39.14	37.80	82.81	45.65
13	1	1978	3680	205700	55.90	34.11	100.00	34.11
14	2	1978	4350	251400	57.79	34.11	100.00	34.11
15	3	1978	4300	212000	49.30	34.11	100.00	34.11
16	4	1978	7520	435400	57.90	34.11	100.00	34.11
17	1	1979	6710	441904	65.86	35.58	114.84	30.98
18	2	1979	4895	305154	62.34	35.58	114.84	30.98
19	3	1979	6900	379860	55.05	35.58	114.84	30.98
20	4	1979	2595	139282	53.67	35.58	114.84	30.98
21	1	1980	4464	248575	55.68	30.16	136.15	22.15
22	2	1980	5311	297416	56.00	30.16	136.15	22.15
23	3	1980	1853	112107	60.50	30.16	136.15	22.15
24	4	1980	12372	661902	53.50	30.16	136.15	22.15
25	1	1981	4030	224605	55.73	31.64	152.01	20.81
26	2	1981	4746	265800	56.01	31.64	152.01	20.81
27	3	1981	1366	82715	60.55	31.64	152.01	20.81
28	4	1981	9658	516670	53.50	31.64	152.01	20.81
29	1	1982	4367	222458	50.94	33.00	172.44	19.14
30	2	1982	3835	183716	47.91	33.00	172.44	19.14
31	3	1982	1269	65754	51.82	33.00	172.44	19.14
32	4	1982	6529	298092	45.66	33.00	172.44	19.14
33	1	1983	5020	298100	59.38	36.45	197.87	18.42
34	2	1983	5250	306600	58.40	36.45	197.87	18.42
35	3	1983	3400	164500	48.38	36.45	197.87	18.42
36	4	1983	4330	170800	39.45	36.45	197.87	18.42
37	1	1984	5100	316300	62.02	33.00	217.30	15.19
38	2	1984	6300	436500	69.29	33.00	217.30	15.19
39	3	1984	5900	355300	60.22	33.00	217.30	15.19

DATOS ANUALES Y POR REGIONES SOBRE

ARROZ (cont.)

NO.	REG	YEAR	AREA MZ	PRODUCC. QQ	RENDMTO QQ/MZ	PRECIO NOMINAL	IPC	PRECIO REAL
	REG	YR	ARAZ	QQAZ	RDAZ	PNAZ	IPC	PRAZ
40	4	1984	4600	268800	58.43	33.00	217.30	15.19
41	1	1985	5200	323800	62.27	33.50	286.68	11.69
42	2	1985	7400	494700	66.85	33.50	286.68	11.69
43	3	1985	5300	302100	57.00	33.50	286.68	11.69
44	4	1985	6800	376800	55.41	33.50	286.68	11.69
45	1	1986	2800	154000	55.00	24.80	373.70	6.64
46	2	1986	6900	467800	67.80	24.80	373.70	6.64
47	3	1986	3900	216100	55.41	24.80	373.70	6.64
48	4	1986	3600	182500	50.69	24.80	373.70	6.64
49	1	1987	1800	104250	57.92	71.31	446.96	15.95
50	2	1987	5600	403200	72.00	71.31	446.96	15.95
51	3	1987	5300	256600	48.42	71.31	446.96	15.95
52	4	1987	4000	150500	37.63	71.31	446.96	15.95
53	1	1988	1600	98100	61.31	61.82	528.53	11.70
54	2	1988	8300	622300	74.98	61.82	528.53	11.70
55	3	1988	7100	376400	53.01	61.82	528.53	11.70
56	4	1988	2700	149100	55.22	61.82	528.53	11.70
57	1	1989	1400	89200	63.71	45.66	652.55	7.00
58	2	1989	9800	662900	67.64	45.66	652.55	7.00
59	3	1989	7200	415800	57.75	45.66	652.55	7.00
60	4	1989	3800	217300	57.18	45.66	652.55	7.00
61	1	1990	1200	79900	66.58	57.34	778.80	7.36
62	2	1990	10800	756000	70.00	57.34	778.80	7.36
63	3	1990	4800	305800	63.71	57.34	778.80	7.36
64	4	1990	3600	199400	55.39	57.34	778.80	7.36
65	1	1991	1400	75800	54.14	110.28	855.66	12.89
66	2	1991	12100	780100	64.47	110.28	855.66	12.89
67	3	1991	4000	178400	44.60	110.28	855.66	12.89
68	4	1991	2900	83800	28.90	110.28	855.66	12.89

APPENDIX 15

RESULTS OF COMPARISON OF MEANS STUDY

TEST OF SIGNIFICANCE DIFFERENCES BETWEEN PLANTING AND HARVEST PRICES FOR CORN, 1990-91

Department	Planting Price/1	Harvest Price/2	Difference	T-test	Prob. One-Tail
Ahuachapan	72.80	59.75	13.05	7.3609	0.0000
Cabanas	67.75	48.62	19.13	8.5751	0.0000
Chalatenango	66.73	49.08	17.65	8.4705	0.0000
Cuscatlan	71.10	56.18	14.92	4.8000	0.0000
La Paz	79.44	56.22	23.22	13.4766	0.0000
La Union	76.82	59.78	17.04	8.3387	0.0000
La Libertad	69.06	54.84	14.22	6.9692	0.0000
Morazan	78.85	59.07	19.78	13.8642	0.0000
San Salvador	70.68	52.26	18.42	11.9879	0.0000
San Miguel	67.14	53.98	13.16	7.9599	0.0000
Sonsonate	70.68	54.02	16.66	22.1926	0.0000
Santa Ana	72.74	53.50	19.24	13.6073	0.0000
San Vicente	72.88	56.70	16.18	11.8552	0.0000
Usulutan	72.36	56.38	15.98	7.8929	0.0000
National	71.74	54.95	16.79	30.6700	0.0000

1 April, May and June
2 October, November and December

FILE: MAIZSIG.WQ1

Inter-Departmental Tests of Significance of Corn
Price at Harvest, Region I, 1990-91

Department		Ahuachapan	Sonsonate
Sonsonate	Diff	5.73	
	T-test	3.1354	
	Prob	0.0032	
Santa Ana	Diff	6.25	0.52
	T-test	2.9369	0.3977
	Prob	0.0054	0.6926
FILE: MZ-DP-GS.WQ1			

Inter-Departmental Tests of Significance of Corn
Price at Harvest, Region II, 1990-91

Department		Chalatenango	Cuscatlan	La Libertad
Cuscatlan	Diff	7.10		
	T-test	2.8600		
	Prob	0.0078		
La Libertad	Diff	5.76	1.3	
	T-test	3.4430	0.5921	
	Prob	0.0013	0.5577	
San Salvador	Diff	3.18	3.92	2.58
	T-test	1.6297	1.4803	1.4517
	Prob	0.1108	0.1486	0.1534
FILE: MZ-DP-GS.WQ1				

Inter-Departmental Tests of Significance of Corn
Price at Harvest, Region III, 1990-91

Department		Cabanas	La Paz
La Paz	Diff	7.60	
	T-test	4.3635	
	Prob	0.0000	
San Vicente	Diff	8.08	0.48
	T-test	4.8765	0.2883
	Prob	0.0000	0.7744
FILE: MZ-DP-GS.WQ1			

Inter-Departmental Tests of Significance of Corn
Price at Harvest, Region IV, 1990-91

Department		La Union	Morazan	San Miguel
Morazan	Diff	0.71		
	T-test	0.3887		
	Prob	0.6994		
San Miguel	Diff	5.80	5.09	
	T-test	3.1612	3.8380	
	Prob	0.0028	0.0004	
Usulatan	Diff	3.40	2.69	2.40
	T-test	1.6895	1.7182	1.5287
	Prob	0.0979	0.0925	0.1329
FILE: MZ-DP-GS.WQ1				

Inter-Departmental Tests of Significance of Corn Price at Harvest, 1990-91

Department		Ahuachapan	Cabanas	Chalatenango	Cuscatlan	La Paz	La Union	La Libertad
Cabanas	Diff	11.23						
	T-test	5.0028						
	Prob	0.0000						
Chalatenango	Diff	10.67	0.46					
	T-test	4.6182	0.2518					
	Prob	0.0000	0.8024					
Cuscatlan	Diff	3.57	7.56	7.10				
	T-test	1.1366	3.0960	2.8600				
	Prob	0.2657	0.0040	0.0078				
La Paz	Diff	3.53	7.60	7.14	0.04			
	T-test	1.6016	4.3635	3.9904	0.0174			
	Prob	0.1169	0.0000	0.0003	0.9862			
La Union	Diff	0.03	11.16	10.70	3.60	3.56		
	T-test	0.0130	5.5233	5.0853	1.2618	1.7803		
	Prob	0.9897	0.0000	0.0000	0.2161	0.0408		
La Libertad	Diff	4.91	6.22	5.76	1.34	1.38	4.94	
	T-test	2.3423	3.7855	3.4430	0.5921	0.8484	2.5894	
	Prob	0.0241	0.0004	0.0013	0.5577	0.4004	0.0128	
Morazan	Diff	0.68	10.45	9.99	2.89	2.85	0.71	4.23
	T-test	0.3396	6.7400	6.4406	1.3733	1.8410	0.3887	2.9657
	Prob	0.7360	0.0000	0.0000	0.1792	0.0721	0.6994	0.0048
San Salvador	Diff	7.49	3.64	3.18	3.92	3.96	7.52	2.58
	T-test	3.1528	1.9249	1.6297	1.4803	2.1158	3.4945	1.4517
	Prob	0.0031	0.0606	0.1108	0.1486	0.0398	0.0011	0.1534
San Miguel	Diff	5.77	5.36	4.90	2.20	2.24	5.80	0.86
	T-test	2.8699	3.4334	3.1101	1.0317	1.4457	3.1612	0.5954
	Prob	0.0065	0.0013	0.0033	0.3095	0.1548	0.0028	0.5543
Sonsonate	Diff	5.73	5.40	4.94	2.16	2.20	5.76	0.82
	T-test	3.1354	3.8974	3.6223	1.1743	1.5975	3.4303	0.6541
	Prob	0.0032	0.0003	0.0008	0.2484	0.1167	0.0013	0.5162
Santa Ana	Diff	6.25	4.88	4.42	2.68	2.72	6.28	1.34
	T-test	2.9369	2.9163	2.5877	1.1586	1.6405	3.2451	0.8589
	Prob	0.0054	0.0054	0.0131	0.2547	0.1074	0.0022	0.3947
San Vicente	Diff	3.05	8.08	7.62	0.52	0.48	3.08	1.86
	T-test	1.4462	4.8765	4.5099	0.2256	0.2883	1.6058	1.2042
	Prob	0.1557	0.0000	0.0000	0.8229	0.7744	0.1152	0.2344
Usulutan	Diff	3.37	7.76	7.30	0.20	0.16	3.40	1.54
	T-test	1.5187	4.4112	4.0334	0.0808	0.0895	1.6895	0.9343
	Prob	0.1365	0.0000	0.0002	0.9361	0.9291	0.0979	0.3548

Inter-Departmental Tests of Significance of Corn Price at Harvest, 1990-91 (Continued)

Department		Morazan	San Salvador	San Miguel	Sonsonate	Santa Anna	San Vicente
Cabanas	Diff						
	T-test						
	Prob						
Chalatenango	Diff						
	T-test						
	Prob						
Cuscatlan	Diff						
	T-test						
	Prob						
La Paz	Diff						
	T-test						
	Prob						
La Union	Diff						
	T-test						
	Prob						
La Libertad	Diff						
	T-test						
	Prob						
Morazan	Diff						
	T-test						
	Prob						
San Salvador	Diff	6.81					
	T-test	4.0125					
	Prob	0.0002					
San Miguel	Diff	5.09	1.72				
	T-test	3.8380	1.0126				
	Prob	0.0004	0.3165				
Sonsonate	Diff	5.05	1.76	0.04			
	T-test	4.55859	1.1477	0.0312			
	Prob	0.0000	0.2570	0.9753			
Santa Ana	Diff	5.57	1.24	0.48	0.52		
	T-test	3.8093	0.6862	0.3249	0.3977		
	Prob	0.0004	0.4960	0.7466	0.6926		
San Vicente	Diff	2.37	4.44	2.72	2.68	3.20	
	T-test	1.6429	2.4794	1.8629	2.1010	2.0322	
	Prob	0.1072	0.0169	0.0686	0.0409	0.0477	
Usulutan	Diff	2.69	4.12	2.40	2.36	2.88	0.32
	T-test	1.7182	2.1804	1.5287	1.6861	1.7172	0.1914
	Prob	0.0925	0.0344	0.1329	0.0983	0.0924	0.8490

FILE: MZ-DP-SG.WQ1

TEST OF SIGNIFICANCE DIFFERENCES BETWEEN PLANTING AND HARVEST PRICES FOR RICE, 1990-91

Department	Planting Price/1	Harvest Price/2	Difference	T-test	Prob. One-Tail
Ahuachapan	50.00	63.82	-13.82	-4.1096	0.0011
Cabanas	62.39	58.92	3.47	1.1284	0.1391
Chalatenango	54.92	56.23	-1.31	-0.3497	0.3645
Cuscatlan	ND	ND			
La Paz	65.00	65.03	-0.03	-0.0083	0.4968
La Union	ND	ND			
La Libertad	43.67	66.16	-22.49	-9.6802	0.0000
Morazan	ND	ND			
San Salvador	63.00	65.00	-2.00	/4	
San Miguel	57.13	59.74	-2.61	-0.85	0.2014
Sonsonate	56.03/3	64.82	-8.79	5.8810	0.0001
Santa Ana	56.03/3	65.29	-9.26	5.1929	0.0010
San Vicente	49.00	62.73	-13.73	-3.3630	0.0017
Usulutan	56.03/3	63.24	-7.21	23.4127	0.0000
National	56.24	63.24	-7.00	-4.8781	0.0000

/1 April, May and June
/2 September, October, and November
/3 National average for this period
/4 Only one observation for each price
ND = No Data

Source: Price Surveys by DGEA-MAG

FILE: ARROSIG.WQ1

Inter-Departmental Tests of Significance of Rice
Price at Harvest, Region I, 1990-91

Department		Ahuachapan	Sonsonate
Sonsonate	Diff	1.00	
	T-test	0.5612	
	Prob	0.5809	
Santa Ana	Diff	1.47	0.47
	T-test	0.7885	0.1987
	Prob	0.4419	0.8450
FILE: AR-DP-GS.WQ1			

Inter-Departmental Tests of Significance of Rice
Price at Harvest, Region II, 1990-91

Department		Chalatenango	Cuscatlan	La Libertad
Cuscatlan	Diff	ND		
	T-test			
	Prob			
La Libertad	Diff	9.93	ND	
	T-test	3.8373		
	Prob	0.0004		
San Salvador	Diff	8.77	ND	1.16
	T-test	0.6986		0.2990
	Prob	0.4933		0.7675
FILE: AR-DP-GS.WQ1				

Inter-Departmental Tests of Significance of Rice
Price at Harvest, Region III, 1990-91

Department		Cabanas	La Paz
La Paz	Diff	6.11	
	T-test	1.8966	
	Prob	0.0717	
San Vicente	Diff	3.81	2.30
	T-test	0.8967	0.8360
	Prob	0.3824	0.4103
FILE: AR-DP-GS.WQ1			

Inter-Departmental Tests of Significance of Rice
Price at Harvest, Region IV, 1990-91

Department		La Union	Morazan	San Miguel
Morazan	Diff	ND		
	T-test			
	Prob			
San Miguel	Diff	ND	ND	
	T-test			
	Prob			
Usulatan	Diff	ND	ND	3.50
	T-test			2.2759
	Prob			0.0278
FILE: AR-DP-GS.WQ1				

Inter-Departmental Tests of Significance of Rice Price at Harvest, 1990-91

Department		Ahuachapan	Cabanas	Chalatenango	Cuscatlan	La Paz	La Union	La Libertad
Cabanas	Diff	4.90						
	T-test	1.7855						
	Prob	0.0944						
Chalatenango	Diff	7.59	2.69					
	T-test	2.0023	0.5015					
	Prob	0.0547	0.6206					
Cuscatlan	Diff	ND	ND	ND				
	T-test							
	Prob							
La Paz	Diff	1.21	6.11	8.80	ND			
	T-test	0.5884	1.8966	2.6737				
	Prob	0.5614	0.0717	0.0113				
La Union	Diff	ND	ND	ND	ND	ND		
	T-test							
	Prob							
La Libertad	Diff	2.34	7.24	9.93	ND	1.13	ND	
	T-test	1.7771	3.2842	3.8373		0.7267		
	Prob	0.0845	0.0027	0.0004		0.4716		
Morazan	Diff	ND	ND	ND	ND	ND	ND	ND
	T-test							
	Prob							
San Salvador/1	Diff	1.18	6.08	8.77	ND	0.03	ND	1.16
	T-test	0.3515	0.6879	0.6986		0.0045		0.2990
	Prob	0.7325	0.5221	0.4933		0.9964		0.7675
San Miguel	Diff	4.08	0.82	3.51	ND	5.29	ND	6.42
	T-test	1.8588	0.2534	1.2145		2.5232		4.0686
	Prob	0.0717	0.8018	0.2312		0.0157		0.0002
Sonsonate	Diff	1.00	5.90	8.59	ND	0.21	ND	1.34
	T-test	0.5612	1.8686	2.2138		0.0939		0.8880
	Prob	0.5809	0.0813	0.0349		0.9259		0.3808
Santa Ana	Diff	1.47	6.37	9.06	ND	0.26	ND	0.87
	T-test	0.7885	1.7539	1.8870		0.0967		0.5107
	Prob	0.4419	0.1072	0.0708		0.9238		0.6133
San Vicente	Diff	1.09	3.81	6.50	ND	2.30	ND	3.43
	T-test	0.3877	0.8967	1.6532		0.8360		1.6854
	Prob	0.7019	0.3824	0.1084		0.4103		0.1006
Usulutan	Diff	0.58	4.32	7.01	ND	1.79	ND	2.92
	T-test	0.7128	2.4103	2.6052		1.2708		3.3277
	Prob	0.4815	0.0236	0.0129		0.2120		0.0018

Inter-Departmental Tests of Significance of Rice Price at Harvest, 1990-91 (Continued)

Department		Morazan	San Salvador/1	San Miguel	Sonsonate	Santa Anna	San Vicente
Cabanas	Diff						
	T-test						
	Prob						
Chalatenango	Diff						
	T-test						
	Prob						
Cuscatlan	Diff						
	T-test						
	Prob						
La Paz	Diff						
	T-test						
	Prob						
La Union	Diff						
	T-test						
	Prob						
La Libertad	Diff						
	T-test						
	Prob						
Morazan	Diff						
	T-test						
	Prob						
San Salvador	Diff	ND					
	T-test						
	Prob						
San Miguel	Diff	ND	5.26				
	T-test		0.7462				
	Prob		0.4628				
Sonsonate	Diff	ND	0.18	5.08			
	T-test		0.0351	2.1934			
	Prob		0.9727	0.0352			
Santa Ana	Diff	ND	0.29	5.55	0.47		
	T-test		0.0567	1.9855	0.1987		
	Prob		0.9566	0.0563	0.8450		
San Vicente	Diff	ND	2.27	2.99	2.09	2.56	
	T-test		0.2488	1.1524	0.6978	0.7099	
	Prob		0.8078	0.2568	0.4926	0.4868	
Usulutan	Diff	ND	1.76	3.50	1.58	2.05	0.51
	T-test		1.2201	2.2759	1.3763	1.8176	0.2615
	Prob		0.2366	0.0278	0.1789	0.0807	0.7954

1 San Salvador based on one price report
ND = No Data

FILE: AR-DP-SG.WQ1

TEST OF SIGNIFICANCE DIFFERENCES BETWEEN PLANTING AND HARVEST PRICES FOR BEANS, 1990-91

Department	Planting Price/1	Harvest Price/2	Difference	T-test	Prob. One-Tail
Ahuachapan	288.61	286.25	2.36	0.1089	0.4575
Cabanas	283.40	247.93	35.47	2.9635	0.0026
Chalatenango	275.80	259.98	15.82	1.8098	0.0383
Cuscatlan	290.86	246.80	44.06	4.8792	0.0000
La Paz	307.75	243.63	64.12	3.8707	0.0004
La Union	ND	275.00			
La Libertad	259.16	277.61	-18.45	-2.4261	0.0099
Morazan	ND	280.00			
San Salvador	293.82	282.40	11.42	2.9061	0.0034
San Miguel	224.94	252.86	-27.92	-1.64	0.0575
Sonsonate	266.97	217.18	49.79	6.2831	0.0000
Santa Ana	286.19	269.82	16.37	2.6764	0.0052
San Vicente	291.80	245.49	46.31	4.5835	0.0000
Usulutan	225.00	297.22	-72.22	-9.7653	0.0000
National	278.68	257.79	20.89	6.0341	0.0000

/1 July, August and September
/2 October, November and December
ND = No Data

FILE: FRIJSIG.W91

Inter-Departmental Tests of Significance of Beans
Price at Harvest, Region I, 1990-91

Department		Ahuachapan	Sonsonate
Sonsonate	Diff	69.07	
	T-test	4.1990	
	Prob	0.0003	
Santa Ana	Diff	16.43	52.64
	T-test	1.3431	7.7981
	Prob	0.1897	0.0000
FILE: FR-DP-GS.WQ1			

Inter-Departmental Tests of Significance of Beans
Price at Harvest, Region II, 1990-91

Department		Chalatenango	Cuscatlan	La Libertad
Cuscatlan	Diff	13.18		
	T-test	1.0399		
	Prob	0.3059		
La Libertad	Diff	17.63	30.81	
	T-test	1.9746	3.8683	
	Prob	0.0551	0.0007	
San Salvador	Diff	22.42	35.60	4.79
	T-test	2.3467	4.4297	1.0518
	Prob	0.0243	0.0002	0.3010
FILE: FR-DP-GS.WQ1				

Inter-Departmental Tests of Significance of Beans
Price at Harvest, Region III, 1990-91

Department		Cabanas	La Paz
La Paz	Diff	4.30	
	T-test	0.2377	
	Prob	0.8138	
San Vicente	Diff	2.44	1.86
	T-test	0.1547	0.1424
	Prob	0.8781	0.8877
FILE: FR-DP-GS.WQ1			

Inter-Departmental Tests of Significance of Beans
Price at Harvest, Region IV, 1990-91

Department		La Union	Morazan	San Miguel
Morazan	Diff	5.00		
	T-test	ND		
	Prob	ND		
San Miguel	Diff	22.14	27.14	
	T-test	0.6301	0.7723	
	Prob	0.5396	0.4537	
Usulatan	Diff	22.22	17.22	44.36
	T-test	2.1009	1.6282	3.7867
	Prob	0.0688	0.1421	0.0011
FILE: FR-DP-GS.WQ1				

Inter-Departmental Tests of Significance of Beans Price at Harvest, 1990-91

Department		Ahuachapan	Cabanas	Chalatenango	Cuscatlan	La Paz	La Union/1	La Libertad
Cabanas	Diff	38.32						
	T-test	1.4186						
	Prob	0.1731						
Chalatenango	Diff	26.27	12.05					
	T-test	1.4538	0.8262					
	Prob	0.1567	0.4145					
Cuscatlan	Diff	39.45	1.113	13.18				
	T-test	1.9179	0.0588	1.0399				
	Prob	0.0758	0.9536	0.3059				
La Paz	Diff	42.62	4.30	16.35	3.17			
	T-test	1.9089	0.2377	1.3116	0.2046			
	Prob	0.0707	0.8138	0.1973	0.8396			
La Union/1	Diff	11.25	27.07	15.02	28.20	31.37		
	T-test	0.1896	0.4710	0.4116	0.9553	0.6992		
	Prob	0.8571	0.6455	0.6843	0.3644	0.4951		
La Libertad	Diff	8.64	29.68	17.63	30.81	33.98	2.61	
	T-test	0.6310	2.1860	1.9746	3.8683	3.1326	0.1778	
	Prob	0.5346	0.0368	0.0551	0.0007	0.0037	0.8610	
Morazan/1	Diff	6.25	32.07	20.02	33.20	36.37	5.00	2.39
	T-test	0.1053	0.5580	0.5486	1.1247	0.8106	ND	0.1626
	Prob	0.9202	0.5863	0.5884	0.2898	0.4303	ND	0.8727
San Salvador	Diff	3.85	34.47	22.42	35.60	38.77	7.40	4.79
	T-test	0.2675	2.3556	2.3467	4.4297	3.3425	0.6348	1.0518
	Prob	0.7920	0.0260	0.0243	0.0002	0.0023	0.5358	0.3010
San Miguel	Diff	33.39	4.93	7.12	6.06	9.23	22.14	24.75
	T-test	1.6744	0.2833	0.6070	0.4614	0.6407	0.6301	2.8004
	Prob	0.1113	0.7792	0.5475	0.6490	0.5270	0.5396	0.0088
Sonsonate	Diff	69.07	30.75	42.80	29.62	26.45	57.82	60.43
	T-test	4.1990	2.1744	4.4453	2.6790	2.3391	1.9272	7.9834
	Prob	0.0003	0.0367	0.0000	0.0779	0.0314	0.0676	0.0000
Santa Ana	Diff	16.43	21.89	9.84	23.02	26.19	5.18	7.79
	T-test	1.3431	1.8599	1.2591	3.0944	2.7571	0.3236	1.6655
	Prob	0.1897	0.0709	0.2141	0.0040	0.0088	0.7491	0.1034
San Vicente	Diff	40.76	2.44	14.49	1.31	1.86	29.51	32.12
	T-test	2.2555	0.1547	1.3584	0.1098	0.1424	0.9264	3.9785
	Prob	0.0349	0.8781	0.1819	0.9134	0.8877	0.3680	0.0004
Usulutan	Diff	10.97	49.29	37.24	50.42	53.59	22.22	19.61
	T-test	0.5955	2.6146	3.0517	5.0794	3.6080	2.1009	3.6714
	Prob	0.5617	0.0162	0.0046	0.0000	0.0015	0.0688	0.0011

Inter-Departmental Tests of Significance of Beans Price at Harvest, 1990-91 (Continued)

Department		Morazan/1	San Salvador	San Miguel	Sonsonate	Santa Anna	San Vicente
Cabanas	Diff						
	T-test						
	Prob						
Chalatenango	Diff						
	T-test						
	Prob						
Cuscatlan	Diff						
	T-test						
	Prob						
La Paz	Diff						
	T-test						
	Prob						
La Union	Diff						
	T-test						
	Prob						
La Libertad	Diff						
	T-test						
	Prob						
Morazan	Diff						
	T-test						
	Prob						
San Salvador	Diff	2.40					
	T-test	0.2059					
	Prob	0.8398					
San Miguel	Diff	27.14	29.54				
	T-test	0.7723	3.1900				
	Prob	0.4537	0.0036				
Sonsonate	Diff	62.82	65.22	35.68			
	T-test	2.0939	8.1759	3.3462			
	Prob	0.0486	0.0000	0.0020			
Santa Ana	Diff	10.18	12.58	16.96	52.64		
	T-test	0.6359	2.7062	2.1381	7.7981		
	Prob	0.5309	0.0101	0.0392	0.0000		
San Vicente	Diff	34.51	36.91	7.37	28.31	24.33	
	T-test	1.0834	4.3621	0.6315	2.9170	3.3582	
	Prob	0.2947	0.0001	0.5327	0.0060	0.0017	
Usulutan	Diff	17.22	14.02	44.33	80.04	27.40	51.73
	T-test	1.6282	3.2405	3.7867	7.2969	4.8642	4.8394
	Prob	0.1421	0.0038	0.0011	0.0000	0.0000	0.0000

/1 La Union and Morazan data consist of only one observation
ND = No Data

FILE: FR-DP-SG.WQ1

TEST OF SIGNIFICANCE DIFFERENCES BETWEEN PLANTING AND HARVEST PRICES FOR SORGHUM 1990-91

Department	Planting Price/1	Harvest Price/2	Difference	T-test	Prob. One-Tail
Ahuachapan	51.43	50.96	0.47	0.4361	0.3340
Cabanas	55.95	45.03	10.92	5.3283	0.0000
Chalatenango	54.64	43.13	11.51	8.3450	0.0000
Cuscatlan	57.50	57.67	-0.17	-0.0283	0.4896
La Paz	62.12	56.85	5.27	1.9313	0.0312
La Union	57074	52.44	5.30	2.6180	0.0062
La Libertad	56.90	51.42	5.48	4.4835	0.0000
Morazan	52.84	50.43	2.41	1.3342	0.0982
San Salvador	52.83	53.32	-0.49	-0.7133	0.2398
San Miguel	59.56	58.55	1.01	0.4583	0.3245
Sonsonate	53.62	51.73	1.89	1.7101	0.0469
Santa Ana	52.77	56.00	-3.23	-0.8546	0.2010
San Vicente	67.35	57.28	10.05	2.2586	0.0166
Usulutan	56.00	46.57	9.43	3.4690	0.0019
National	56.04	52.42	3.62	5.6231	0.0000

/1 July, August and September
/2 November, December and January

FILE: SORGSIG.WQ1

Inter-Departmental Tests of Significance of Sorghum
Price at Harvest, Region I, 1990-91

Department		Ahuachapan	Sonsonate
Sonsonate	Diff	0.77	
	T-test	0.6881	
	Prob	0.4958	
Santa Ana	Diff	5.04	4.27
	T-test	1.4505	1.5917
	Prob	0.1610	0.1207
FILE: SO-DP-GS.WQ1			

Inter-Departmental Tests of Significance of Sorghum
Price at Harvest, Region II, 1990-91

Department		Chalatenango	Cuscatlan	La Libertad
Cuscatlan	Diff	14.54		
	T-test	5.4079		
	Prob	0.0000		
La Libertad	Diff	8.29	6.25	
	T-test	7.8041	4.0099	
	Prob	0.0000	0.0005	
San Salvador	Diff	10.19	4.35	1.90
	T-test	9.9671	3.1924	2.8179
	Prob	0.0000	0.0037	0.0070
FILE: SO-DP-GS.WQ1				

Inter-Departmental Tests of Significance of Sorghum
Price at Harvest, Region III, 1990-91

Department		Cabanas	La Paz
La Paz	Diff	11.82	
	T-test	4.9262	
	Prob	0.0000	
San Vicente	Diff	12.25	0.43
	T-test	3.8484	0.1741
	Prob	0.0005	0.8626
FILE: SO-DP-GS.WQ1			

Inter-Departmental Tests of Significance of Sorghum
Price at Harvest, Region IV, 1990-91

Department		La Union	Morazan	San Miguel
Morazan	Diff	2.01		
	T-test	0.9695		
	Prob	0.3424		
San Miguel	Diff	6.11	8.12	
	T-test	2.8971	2.8358	
	Prob	0.0062	0.0086	
Usulatan	Diff	5.87	3.86	11.98
	T-test	2.7982	6.0755	4.1666
	Prob	0.0102	0.0000	0.0003
FILE: SO-DP-GS.WQ1				

Inter-Departmental Tests of Significance of Sorghum Price at Harvest, 1990-91

Department		Ahuachapan	Cabanas	Chalatenango	Cuscatlan	La Paz	La Union	La Libertad
Cabanas	Diff	5.93						
	T-test	2.3982						
	Prob	0.0239						
Chalatenango	Diff	7.83	1.90					
	T-test	5.8947	0.8453					
	Prob	0.0000	0.4040					
Cuscatlan	Diff	6.71	12.64	14.54				
	T-test	5.0193	2.4416	5.4079				
	Prob	0.0002	0.0266	0.0000				
La Paz	Diff	5.89	11.82	13.72	0.82			
	T-test	3.3536	4.9262	8.2767	0.2249			
	Prob	0.0020	0.0000	0.0000	0.8240			
La Union	Diff	1.48	7.41	9.31	5.23	4.41		
	T-test	0.9392	2.9945	5.7989	1.6162	2.4071		
	Prob	0.3553	0.0054	0.0000	0.1225	0.0209		
La Libertad	Diff	0.46	6.39	8.29	6.25	5.43	1.02	
	T-test	0.5624	3.4589	7.8041	4.0099	4.0746	0.8299	
	Prob	0.5773	0.0014	0.0000	0.0005	0.0002	0.4114	
Morazan	Diff	0.53	5.40	7.30	7.24	6.42	2.01	0.99
	T-test	0.6692	1.6176	4.2262	7.3301	2.7385	0.9695	1.0038
	Prob	0.5118	0.1214	0.0003	0.0000	0.0106	0.3424	0.3235
San Salvador	Diff	2.36	8.29	10.09	4.35	3.53	0.88	1.90
	T-test	3.2249	4.5635	9.9671	3.1924	2.7051	0.7320	2.8179
	Prob	0.0027	0.0000	0.0000	0.0037	0.0095	0.4683	0.0070
San Miguel	Diff	7.59	13.52	15.42	0.88	1.70	6.11	7.13
	T-test	3.5667	5.0564	8.0066	0.1990	0.8339	2.8971	4.4882
	Prob	0.0011	0.0000	0.0000	0.7440	0.4090	0.0062	0.0000
Sonsonate	Diff	0.77	6.70	8.60	5.94	5.12	0.71	0.31
	T-test	0.6881	3.3854	7.0137	2.6542	3.6322	0.5127	0.3423
	Prob	0.4958	0.0017	0.0000	0.0134	0.0010	0.6109	0.7336
Santa Ana	Diff	5.04	10.97	12.87	1.67	0.85	3.56	4.58
	T-test	1.4505	2.6585	4.2186	0.2254	0.2709	1.0712	1.7956
	Prob	0.1610	0.0138	0.0002	0.8254	0.7882	0.2936	0.0815
San Vicente	Diff	6.32	12.25	14.15	0.39	0.43	4.84	5.86
	T-test	2.2930	3.8484	5.8971	0.0674	0.1741	1.8603	2.8911
	Prob	0.0288	0.0005	0.0000	0.9469	0.8626	0.0710	0.0060
Usulutan	Diff	4.39	1.54	3.44	11.10	10.28	5.87	4.85
	T-test	5.0684	0.4591	1.9702	8.9393	4.3580	2.7982	4.7694
	Prob	0.0000	0.6511	0.0600	0.0000	0.0002	0.0102	0.0000

Inter-Departmental Tests of Significance of Sorghum Price at Harvest, 1990-91 (Continued)

Department		Morazan	San Salvador	San Miguel	Sonsonate	Santa Anna	San Vicente
Cabanas	Diff						
	T-test						
	Prob						
Chalatenango	Diff						
	T-test						
	Prob						
Cuscatlan	Diff						
	T-test						
	Prob						
La Paz	Diff						
	T-test						
	Prob						
La Union	Diff						
	T-test						
	Prob						
La Libertad	Diff						
	T-test						
	Prob						
Morazan	Diff						
	T-test						
	Prob						
San Salvador	Diff	2.89					
	T-test	3.3787					
	Prob	0.0020					
San Miguel	Diff	8.12	5.23				
	T-test	2.8358	3.3420				
	Prob	0.0086	0.0017				
Sonsonate	Diff	1.30	1.59	6.82			
	T-test	0.9048	1.8315	4.0292			
	Prob	0.3728	0.0732	0.0002			
Santa Ana	Diff	5.57	2.68	2.55	4.27		
	T-test	1.1756	1.0633	0.7380	1.5917		
	Prob	0.2569	0.2951	0.4661	0.1207		
San Vicente	Diff	6.85	3.96	1.27	5.55	1.28	
	T-test	1.8336	1.9737	0.4754	2.6209	0.3174	
	Prob	0.0787	0.0549	0.6371	.0121	0.7532	
Usulutan	Diff	3.86	6.75	11.98	5.16	9.43	10.71
	T-test	6.0755	7.5914	4.1666	3.5371	1.9834	2.8585
	Prob	0.0000	0.0000	0.0003	0.0013	0.0648	0.0085

FILE: SO-DP-SG.WQ1