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TRAINING MANUAL IN MARKETING FOR THE PERSONNEL OF THE AGRICULTURAL STATISTICS AGENCY OF THE GOVERNMENT OF EL SALVADOR

KSU
KANSAS STATE UNIVERSITY

Food and Feed Grains Institute
Manhattan, Kansas 66506-2202
USA

TRAINING MANUAL IN MARKETING FOR THE PERSONNEL OF THE AGRICULTURAL STATISTICS AGENCY OF THE GOVERNMENT OF EL SALVADOR

DATES OF TRAINING
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by

KENNETH E. NEILS

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SECTION I

INTRODUCTION

The Agricultural Statistics Agency (DGEA) of the Government of El Salvador (GOES) carries out extensive surveys on the production and marketing of agricultural products with the purpose of collecting and analyzing information. Although the activities of the DGEA are well defined, errors and discrepancies within the surveys and in the collection process make it difficult to synthesize and interpret the data. The objective of this training program is to improve the surveys, the collection of the data, and the analysis. The purpose of the program is to provide on-the-job training to the technical staff of the DGEA in order to improve their performance in data collection and in carrying out the analysis useful for making agricultural policy decisions.

The training program is divided into two areas: (1) area frame sampling, production estimation, and analysis, and (2) the collection and analysis of market information. The schedule of the training program in the two areas are presented in Tables 1.1 and 1.2. Although the training in the two areas will be carried out separately, the nature of the training in the two areas will be the same, as follows:

- The emphasis will be in training small groups of technicians of the DGEA in very specific areas in which they have work responsibilities.

- Improvements to the techniques of data collection and analysis to be presented will utilize examples with El Salvador data.

- Technical assistance will be given to the technical staff members in their respective work areas.

- The training of the technical staff at DGEA in upgrading their skills in using computer software programs will form an integral part of the training.

- The techniques of editing the collected data, correcting errors in the data, estimating missing data points, and improving the techniques of processing the data will also be an important part of the training.

- All the training materials will be presented in spanish and will be included in the training manual.

The training manual for area frame sampling and production estimation will be presented in a separate training manual from the manual on data collection and analysis of market information. The training manual that is presented here contains a section on the value of information, various sections on the training in data collection and market analysis, and a section on the food balance sheets for basic grains. The sections on data collection and market analysis are divided into various themes, including the analysis of marketing margins and market analysis separated by time and by physical space.

TABLE 1.1

TRAINING PROGRAM IN AREA FRAME SAMPLING AND PRODUCTION - DGEA

ACTIVITY	1st WEEK					2nd WEEK					3rd WEEK				
	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F
INTRODUCTION	X														
AREA FRAME CONSTRUCTION															
Cartography		X													
Delineation		X	X												
Measurement of Primary Sampling Unit				X	X										
Frame Allocation				X	X										
SAMPLE															
Sampling Design				X		X									
Sample Allocation						X	X								
SURVEY															
Design of Forms							X	X							
Training Surveyors								X	X						
Execution of Surveys									X	X					
EDITING															
Entry of Data											X				
Editing											X	X			
SUMMARY															
Statistical Parameters												X	X		
Statistical Programs													X	X	
Estimations														X	X

TABLE 1.2

TRAINING PROGRAM IN MARKETING - DGEA

ACTIVITY	1st WEEK					2nd WEEK					3rd WEEK				
	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F
INTRODUCTION	X														
THE VALUE OF MARKET INFORMATION								X							
ORGANIZATION OF THE COLLECTION AND ANALYTICAL ACTIVITIES						X									
MARGIN ANALYSIS			X	X	X										
SPATIAL MARKET ANALYSIS						X	X	X	X	X					
TEMPORAL MARKET ANALYSIS								X	X	X					
FOOD BALANCE SHEET															
Beginning Inventory											X				
Production											X				
Imports											X				
Consumption															
Human												X			
Industrial												X			
Animal												X			
Seed													X		
Losses of Grain													X		
Exports													X		
Food Security													X		
Ending Inventory													X		
USERS															
Producers														X	
UAP														X	
Agricultural Bank														X	
AVES														X	
DIANA														X	
FAMOSSA														X	
World Food Program														X	
Donors														X	
Other Organizations of the GDES														X	
VISITS TO THE MARKET											X		X		X
COMPUTER TRAINING											X	X	X	X	X

SECTION II

VALUE OF INFORMATION

Information may be available in different forms and conveyed in different ways. Information takes on tremendous value when it is only available and being conveyed through one source. DGEA is the only source of statistical information on all aspects of production and marketing in El Salvador. In that respect, DGEA's information is potentially of tremendous value to both the public and private sectors.

For information collected and reported at DGEA to become tremendously valuable, the information must be linked to the types of agricultural policies being implemented by the Government of El Salvador and to the needs of the private sector. In either case, the information takes on tremendous value if it is reported in a timely fashion. Policy-makers in El Salvador require timely information in order to anticipate the results of their policies. Private sector requires timely information in order to anticipate changes in the structure and in the performance of the market, demand/supply conditions, and pricing behavior.

Some of the policies that the GOES has been developing in recent years includes policies on food security, enhancing real incomes of small farmers, infrastructural development, etc. Since more liberalized food marketing policies have been established in El Salvador, the potential exists within the country for markets to become more efficient if resources are allocated optimally and policies are passed that facilitate sustainable growth within the economy and, specifically, within the agricultural sector. Statistical information provided by the DGEA can be of tremendous value in measuring the impacts of these policies on the general welfare of the people of El Salvador, and, more specifically, on the agriculture sector, including producers and consumers.

In the private sector, the financial risks that agricultural producers, commodity assemblers, wholesalers, and retailers take are to a great extent a function of the quantity and quality of information available to them. The private sector in the food marketing system cannot afford to collect and analyze countrywide information that relates to the structure, conduct, and performance of the market. Furthermore, it would not serve their immediate needs to maintain comprehensive information on the market when their interests are more micro-oriented and commodity and market channel specific. The role of the public sector, on the other hand, in the marketplace is, among other things, to monitor the structure, conduct, and performance of the market. To do so, the public sector must work closely with the private sector market participants in making sure what information is collected accurately and reliably reflects the status of the production and marketing systems. In addition, the public sector is responsible for keeping the private sector well-informed on the nationwide and global situation and outlook for these agricultural sub-sectors and commodities important to the country.

The following points-of-view (producer, consumer, and whole society) are meant to stimulate discussion on how valuable DGEA's information is.

2.1 From the Producer's Point-of-View

A well-informed agricultural producer in El Salvador is more likely to sell his product when the market demands it most (i.e., at higher prices), if he has access to historical, current, and projected information on prices, supplies,

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seasonality, trends, etc. On the other hand, a poorly-informed producer is more likely to sell his product whenever the opportunity knocks at his door, rather than weighing his options quantitatively. In El Salvador, information on market prices have been broadcasted (by radio) throughout the country on a timely basis, however, the dynamics of the commodity prices as they fluctuate with time and among the different Departments within the country are not communicated. If producers in San Vicente knew, for example, that production of corn in the western region was far below the region's average production, while all other regions had average production of corn, they could possibly find it more economically feasible to sell their corn to truckers from Santa Ana than to truckers from San Salvador. In this case, the demand/supply conditions for corn in the western region would have changed, providing unusual spatial marketing alternatives for producers from other regions.

Other examples of how information could be of value to producers in forming price expectations, alternative marketing strategies, etc., will be discussed throughout the training period.

2.2 From the Consumer's Point-of-View

Consumers of staple commodities, such as corn, beans, and rice, are more likely to be buying their commodities in a competitive environment where they have choices as per prices. In the large cities throughout El Salvador, commodity prices in the city marketplaces provide consumers with all the information regarding current demand/supply conditions and quality of product. There may be some seasonality and/or trends, however, in retail margins that could benefit consumers who may be in need of paying as little as possible for their staple food. Buying in volume from wholesalers may certainly be an alternative for those on a tight household budget. In summary, consumer information is conveyed to a great extent within the marketplace. Producers, on the other hand, typically sell their products in an environment with few buyers who generally have better market information than the producers.

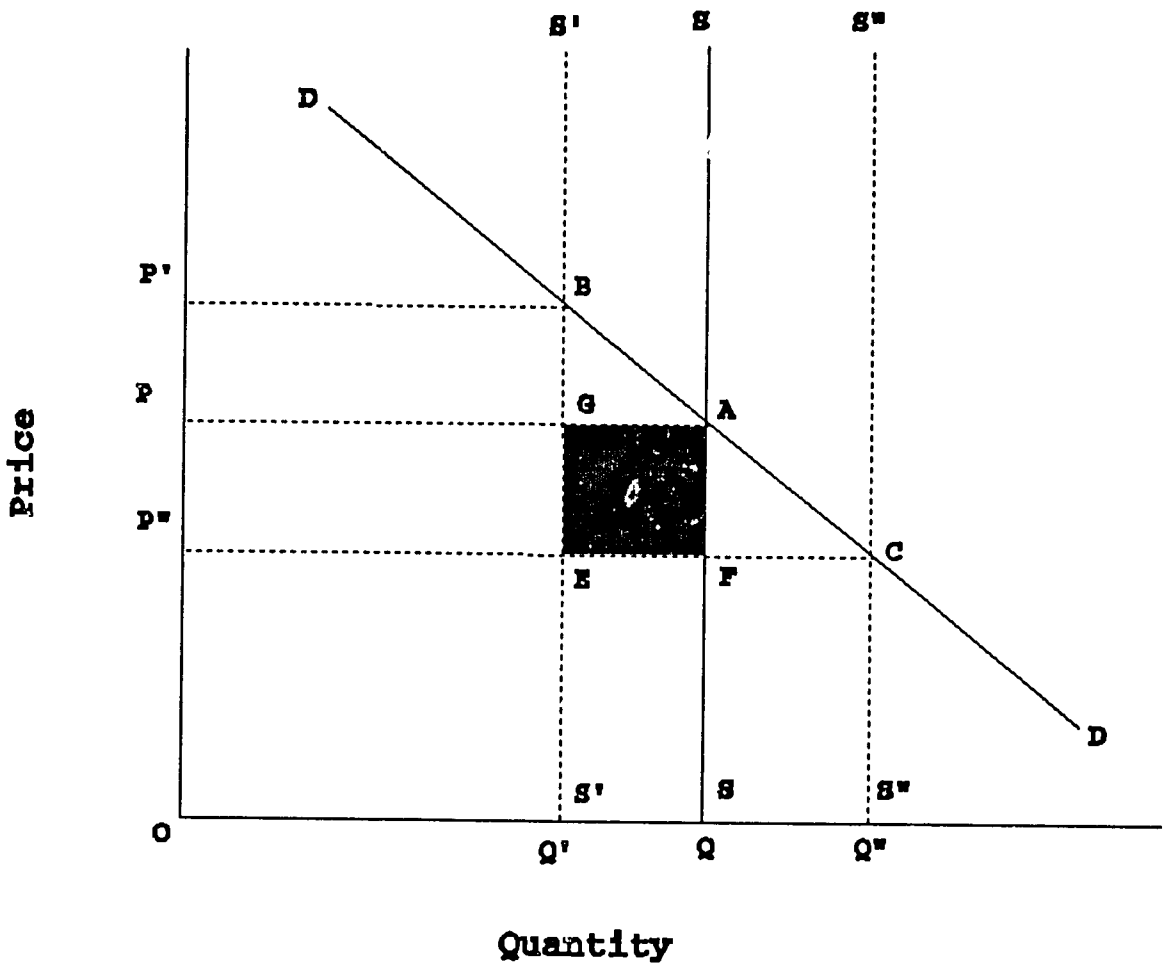
2.3 From the Point-of-View of the Whole Society

The social returns to information such as that reported by DGEA is generally measured using social welfare (or benefit) and social cost concepts. These concepts can be illustrated on a graph in order to get a more quantitative view (Figure 2.1). In this graph, the supply curve (SS) is perfectly inelastic (vertical) meaning that production cannot change as prices change during the growing season. The market demand curve is denoted by DD. Price is, of course, determined at the point where the demand and supply curves intersect (Hayami and Peterson, 1972).

Social welfare is defined as the area under the demand curve, and social cost or opportunity cost is defined as the area under the supply curve. When a sampling error in statistical reporting of, for example, production or the total supply of a commodity in the country is made, social welfare is expected to decrease. It decreases when producers supplied with erroneous information make erroneous production and storage decisions. Marginal improvements in the accuracy of these statistics can reduce the social cost of misinformation or, in other words, enhance the net social welfare. However, the cost of making such improvements in statistical reporting must be weighed against the social benefit of such improvements. It is certainly the case that the Directors and Managers at the

FIGURE 2.1

SOCIAL WELFARE MODEL



DGEA must weigh the costs and the benefits of making improvements in statistical reporting. Furthermore, the DGEA has a major constraint, a fixed budget.

A good example for estimating the social returns to the improvements in information occurs in the case of staple grains. Once the crops are planted, it is usually not profitable for producers to significantly expand or contract the output. On the other hand, it is relatively easy and inexpensive to store these commodities. For staple grains, the social cost of misreporting of future production through such errors as acreage or yield estimates, arises because of distortions in the optimum consumption patterns of the staple grains. Because staple grains like corn, beans, rice, and sorghum, are produced during a relatively short period of time within the year, their consumption patterns depend very much on the storage and inventory policies of producers and marketing firms with storage capacity. For example, the expectation of an abnormally small crop in the upcoming harvest and higher prices can be expected to result in a decreased rate of depleting the inventories during the remainder of the current period. This is turn results in increased prices and a decreased rate of consumption during the current period (Figure 2.1).

Suppose that DGEA estimates the current period's production as 0Q' as opposed to the actual production 0Q. Grain inventory firms, in forming grain price expectations for the coming period, expect the average price to equal 0P'. In other words, they would expect the future price to be higher by PP' (or BG) than would be the case had no error been involved in the production estimate. Consequently, inventory holders find it profitable to decrease their rate of depleting their inventory for the remainder of the year, until the current price has risen by PP'. Consumption then would contract to 0Q', or by the amount Q'Q. In turn, the inventory carry-over into the next production period would be increased by the same amount, Q'Q. As a consequence, the reduction in consumpcion during the current period would reduce consumer welfare by the area ABQ'Q.

Because of the abnormally large carryover into the next period, assume that supply in the next period would increase by the amount Q'Q which is equal to QQ" in Figure 2.1. The total quantity, then, of grain put on the market during the next period would be the true production 0Q plus the increased carryover QQ". The result would be a decrease in the average price down to 0P" as opposed to price 0P which would have prevailed had there been no reporting errors. The decrease in price, however, results in an increase in consumption during the next period by the amount QQ". Thus total consumer welfare is increased during the next period by ACQ"Q. The overall result of reporting errors that gave rise to the decline in current consumption and the increase in future consumption is a net loss in consumer welfare equal to rectangle AGEF (area ABQ'Q minus area ACQ'Q), the shaded area in Figure 2.1, assuming that the demand curve is linear.

The same amount of net welfare loss would have resulted from an erroneous overestimate of production, that is, if 0Q" would have been predicted instead of 0Q'. Since the errors in statistical reporting can be expected to be random, inventory costs can be expected to average out to zero over a period of years.

Assuming a linear demand curve, the area of rectangle AGEF could be estimated using mathematical models. The purpose of this exercise, however, is only to illustrate the value of statistical reporting in terms of social welfare and social cost.

SECTION III

ORGANIZING DATA COLLECTION AND ANALYTICAL WORK

3.1 Staffing and Budgeting

The DGEA is divided into the Production Statistics Division and the Market Stacistics Division (Figure 3.1). Over 50 employees work for the DGEA.

3.1.1. Production Statistics Division

As of June 1992, the Production Statistics Division employed 27-32 technical people (as of June 1992). Twelve of those people are enumerators that are continually working on the surveys. The responsibilities of the technical people in the office in San Salvador are divided into

a. Costs
b. Surveys
c. Area Frame
d. Objective Yield Measurements
e. Operations
f. Processing

The planning, execution, and processing schedule of surveys is given in Figure 3.2. The different surveys executed include planting and harvesting surveys, cost of production surveys, and yield surveys.

The number years of experience and the academic background o. these people are given in the Training Manual for Area Frame Sampling and Production.

This Division generates an Annual Report, and time-lagged reports from each of its survey activities. The reports from the surveys are generally delayed by a queue for processing the information.

3.1.2. Market Statistics Division

The Market Statistics Division of DGEA employs 13 technical people (as of June 1992). The investigative responsibilities of these people were divided into five areas, including

a. International Trade (2 people)
b. Agrochemicals (1 person)
c. Agricultural Products (3 people and 4 reporters)
d. Livestock Products (2 people)
e. Export Products (1 person)

The number of years working within the Division varies from 17 years (1 person) to 6 months (1 person). Two employees have worked for 10 years, one for four years, five employees has worked for 3 years, and three for 1 year. The published reports include the annual report by the DGEA. The academic background for these employees varies from a high school education to an Associate's Degree.

The four reporters have divided their field visits by geographical location. Two reporters visit the San Salvador market every business day while the other two

FIGURE 3.1

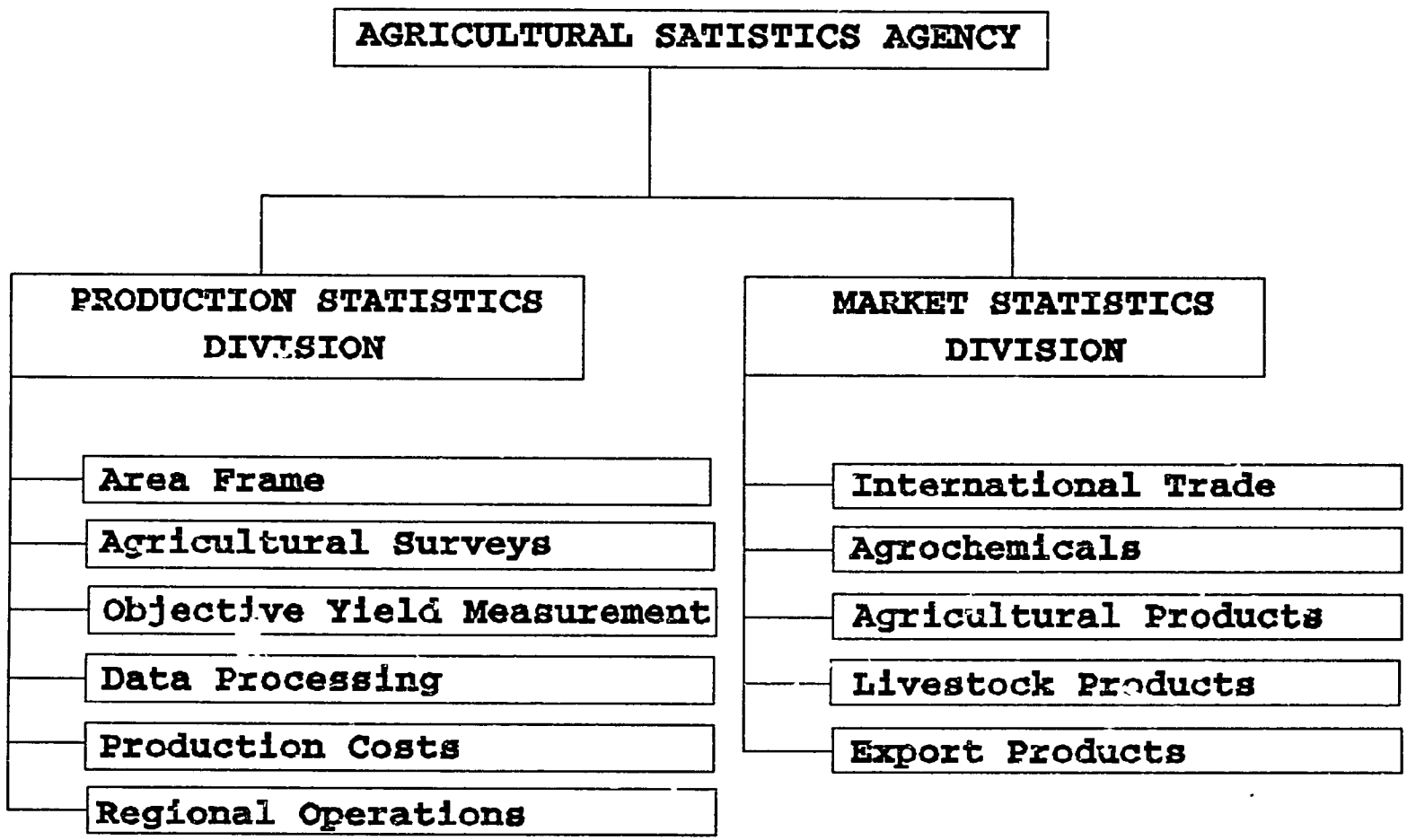
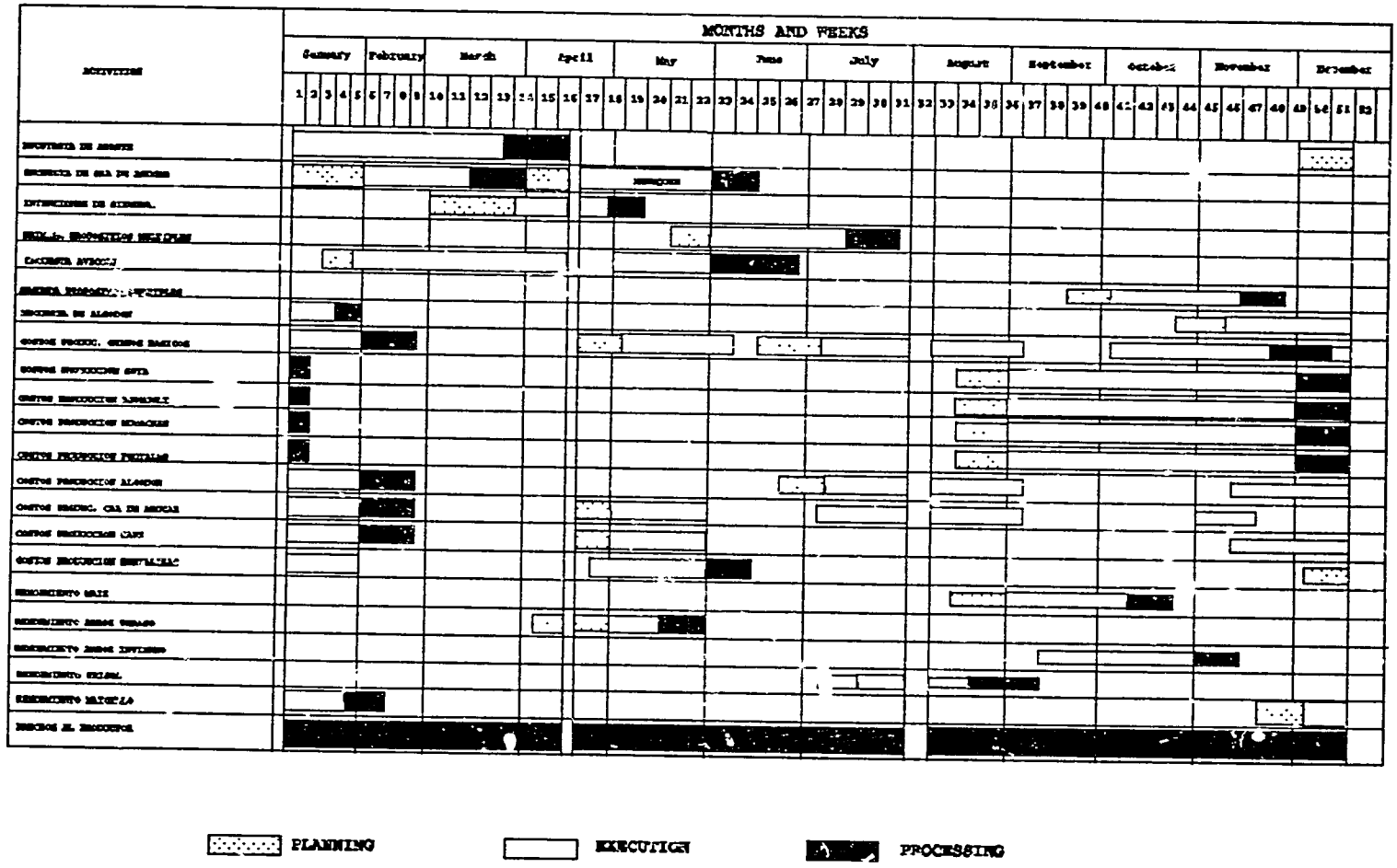

AGRICULTURAL SATISTICS AGENCY
PRODUCTION STATISTICS DIVISION
MARKET STATISTICS DIVISION
Area Frame
Agricultural Surveys
Objective Yield Measurement
Data Processing
Production Costs
Regional Operations
International Trade
Agrochemicals
Agricultural Products
Livestock Products
Export Products

FIGURE 3.2

CALENDAR OF ACTIVITIES OF THE
AGRICULTURAL STATISTICS DIVISION
1992



SOURCE: DGEA

travel on the east and west sides of the country, respectively, to visit the marketplaces in those major cities two or three times per week.

The budget for this Division is not known. The Division makes estimates of the balance sheets for basic grains and monthly reports on market prices for basic grains, vegetables, etc.

3.2. Kansas Agricultural Statistics

Although Kansas is twice the size of El Salvador and is, in general, more intensively cultivated than El Salvador, a comparison can be drawn as to the effort made to collect agricultural statistics. In Kansas, a total of 95 people (technical and support staff) are involved in the effort to collect and process the agricultural statistics. Eleven statisticians with mostly Master's and Bachelor's Degrees are involved in the collection and analysis of agricultural statistics. There are 40 part-time (500 hours/year) enumerators (typically retired farmers and wives of full-time farmers) and 25 part-time (600 hours/year) telephone interviewers (with little/no farm background. Approximately 300 surveys are conducted and 400 reports are published each year. The data collection for each of the Agricultural Surveys (in March, June, September, and December) is completed within a 14-day period (examples of the Surveys are given in Table 3.1). Five days are allotted for submitting the results from each survey. By the end of the month (within 31 days), the results of the survey in Kansas is released as part of a nationwide Agricultural Survey.

The annual operating budget for the Agricultural Statistics effort in Kansas is about $1.6 million.

3.3 Comparison of El Salvador with Kansas Agricultural Statistics Efforts

Comparing the level of effort in Kansas with that in El Salvador is relative to say the least, however, some insights may add to the general observations. In Kansas, the agricultural have met the deadline on submitting their survey results consistently. In fact, the dates for release of various agricultural statistics are fixed. The public and private sectors have been able to count on this agricultural statistical information being available on a timely basis and, therefore, being useful for making policy and marketing decisions. In El Salvador, production surveys take approximately 1.5 months to complete, while the processing time of the surveys is highly volatile, extending to as much as 3 months. If survey results are not released until 3 or more months after the field surveys were initiated, the information is of marginal value in warning the Government of food security problems in the country. Furthermore, private sector, which has taken on most of the marketing functions in El Salvador since market liberalization policies were implemented, is unable to access the agricultural statistics in time for making critical storage, importing, exporting, and other decisions.

In Kansas, part-time survey assistance (both by telephone and by field visits) comprises a significant part of the effort in collecting agricultural statistics. For example, agricultural product yields are updated monthly by telephone surveys. These short surveys (see Table 3.2) are used to adjust the survey data collected in the field visits in March, June, September, and December.

In El Salvador, the effort in collecting agricultural statistics is done solely in field visits. Since telephones are not found in rural areas, it is understandable that surveys are repeated less frequently than in Kansas. Because roads are much poorer in El Salvador, it is also understandable that the time to complete the surveys is longer. In order to speed the process of data collection, is it possible to hire part-time field enumerators to assist the current enumerators in collecting agricultural statistics?

A more urgent problem is the processing time for reporting the production survey results. Additional computers and more efficient organization of agricultural statistics on the computers may lend itself to a quicker turn-around in reporting the statistics.

TABLE 3.1

KANSAS AGRICULTURAL STATISTICS SERVICE

Kansas State Board of Agriculture
P.O. Box 3534
Topeka, Kansas 66601-3534

AGRICULTURAL SURVEY MARCH 1, 1992

Form Approved
O.M.B. Number 0535-0213
Expiration Date 1/31/93
Project Code 122

Kansas

Optional	Optional
407	408

Data Collection
Mar 1 - 14
Mar 15 - 19 Submit
Mar 31st Rel

Dear Reporter:

Information requested in this survey is used to prepare agricultural estimates. Facts about your farm or ranch are confidential and used only in combination with similar reports from other producers. Response is voluntary.

Sincerely,

233-2230

T.J. Byram
State Statistician

Attempted Contacts		
Date	Time	Notes

Strata	ID	Tract	Subtr.

SECTION 1 - IDENTIFICATION

1

Please verify name and address of this operation. Make corrections on label.

1. On land operated by the farm, ranch or individual(s) listed on the label:

a. Have or will crops be grown or hay cut at any time during 1992, or is any of the land in this operation in government programs? ..... ☐ YES ☐ NO

b. Have or will grains, oilseeds, or hay be stored at any time during 1992, or do you have storage facilities used for storing grain? ..... ☐ YES ☐ NO

c. Have or will there be any hogs on this operation at any time during 1992? ..... ☐ YES ☐ NO

d. Have or will there be any cattle, sheep, other livestock, or poultry on this operation at any time during 1992? ..... ☐ YES ☐ NO

→ If NO to all questions, GO TO SECTION 8.

2. Does this operation do business under any name, other than as shown on label?

☐ YES - Enter name: _____

(Do you want this name to appear on the label?) ☐ YES ☐ NO

☐ NO

3. Are the day-to-day decisions for this farming (or ranching) operation made by:

☐ An Individual Operator?

☐ Partners? Enter number of partners, including self. . . . ☐
(Partners jointly operate land and share in decision making. DO NOT include landlord as partner.)

☐ A Hired Manager?

3a. Are the decisions still made by the same person(s) making them on June 1, 1991?

☐ YES ☐ NO - Would you please explain what changed?

_____

_____

Office Use
R. Unit
921
Change
923
Sub.
941

Continue On Next Page

SECTION 2 - ACRES OPERATED

1

1. Now I would like to ask about the total acres operated under this land arrangement. Include farmstead, all cropland, woodland, pastureland, wasteland, and government program land.

	ACRES	
1a. On March 1, how many acres did this operation own?	901	+
1b. Rent from others? *[Exclude land used on an animal unit month (AUM) basis.]*	902	+
1d. Rent to others?	905	-
1e. Then the total acres operated under this arrangement are *[Item 1a + 1b - 1d]*	900	

Does this include the farmstead, all cropland, woodland, pastureland, wasteland, and government program land?

☐ YES - *[Go to Item 2.]*

☐ NO - *[Make corrections, then go to Item 2.]*

2. For the rest of this survey I will be asking for information on crops, stocks, and livestock on these *(Item 1e)* _____ acres.

3. Of the total *(Item 1e)* _____ acres operated, how many acres would be considered cropland, including land in hay and cropland in government programs? 802

SECTION 3 - CROPS

C

How to complete this section.

- - Report for all the land you operate, including land rented from others.
- - Include cover crops planted on government program land.

1. For the following **SMALL GRAIN CROPS**, please report acres **PLANTED** and **TO BE PLANTED** for all purposes last fall or this spring, and acres **TO BE HARVESTED** for grain in the **1992 CROP YEAR**.

WINTER WHEAT:	
Acres planted for all purposes	540
Acres to be harvested for grain	541
OATS *(include cover crop on government program acres)*:	
Acres planted and to be planted for all purposes	533
Acres to be harvested for grain	534

2. For the following **SMALL GRAIN CROP**, please report acres **PLANTED** and **TO BE PLANTED** for all purposes last fall or this spring.

BARLEY acres planted and to be planted for all purposes 535

Continued On Next Page

SECTION 3 - CROPS (Continued)

20

3. Please report for crops PLANTED and TO BE PLANTED for the 1992 CROP YEAR.

	ACRES PLANTED AND TO BE PLANTED THIS SPRING 1992
CORN for all purposes *(exclude popcorn and sweet corn)*	530
SORGHUM for all purposes *(include milo, other grain and forage sorghums -- EXCLUDE crosses with Sudan)*	570
SORGHUM X SUDAN CROSSES for all purposes	111
SOYBEANS for all purposes	600
SUNFLOWER for all purposes: Oil varieties	680
Non-oil varieties	681
DRY EDIBLE BEANS *(pinto, navy, great northern, and other varieties)*	607

4. Please report acres of HAY CUT AND TO BE CUT IN 1992. *(exclude straw, haylage, and greenchop)*

	ACRES FOR HARVEST IN 1992
ALL HAY *(include alfalfa and alfalfa mixtures, clover and clover mixtures, lespedeza, grains, sudan, timothy, other tame and wild hay.)*	650

5. ALL OTHER CROPS *(Specify)*:

	ACRES IN 1992
a. _____	56 __
b. _____	56 __
c. _____	56 __
d. _____	56 __

6. Acres in ALL OTHER LAND USES, including pastureland, woods, wasteland, ponds, orchards, farmsteads, idle land, farm lots, etc. -- *(EXCLUDE grazing allotments)* 800

Continue On Next Page

1 - Incomplete, Has Crops 2 - Incomplete, Crops Presence Unknown	138
3 - Valid Zero	

SECTION 4 - GRAINS AND SOYBEANS IN STORAGE

10

Please account for whole grains and soybeans on hand or stored **March 1** on the total acres operated, whether for feed, seed, or sale. They may have belonged to you or someone else, or been stored under a government program *(loan, farmer owned reserve, or CCC)*.

	NO	YES		1991 and earlier crop years
1. On March 1, was any **WHOLE GRAIN CORN** on hand or stored on the total acres operated?	☐	☐	How many bushels?	121
Were any **SOYBEANS** on hand or stored on these acres?	☐	☐	How many bushels?	125
What about **SORGHUM GRAIN (MILO)**?	☐	☐	How many bushels?	122
WHEAT, including all types? *(winter, durum, and spring)*	☐	☐	How many bushels?	126
OATS?	☐	☐	How many bushels?	123
BARLEY?	☐	☐	How many bushels?	124

1 - Incomplete, Has Stocks 2 - Incomplete, Stocks Presence Unknown	141
3- Valid Zero	

GRAIN STORAGE CAPACITY

2. On March 1, what was the **TOTAL STORAGE CAPACITY** of all the bins, cribs, sheds, and other structures normally used to store whole grains or oilseeds on the total acres operated? ..... bushels | 808 |

Continue On Next Page

SECTION 5 - HOGS AND PIGS

2

1. On March 1, were any HOGS or PIGS, regardless of ownership, on the total acres operated?

☐ YES ☐ NO → 1a. Were any HOGS or PIGS on the total acres operated, at any time, during the period of December 1, 1991 through February 29, 1992?

☐ YES - *GO TO Item 5.* ☐ NO - *GO TO Item 10.*

2. Of the HOGS and PIGS for BREEDING on hand March 1, how many were:

a. SOWS, GILTS and YOUNG GILTS bred and to be bred? .... 301 ★

Of these SOWS and GILTS, how many have farrowed, or are expected to farrow:

(1) During March, April, and May 1992? 331

(2) During June, July, and August 1992? 332

b. How many were BOARS and YOUNG MALES for breeding? .. 302 ★

c. How many were SOWS and BOARS no longer used for breeding? ..... 303 ★

3. Of the HOGS and PIGS for MARKET and HOME USE, how many were in each of the following four weight groups? *(Exclude breeding hogs reported in Item 2.)*

a. Under 60 lbs. *(Include pigs not yet weaned)* ... 311 ★

b. 60 - 119 lbs ..... 312 ★

c. 120 - 179 lbs ..... 313 ★

d. 180 lbs. and over ..... 314 ★
(Exclude hogs no longer used for breeding.)

4. Then the TOTAL number of HOGS and PIGS on hand March 1 was ... 300
(Add ★ Items 2a through 3d)

Continue with Item 5 in next column.

5. How many SOWS and GILTS FARROWED during Dec. 1991, January and February 1992? 326

6. PIGS from these *(Item 5)* litters:

a. On hand March 1? 327

b. Sold, moved off land operated, or slaughtered before March 1? .. 328

7. How many HOGS and PIGS PURCHASED since Sept. 1, 1991 were on hand March 1, 1992? *(Include feeder pigs purchased)* 317

If Item 7 is zero, skip to Item 9.

8. How many FEEDER PIGS were purchased during February 1992? 340

a. Average price per head *(dollars and cents)* ..... $ 341 .__

b. Average weight per head ..... Lbs. 342

9. How many WEANED PIGS and OLDER HOGS died during December 1991, January and February 1992? 335

10. Were any HOGS or PIGS being raised under CONTRACT for another person or firm?

☐ YES - *GO TO Item 11.* ☐ NO - *GO TO Section 6 on page 7.*

11. How many were being raised under contract on March 1? 333

Were these hogs or pigs included in Item 4?

☐ YES ☐ NO

Who owned the HOGS and PIGS?

Name: _____

Address: _____

Phone: _____

Continue

1 - Incomplete, Has Hogs 2 - Incomplete, Hogs Presence Unknown	499
3 - Valid Zero	

SECTION 6 - LIVESTOCK

1

Please report animals of any age, including newborns.

1. On March 1, how many cattle and calves, regardless of ownership, were on the total acres operated? *(Include cattle and calves owned or managed on land administered or controlled by a public agency, industrial corporation, or grazing association on a fee per head or AUM basis.)* 670

1a. Of the total number of cattle and calves reported in Item 1, how many were milk cows, both dry and in milk? 671

2. On March 1, how many sheep and lambs, regardless of ownership, were on the total acres operated? 672

3. On March 1, how many hens and pullets of laying age, regardless of ownership, were on the total acres operated? 719

SECTION 7 - PARTNER NAMES

1

1. Did you check partners in Section 1, Item 3, on Face Page?

☐ NO - *GO TO Section 9.*

☐ YES - *Continue.*

2. Please identify the other person(s) in this partnership in boxes below, then go to Section 9 on next page.
(make necessary corrections if names have already been entered)

Name _____ Phone _____
(First) (Middle) (Last)

Address _____
(Rt. or St.) (City) (State) (Zip)

Did this person operate land individually in this State on June 1, 1991? ☐ YES ☐ NO

Office Use: 925 / 924

Name _____ Phone _____
(First) (Middle) (Last)

Address _____
(Rt. or St.) (City) (State) (Zip)

Did this person operate land individually in this State on June 1, 1991? ☐ YES ☐ NO

Office Use: 926 / 924

Name _____ Phone _____
(First) (Middle) (Last)

Address _____
(Rt. or St.) (City) (State) (Zip)

Did this person operate land individually in this State on June 1, 1991? ☐ YES ☐ NO

Office Use: 927 / 924

Name _____ Phone _____
(First) (Middle) (Last)

Address _____
(Rt. or St.) (City) (State) (Zip)

Did this person operate land individually in this State on June 1, 1991? ☐ YES ☐ NO

Office Use: 928 / 924

Go To Section 9 On Next Page

SECTION 8 - CHANGE IN OPERATOR

1

Has this operation (name on label) been sold, or turned over to someone else?

☐ NO - *GO TO Section 9.* ☐ YES - *Please identify the new operator(s).*

Operation Name _____

Name _____

Address _____ Phone _____

City _____ State _____ Zip _____

Did this person operate land individually in this State on June 1, 1991? ☐ YES ☐ NO

SECTION 9 - CONCLUSION

1

1. Do you make any day-to-day decisions for another farm or ranch?

☐ NO ☐ YES - *1a. What is the name of this operation?* _____

1b. Was this operation in business before June 1, 1991? ☐ YES ☐ NO

(Complete a separate questionnaire for this operation)

OFFICE USE FOR LSF	
789	

2. Is your SSN and EIN printed correctly on the label?

☐ YES - *GO TO Item 3.*

☐ NO

To assist in identifying duplication with our list of farm operators, please report your Social Security Number. If your operation has a Federal Employer Identification Number, this would also be helpful. Disclosure of your SSN is voluntary and is collected under the general authority of Title 7, Section 2204, of the U. S. Code.

Operator's Social Security Number	470 ___ - __ - ____
Operator's Employer ID Number	466 __ - _____

3. Would you like to receive a copy of the results of this survey? ..... ☐ YES = 1 099

This completes the survey. Thank you for your help.

Respondent's Name _____ Date _____

Telephone (Area Code) _____ (Number) _____

Respondent		Response Code		Enum	Eval	Julian Date
1-Op 2-Sp 3-Oth 4-Est R 5-Est NR	101	2-Tel 3-Int 7-TR 8-IR 9-Inac	910	098	100	987
S/E N						

February	March	March
28-59	04-64	10-70
29-60	05-65	11-71
March	06-66	12-72
01-61	07-67	13-73
02-62	08-68	14-74
03-63	09-69	15-75

Public reporting burden for this survey is estimated to average 20 minutes per response, including the time for reviewing instructions, gathering and maintaining the data needed, and completing the questionnaire Send comments regarding this survey, including suggestions for reducing the burden, to the Office of Management and Budget, Paperwork Reduction Project (0535-0213), Washington, D C. 20503 Do not mail questionnaire to this address

TABLE 3.2

KANSAS
AGRICULTURAL
STATISTICS

Kansas State Board of Agriculture
P.O. Box 3534
Topeka, Kansas 66601-3534
Phone 1-800-258-4564

MAY YIELD SURVEY

1992

Form Approved
O.M.B. Number 0535-0213
Expiration Date 01/31/93
Project Code 128
QID-030050
Kansas

Dear Reporter:

Your help is needed to prepare crop estimates. Response to this survey is voluntary. Facts about your operation will be kept CONFIDENTIAL and used only in combination with similar reports from other producers for statistical summaries.

Sincerely,

T.J. Byram
State Statistician

Stratum	ID	Tract	Subtr.

Please make corrections in name, address and Zip Code, if necessary.

If you no longer operate this farm or ranch go to Section 2 on reverse side.

SECTION 1 - CROP ACREAGE, YIELD, AND HAY STOCKS

Please provide information for the following crops. (Do not include information for land rented to others.)

1. How many ACRES of WINTER WHEAT are to be harvested for grain on the total acres you operate? . . . . . Acres [541]

2. What is the EXPECTED YIELD PER ACRE for WINTER WHEAT to be harvested for grain on the total acres you operate? . . . . . Bu. [151]

3. HAY STOCKS:

   a. What was the TOTAL PRODUCTION for ALL HAY harvested on the total acres you operated last year (1991 crops)? (_____ bales and _____ wt./bale) . . . . . Tons [076]

   b. Report ALL OLD CROP HAY STORED MAY 1, 1992 on the total acres you now operate. (Include hay produced in 1991 and earlier years) (_____ bales and _____ wt./bale) . . . . . Tons [075]

Office Use
R Unit
921

SECTION 2 - CONCLUSIONS

1. If you no longer operate this farm or ranch, please provide name and address of the new operator.

   Name _____

   Address _____

   City _____ Zip _____

   County _____ Phone _____

2. Do you make any day-to-day decisions for another farm or ranch?

   ( ) YES - List other operation(s) _____

   _____

   ( ) NO

COMMENTS:

Would you like to receive a free copy of the results of this survey? ( ) YES = 1 . . . [099]

This completes the survey. Thank you for your help.

Reported by _____ Date _____

Telephone (Area Code) _____ (Number) _____

Respondent		Response Code		Sup/Enum	Eval
1 OP 2 SP 3 OTH 4 EST	101	2-Tel 3-Int 7-TR 8-IR 9-Inac	910	098	100

Public reporting burden for this survey is estimated to average 10 minutes per response, including the time for reviewing instructions, gathering and maintaining the data needed, and completing the questionnaire. Send comments regarding this burden estimate or any other aspect of this survey, including suggestions for reducing the burden, to the Office of Management and Budget, Paperwork Reduction Project (0535-0213), Washington, D.C 20503. Please DO NOT mail the questionnaire to this address

SECTION IV

MARGIN ANALYSIS

A principal means of determining how efficient agricultural commodity markets are working is by measuring the marketing margin. The marketing margin is generally defined as the difference between the price received by producers and the price paid by consumers. In El Salvador, the marketing margin most affected by agricultural and/or rural development policies is the producer-trucker marketing margin. Retailer and wholesaler margins are impacted more so by consumer's willingness to buy than possibly by agricultural and/or rural development policies.

4.1 Value

It is especially imperative in a country like El Salvador which is undergoing major structural adjustment changes (including liberalizing the commodity markets and privatizing marketing facilities) for a government agency like DGEA to monitor marketing margins (trucker, wholesaler, and retailer) on staple commodities. Fortunately, in El Salvador, there does not appear to be any firms or truckers with monopsonistic power in any of the Departments. Marketing margins between the producer and the trucker are, then, based primarily on the cost of loading and unloading of the commodities and the cost of transport of the commodities to the wholesalers in the various cities in El Salvador. Transport costs are discussed in-depth in Section 5.

By collecting price information that allows the DGEA to analyze marketing margins of agricultural commodities in El Salvador, DGEA can assist the Government in answering questions such as:

a. How is the marketing margin impacted by improvements in road infrastructure within certain Departments or between certain cities within the country? Who benefits most from improved roads - consumers, middlemen, or producers - or do they all benefit?

b. How is the marketing margin impacted when the supply of grains or edible beans is very high or very low within El Salvador?

c. How volatile are marketing margins? What makes marketing margins between commodities different? Do marketing margins change uniformly between different staple commodities in El Salvador?

d. How is the marketing margin impacted by increased concentration within the trucking industry?

e. What is the farmer's share statistic on the commodities produced?

4.2 Collection Effort

4.2.1. Modal prices versus average prices

The Market Statistics Division of the DGEA collects weekly trucker, wholesaler, and retailer prices in markets in ten cities of El Salvador. In San Salvador, the prices are collected daily through the week. The weekly modal prices (trucker,

wholesaler, and retailer) of each city are announced every week on the radio by DGEA. Transmitting the weekly modal price is a reasonable manner of informing the producer of the prices received in the last week. However, when the market prices are going to be analyzed, problems using modal prices arise In a given week, the modal trucker price and the average producer price can be the same or in other cases the modal trucker price can be lower than the average producer price. For example, the weekly modal trucker price in Santa Ana in the first week of August (1991) was 85.00 (C/QQ) while the average weekly producer price in Santa Ana was 87.90 (C/QQ). In the second week, the weekly modal price was 80.00 (C/QQ) while the average weekly producer price was 81.70 (C/QQ). In both weeks the trucker-producer margin was negative. It is not practical for truckers to be operating when the trucker prices are lower than the producer prices.

Also, it is probably a problem in the manner in which the prices are collected and processed. The DGEA collects producer prices in as many as ten different Departments in El Salvador and collects trucker prices in ten cities in El Salvador. The average margin calculated does not reflect the average of the actual margins received by the truckers interviewed in the ten cities. For obtaining the actual margins received by the truckers, the truckers need to be asked how much they paid the producers or those from which they bought the commodity. Although some truckers may not give the actual prices paid the producers and although the DGEA has no way of verifying the trucker's information, there is no better alternative for obtaining such information.

The Market Statistics Division needs to process weekly average prices reported by the producers, truckers, wholesalers, and retailers of corn. beans, sorghum, and rice in order to obtain information more reliable with the dynamic changes in the margins. The weekly average prices and margins, then, must be maintained with easy access in the database in Quatro-Pro. With such a database, the different spatial and seasonal prices within and between the various cities of El Salvador can be calculated easily.

4.2.2. Weekly aggregation

The aggregation of producer prices and volumes to only a monthly weighted average does not allow for in-depth analysis of the dynamics of the producer/trucker marketing margin. Instead, for analyzing the marketing margin producer prices should first be aggregated on a weekly basis (as has been done in the case of the trucker prices) and if need be for other types of analysis, such as seasonality in prices, margins can be aggregated on a monthly basis. An example of how dynamic the weekly marketing margins can be examine Figure 4.1. Such dynamic movements are reason for limiting some analysis to a weekly basis.

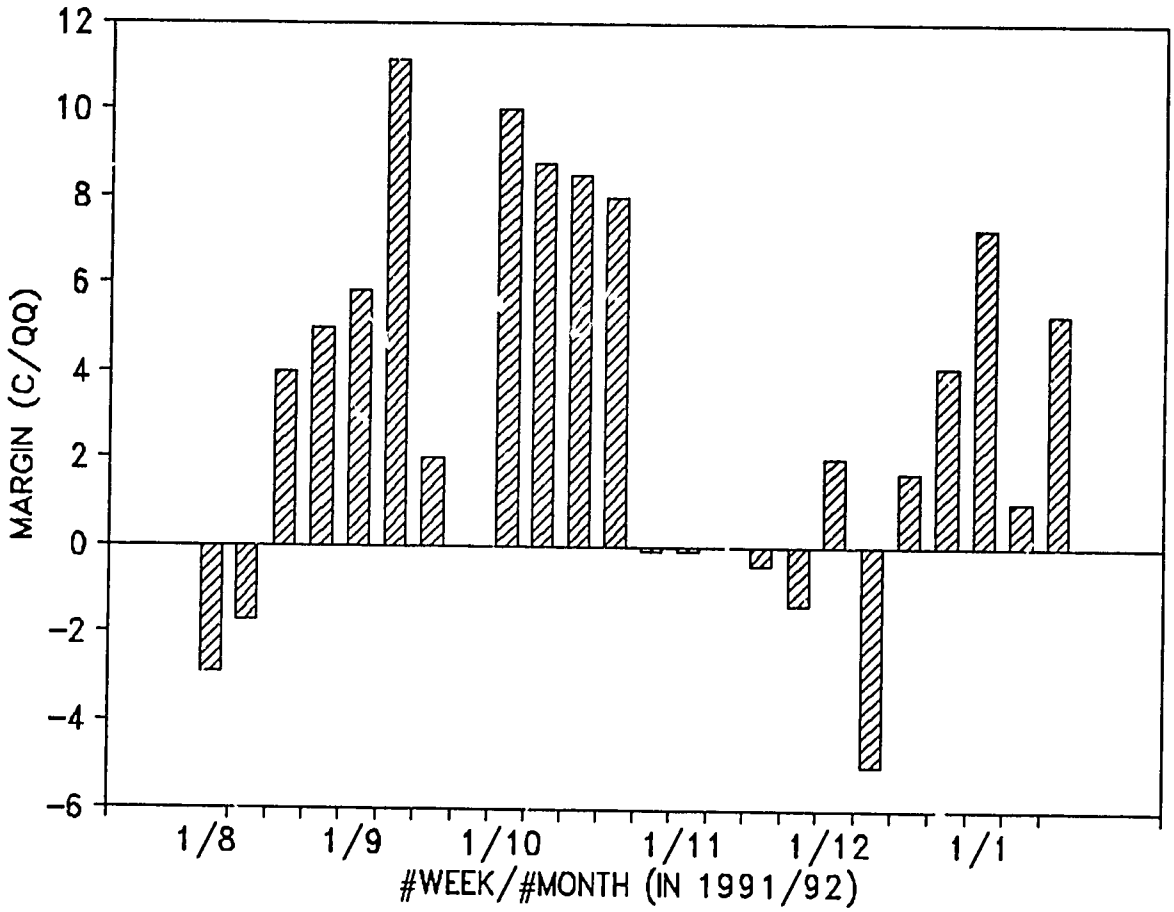
4.2.3. Additions and modifications to the surveys

4.2.3.1. Sales volumes

The Production Statistics Division has been collecting prices and volumes of producer sales in the various Departments within El Salvador. Monthly weighted average prices of corn, beans, rice, and sorghum are, then, being reported. At the same time, the Market Statistics Division has been collecting on a weekly basis the prices of those products at the level of the trucker, wholesaler, and retailer.

FIGURE 4.1

WEEKLY AVERAGE TRUCKER MARGIN FOR CORN
IN SANTA ANA



In order to obtain 'weighted' average weekly trucker, wholesaler, and retailer prices, volume of sales at each price needs to be collected. In Table 4.1 is a modified version of DGEA's survey form entitled "Average Price of Basic Grains in Major Cities Within Departments".

The volume of sales by the truckers in each of the city markets can be easily obtained in a relatively short period of time, especially since the reporters from the Marketing Statistics Division are already collecting prices from the truckers. It is recommended that the DGEA start in January (1993) to collect sales volume data on a regular basis from truckers and wholesalers in San Salvador. In the case of the truckers, sales volumes should be collected daily. Then after two months of data has been collected, the weekly average and monthly sales volumes of the truckers in the market can be calculated. Sales volumes for each day of the week can also be calculated in order to obtain the average proportion of sales by day of the week.

In the case of the wholesalers, weekly sales volumes can be determined by asking the wholesalers for such information just once per week. Monthly sales volumes can be determined using the weekly sales data.

In Santa Ana and San Miguel, it is also recommended that the sales volumes and the prices be taken weekly from the truckers and the wholesalers at least during the months of January and February. This is not simply to permit the DGEA to obtain an good idea of the dynamics of the market in these cities, but also to permit the DGEA to compare prices between cities (see Section 5).

Once the sales volumes and prices have been collected, it is critical that DGEA people working in price analysis calculate the standard deviation of the mean monthly sales volume (in addition to the monthly average sales volume). An illustration of the calculation of the standard deviation of the mean is in the example that follows.

Given the following daily sales volumes of white corn for four weeks in February:

In addition, it is important that the cost of trucking the commodities be surveyed on a bi-monthly basis or more often if there has been a change in the producer-trucker margin. In Table 4.2 is a Survey Form on trucker costs that could be adopted by the Market Statistics Division.

DAY	WEEK NUMBER 1	WEEK NUMBER 2	WEEK NUMBER 3	WEEK NUMBER 4	AVERAGE	STD.DEV.
	Number of sacks					
Monday	1300	1400	1250	1350	1325	64.55
Tuesday	1100	1000	1150	1050	1075	64.55
Wednesday	700	600	800	650	687.5	85.39
Thursday	1100	1050	1000	1100	1062.5	47.87
Fridays	1200	1300	1250	1300	1262.5	47.87
Saturday	500	450	550	500	500	40.82
Sunday	250	200	150	250	212.5	47.87

TABLE 4.1

AVERAGE PRICE OF BASIC GRAINS IN MAJOR CITIES WITHIN DEPARTMENTS

PLAZA: SAN SALVADOR*

DATE: DECEMBER 10, 1992

	PRODUCER	TRUCKER				WHOLESALE	RETAIL
PRODUCT	PRICE C/QQ	PRICE C/QQ	NUMBER OF TRUCKS TOTAL LARGE (L) MEDIUM (M) SMALL (S)	NUMBER OF SACKS TOTAL LARGE (L) MEDIUM (M) SMALL (S)	ORIGIN OF PRODUCT DEPARM'T	PRICE C/QQ	PRICE C/QQ
WHITE CORN	75	80	10 - L-7 M-2 S-1	800 - 700 - 80 - 20	METAPAN	85	95
SORGHUM							
PADDY RICE							
POLISHED RICE							
RED BEANS							

* An example.

TABLE 4.2

MULTIPLE LINEAR REGRESSION - PRODUCER PRICE

DEPENDENT VARIABLE: producer price		83 VALID CASES	
COEFF OF DETERMINATION:	0.938376		
ADJUSTED R SQUARE:	0.937565	ESTIMATED CONSTANT TERM:	0.0182841
MULTIPLE CORR COEFF:	0.968672	STANDARD ERR OF ESTIMATE:	3.12293

ANALYSIS OF VARIANCE FOR THE REGRESSION:

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F TEST	PROB
REGRESSION	1	12018.9	12018.9	1232.37	0.0000
RESIDUALS	81	789.968	9.75270		
TOTAL	82	12808.9			

VARIABLE	REGRESSION COEFFICIENT	STANDARDIZED COEFFICIENT	STANDARD ERROR	T	PROB
trucker price	0.884144	0.968672	0.0251856	35.1051	0.0000

TABLE 4.3

MULTIPLE LINEAR REGRESSION - TRUCKER PRICE

DEPENDENT VARIABLE: trucker price		83 VALID CASES	
COEFF OF DETERMINATION:	0.938326		
ADJUSTED R SQUARE:	0.937565	ESTIMATED CONSTANT TERM:	2.31045
MULTIPLE CORR COEFF:	0.968672	STANDARD ERR OF ESTIMATE:	3.42150

ANALYSIS OF VARIANCE FOR THE REGRESSION:

SOURCE OF VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F TEST	PROB
REGRESSION	1	14426.9	14426.9	1232.37	0.0000
RESIDUALS	81	948.239	11.7067		
TOTAL	82	15375.1			

VARIABLE	REGRESSION COEFFICIENT	STANDARDIZED COEFFICIENT	STANDARD ERROR	T	PROB
producer price	1.06128	0.968672	0.0302316	35.1051	0.0000

The average sales volume (and standard deviation) for each day of the week is calculated above. The variance (that is, the standard deviation squared) in the sales volume for Monday, for example, is equal to

$$VAR = \frac{\sum_{i=1}^{4} (X)^2 - \left(\sum_{i=1}^{4} X\right)^2 / n}{n-1}$$

where: $\sum_{i=1}^{4} (X)^2$ = the sum of squares of each of the volumes in the data

$= (1300)^2 + (1400)^2 + (1250)^2 + (1350)^2 = 7{,}035{,}000$

$\left(\sum_{i=1}^{4} X\right)^2$ = the sum of squares of the volumes

$= (1200 + 1400 + 1250 + 1350)^2 = 28{,}090{,}000$

n = the total number of weeks in the data series

= 4

Variance = (7,035,000 - (28,090,000)/4)/(4-1) = 4166.7

Standard Deviation = 64.55

The calculation of the standard deviation (error) of the mean (SD-M), however, is different than the calculation of the standard deviation of the individual volumes of each one of the four weeks. In the example for Monday, the variance of the mean (VAR-M) is equal to:

VAR-M = (D1(DS1 x DS1) + D2(DS2 x DS2) + D3(DS3 x DS3) + D4(DS4 x DS4) + D5(DS5 x DS5) + D6(DS6 x DS6) + D7(DS7 x DS7))/(TD x TD)

substituting in the data:

VAR-M = (4(64.55 x 64.55) + 4(64.55 x 64.55) + 4(85.39 x 85.39) + 4(47.87 x 47.87) + 4(47.87 x 47.87) + 4(40.82 x 40.82) + 4(47.87 x 47.87))/(28 x 28)

VAR-M = 123.29
SD-M = 11.10

where D1 = The number of observations of Monday sales volumes
D2 = The number of observations of Tuesday sales volumes
D3 = The number of observations of Wednesday sales volumes
D4 = The number of observations of Thursday sales volumes
D5 = The number of observations of Friday sales volumes
D6 = The number of observations of Saturday sales volumes
D7 = The number of observations of Sunday sales volumes
SD1 = Standard deviation of the volumes sold on Monday
SD2 = Standard deviation of the volumes sold on Tuesday

SD3 - Standard deviation of the volumes sold on Wednesday
SD4 - Standard deviation of the volumes sold on Thursday
SD5 - Standard deviation of the volumes sold on Friday
SD6 - Standard deviation of the volumes sold on Saturday
SD7 - Standard deviation of the volume sold on Sunday
TD - Total number of observations in the six days

When the sales volumes and prices have been collected for each trucker and wholesaler, it is possible for the DGEA to calculate the weighted average price (wholesaler, trucker, and producer) of the grains and edible beans. Then, the margins can be calculated based on the weighted average prices.

4.2.3.2. Survey Size

A question that needs to be answered by the DGEA is the question of sample size. If the DGEA is collecting sales volumes, market prices, or production costs, the sample size is critical. A good method for obtaining decisive information in the appropriate sample size is to compare the standard deviation in various possible sample sizes. For example, in obtaining an appropriate sample size for estimating the cost of production of hybrid corn, a series of sample sizes, with a range of 37 samples to 244 samples (the total samples of the national cost of production survey in 1992 in El Salvador) was used (see below). In the case of the 244-sized sample, the average and the standard deviation of the cost of production of each one of the four regions is used for calculating the weighted average (it is not a simple average) and the standard deviation (error) of the mean of the cost of production.

Region	Number of Samples	Average	Std.Dev.
		-------C/QQ----------	
REGION-1	65	2509.48	510.12
REGION-2	69	2389.71	492.00
REGION-3	53	2485.02	612.95
REGION-4	37	2273.96	541.36

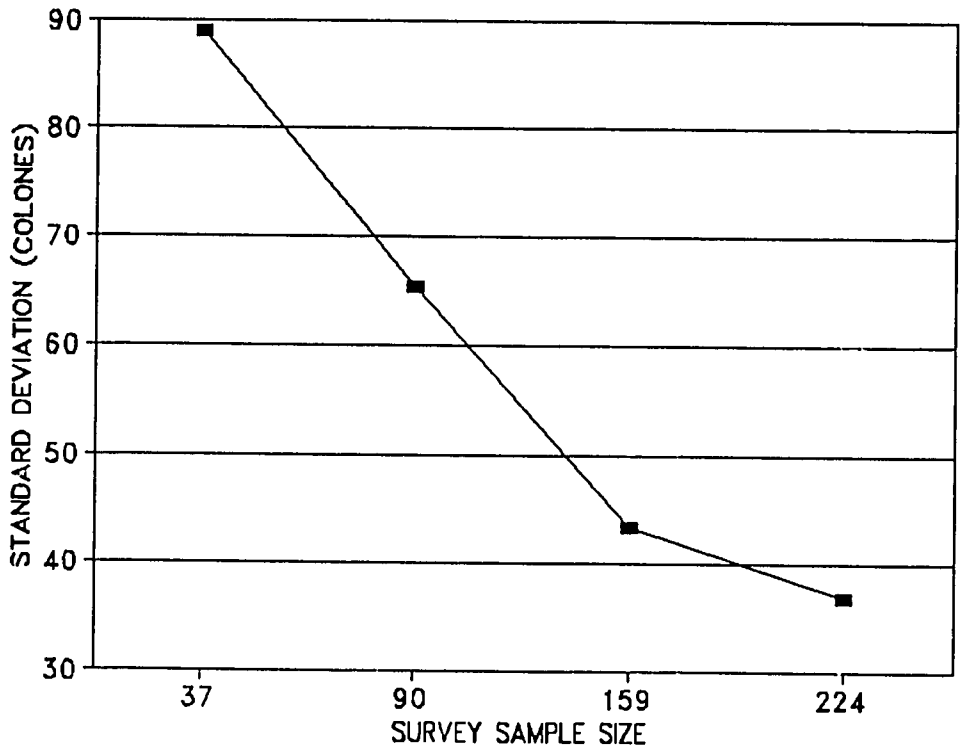
Number of Samples	Simple Average	Weighted Average	Std. Dev. of the Mean	Coefficient of Variation
	----------C/QQ----------			---PERCENT---
37	2273.96	2273.96*	89.00	3.91
90	2379.49	2398.10	65.28	2.72
159	2382.90	2394.54	43.32	1.80
224	2414.54	2427.89	36.82	1.52

* Is not a weighted average since the entire sample came from Region 4.

The standard deviation of the mean for each of the sample sizes was graphed for obtaining a good view of the impact of a change in the standard deviation of each sample size (Figure 4.2). For determining which of the sample sizes is appropriate, the DGEA has to decide at what level of standard deviation it is

FIGURE 4.2

ESTIMATION OF THE SIZE OF
PRODUCTION SURVEY



comfortable with. For this, it is easiest to check the coefficient of variation by the percentage for each sample size. The coefficient of variation can be compared with the level of error in the costs of the components (manual labor, fertilizer, seed, etc.) that makes up the costs of production. If the coefficient of variation for such sample sizes is higher than the error in the cost of the individual components of the costs of production, the sample size should probably be increased (with that increase, the coefficient of variation should decrease).

4.2.3.4. Transport costs

Just as the producer prices of grains and edible beans are influenced by more than the cost of production, the trucker/producer margins are impacted by more than just the cost of transport. To collect the cost of transport of the truckers, a key component of the margin can be quantitatively monitored. The cost of transport information together with other information (such as the producer price) can be used in determining the benefits and the costs of repairing the trucks, especially in the rural areas. The cost of transport to the trucker from point A (where the product is purchased) to a given market in city B does not change much from one month to another. However, such cost information must be obtained monthly in the markets of San Salvador, Santa Ana, and San Miguel. The survey must include the cost of transport of grains bought from producers of at least six or more Departments in the country. For purposes of comparison and for examining the opportunities of arbitrage within the country, the surveys must include truckers who have bought grains from the same Departments but sold the grain in different markets (such as San Salvador and Santa Ana).

See Section 5 for a more detailed description of the costs of transport.

4.2.4. Missing data

It is not unusual for data to contain missing data points (observations). However, before the data is processed, the missing data points must be estimated (as long as there are relatively few data points missing). An example of the methodology is as follows. A missing data point was found in the monthly producer price data series (1984-1990) for sorghum. Since commodity prices at the trucker level are directly correlated with prices at the producer level, and since all monthly trucker prices (from 1984-1990) are included in the data series, a regression equation can be set up (see Annex 1 about details on regression analysis) where the producer price is explained by the trucker price. That is,

(Producer price) = (Constant) + (coefficient) x (trucker price)

All the data points for the two variables (producer price and trucker price) except the one producer price missing are used in the regression. The regression results (see Table 4.2) indicate the following relationship between the trucker price and the producer price:

(Producer price) = 0.018 + (0.884) x 60 (C/QQ)

where 60 C/QQ represents the trucker price in November 1988 (the month in which the missing producer price is found). The coefficient of determination is very

high, therefore, the monthly trucker prices explain much of the variation in the monthly producer prices.

The estimated producer price is 57.06 C/QQ. A similar regression could be run using the same data but where the trucker price is the dependent variable and the producer price is the independent variable (Table 4.3). It is usually the case that producers do not have much bargaining power when truckers when are ready to buy staple commodities (such as sorghum) especially when the supply of that commodity is high. So it is that producers are usually price takers, although they may continue to store their product instead of selling it at prices dictated to them by the truckers. It then follows that prices of the producers are dependent on trucker prices, as is the case in the first regression in Table 4.2.

4.2.5. Outliers

In any process of collecting data, there are points that are outside what is within the normal range. Such points are considered outliers (extreme points). For example, during a number of months of scarcity of edible beans in El Salvador in 1988, the producer price of edible beans in El Salvador jumped to more than 450 C/QQ, an unprecedented level in El Salvador (Figure 4.21). After the supply shock, the producer price returned to a more normal level. The outlying data points reported during this period of high bean prices should not be used to do most types of price analysis, such as in estimating seasonality and trends in prices, or in projecting prices based on historical price movements.

4.3 Analytical Effort

There are various types of margin analysis that DGEA could be doing to make not only better use of the data collected but more importantly to obtain a more thorough understanding of how margins are changing among the basic grains and edible beans, what trends there may be in the margins, how the margins are related to the overall dynamic marketing system, etc.

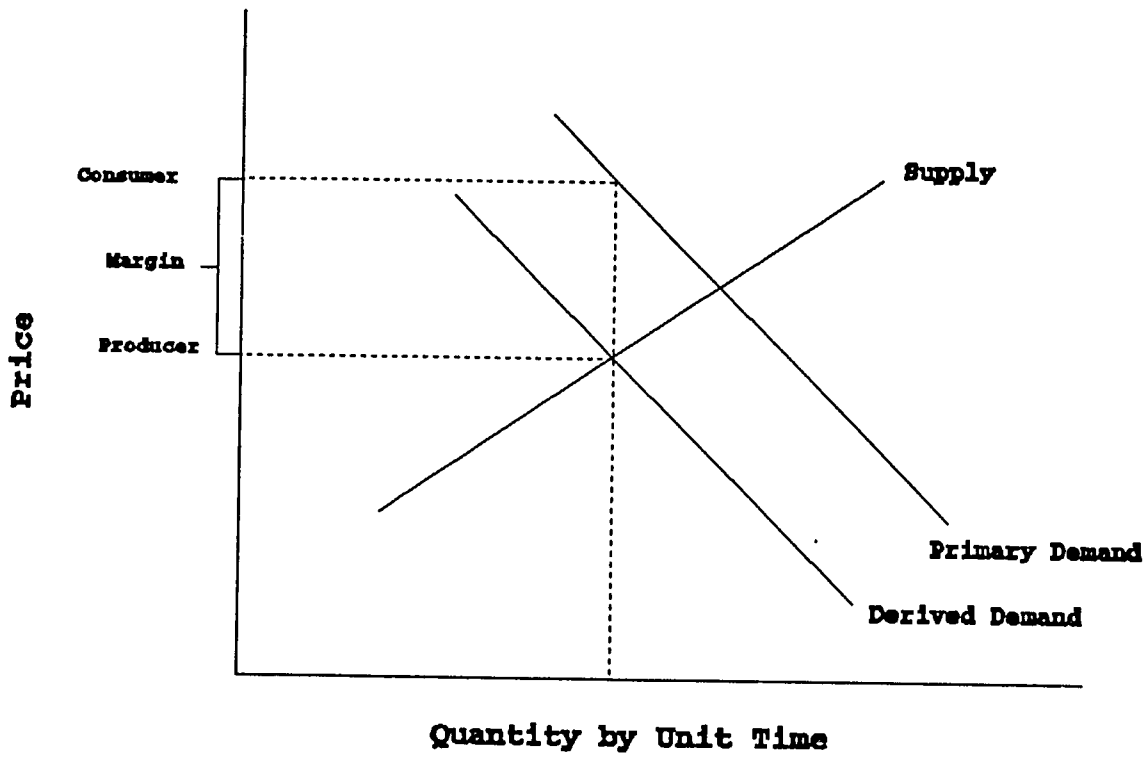
Before understanding margin analysis in El Salvador, it should be understood that grain market prices (producer, trucker, wholesaler, and retailer) in El Salvador

a. follow supply and demand relationships,
b. exhibit seasonality based on the production season,
c. contain trends that follow the state (high inflation, low inflation, etc.) of the economy, and
d. reflect quality differences that are influenced by consumer tastes and preferences.

The price analyst should also understand the economic mechanisms that are at work when marketing margins are being assessed. In economics, a graph can illustrate what 100 or even 1000 words cannot. For the quantity of commodities being consumed or demanded at a specific market price a demand curve can be drawn (as in Figure 4.3). The shape and the exact position of the demand curve is determined by the consumer. This demand curve is called the primary demand curve. When understanding the marketing margin, another demand curve called the derived demand curve is typically given on the graph to represent the quantity of a commodity demanded from the producer at a specific price. Derived demand differs

FIGURE 4.3

DEMAND CURVES



from primary demand by the amount of marketing and processing charges per unit of product. Derived demand for our purposes in El Salvador is based on the price-quantity relationship existing where and when producers sell their produce.

It is relatively easy to explain, for example, the primary demand and the derived demand curves for edible beans in El Salvador (see Figure 4.4). In the case of corn, the demand for corn can be derived from the primary demand for corn products such as tortillas and livestock feed.

Under some market conditions, marketing margins can be expected to remain constant as the quantity of a commodity marketed is changing, while under other conditions, margins will vary. The way in which they respond to changes in the volume marketed depends on the assumptions made with respect to the supply function for marketing services (including the shape and position of the supply curve, as in Figure 4.5). Assuming the supply function for marketing services has a positive slope (as in Figure 4.5), then the price of such services would increase as demand increases; hence margins would be higher when larger quantities are produced and marketed (Tomek and Robinson, 1979).

The primary supply curve refers to the price-quantity supply relation at the farm level (Figure 4.5). The supply relation at retail is derived from the primary relation by adding the expected margin.

A retail price is found at the point where the primary demand and the derived supply relation intersect. The producer price is determined at the point where the derived demand and the primary supply intersect. The marketing margin is the difference between the two points (see Figure 4.5).

Typically with staple agricultural commodities (such as beans, corn, and rice in El Salvador), the primary supply curve is more inelastic than the primary demand curve. (Notice this in Figure 4.6 and also note the effect of an increment in the cost of assembling and trucking on the trucker/producer margins.) That is, the total supply of staple commodities is more or less fixed at the level of the total harvested crop. The marketing margin may change as a result of shifts in the supply or demand relations for such services as assembly, processing, transportation, and retailing.

As margins are being calculated, DGEA must pay close attention to changes in assembly and transportation services. Marketing margins are expected to change, for example, if there are changes in the price of inputs (such as fertilizer and seed), changes in the efficiency of the farming operations (e.g., farm machinery used instead of draft animals), and changes in the services related to the transportation and marketing of farm products (e.g., change in capacity of trucks). Changes in input prices, farming efficiency, or in marketing services may not, however, be fully reflected in the marketing margins immediately but only after a short period of time, time enough for arbitrage opportunities. Arbitrage is the exploitation of price differences between different markets. Data collected by DGEA should and indeed does bear out evidence of these temporary changes in margins and consequent arbitrage opportunities.

FIGURE 4.4

DEMAND CURVES OF BEANS

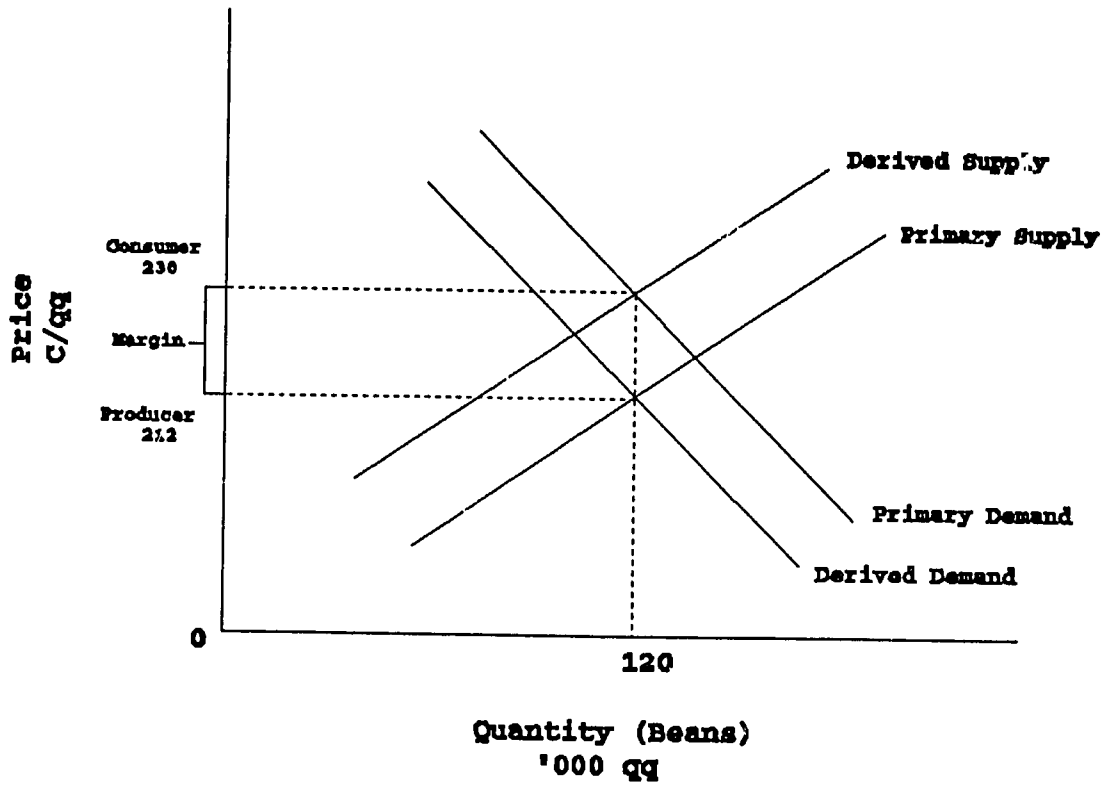


FIGURE 4.5

ILLUSTRATION OF THE DEMAND AND SUPPLY CURVES

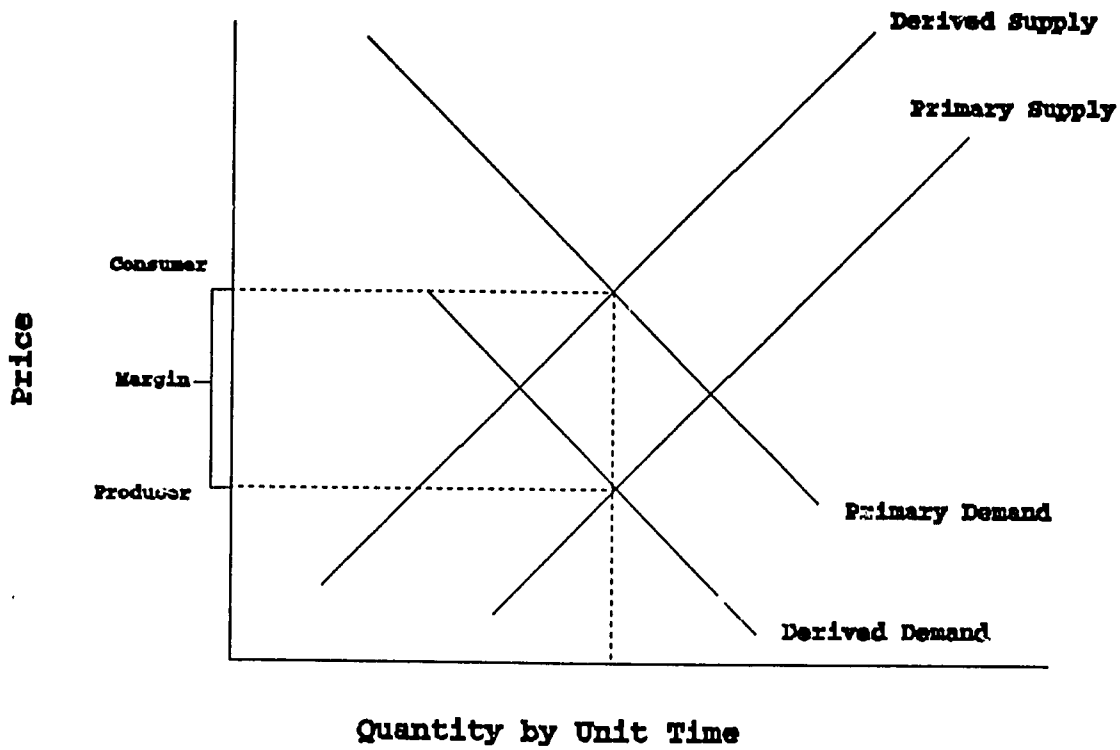
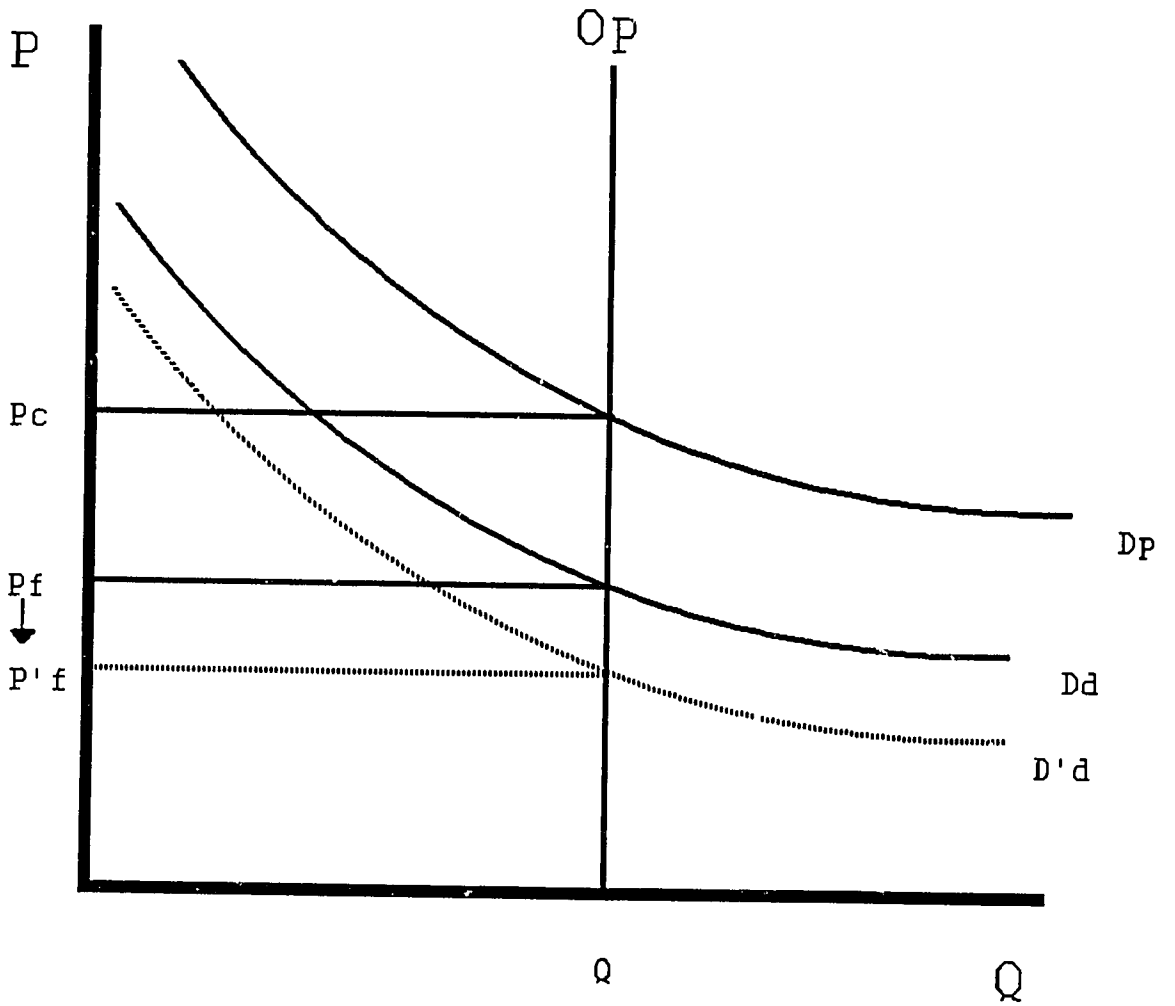


FIGURE 4.6

EFFECT OF AN INCREASE IN THE COST OF TRANSPORT



Note:

The gross marketing margin is the difference between P_c and P_f (consumer price on the primary demand curve (D_d) and the farm price on the derived demand curve (D_p). If the cost of transport increases and the marketing margin is likely to fall, the reaction of the marketing agent will be to lower the price paid to the producer P'_f instead of reducing his margin. (O_p is the short-run primary supply curve).

4.3.1. Graphs

To determine how marketing margins have been behaving historically, average monthly margins (trucker, wholesaler, and retailer) for corn, beans, sorghum, and rice in the years 1984-1992 were graphed (Figures 4.7-4.22). The data on margins and prices used in the graphs (Figures 4.7-4.22) is given in Annex 2. From the graphs one can see how volatile each of the monthly average margins have been. For corn (Figures 4.7-4.9), for example, corn margins have been more volatile since 1987. This increase in volatility since 1987 may be due to government policy changes. If so, were such increases in volatility noted in the other crops? Yes, margins are seemingly more volatile since 1987. With these graphs, however, it is very difficult to see exactly which months are more volatile and to observe whether the swings are seasonal. Graphs such as those in Figures 4.19-4.22 allow the viewer to observe the seasonal producer price swings along with the changes in the margins (for more information on monthly price seasonality see Section 6). For corn, in Figure 4.19, increases in producer prices in pre-harvest months are anticipated by the truckers and wholesalers to such an extent that margins widen during this time. For truckers this may be a time of increasing transport costs due to the need to drive more to assemble the commodities. Retailers have historically had their margins stay the same or decrease during the pre-harvest months. This may be due to the consumers unwillingness to buy corn when prices are highest in the crop year. Retailers must make the corn prices as attractive as possible. During post-harvest months (in particularly, 1989 and 1990) margins of especially truckers and wholesalers have fallen as abruptly as producer prices fall. Retail margins, however, do not fall nearly as a much as the other margins. Consumers are typically not as concerned with the level of corn prices when prices are already quite low.

Trainees should conduct a similar evaluation of the prices and margins of other commodities (beans, rice, and sorghum) and then compare the margins (magnitude, volatility, etc.) between the commodities.

4.3.2. Calculation of the standard error

The quantitative method for explaining the volatility in the margin is presented in Table 4.4. In the table are the average national trucker/producer margins of corn for each month in 1984-90. The average and the standard deviation for each year and for each month during the period of seven years is given. A number of questions about the data should be made.

- Are the average national monthly margins (trucker/producer) providing useful information for further analysis? Probably not! For obtaining more useful information for further margin analysis, average weekly margins (trucker/producer) in various cities/departments could be used.
- Is the calculation of the standard deviation correct for determining the volatility in the average monthly margins over seven years? No. The standard error (deviation) of the mean must be calculated since the average monthly margins are given.

Questions on the volatility of the margins would also include:

- Does the margin volatility depend on the month of the crop year?
- Is there seasonality in the margins, as in the grain prices?

Additional analysis on the margins are presented in Section 5.

FIGURE 4.7

TRUCKER MARGIN FOR CORN
IN SAN SALVADOR (1984-1992)

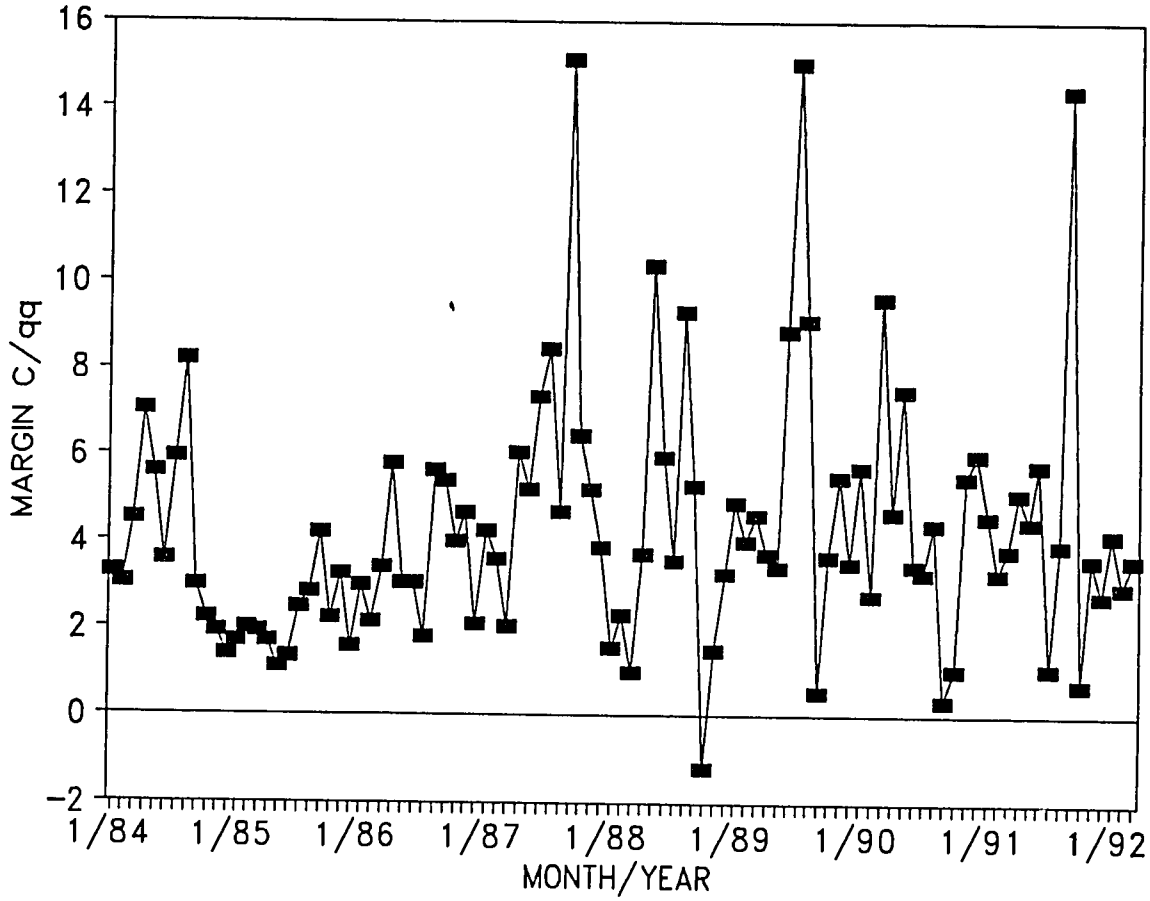


FIGURE 4.8

WHOLESALER MARGIN FOR CORN
IN SAN SALVADOR (1984-1992)

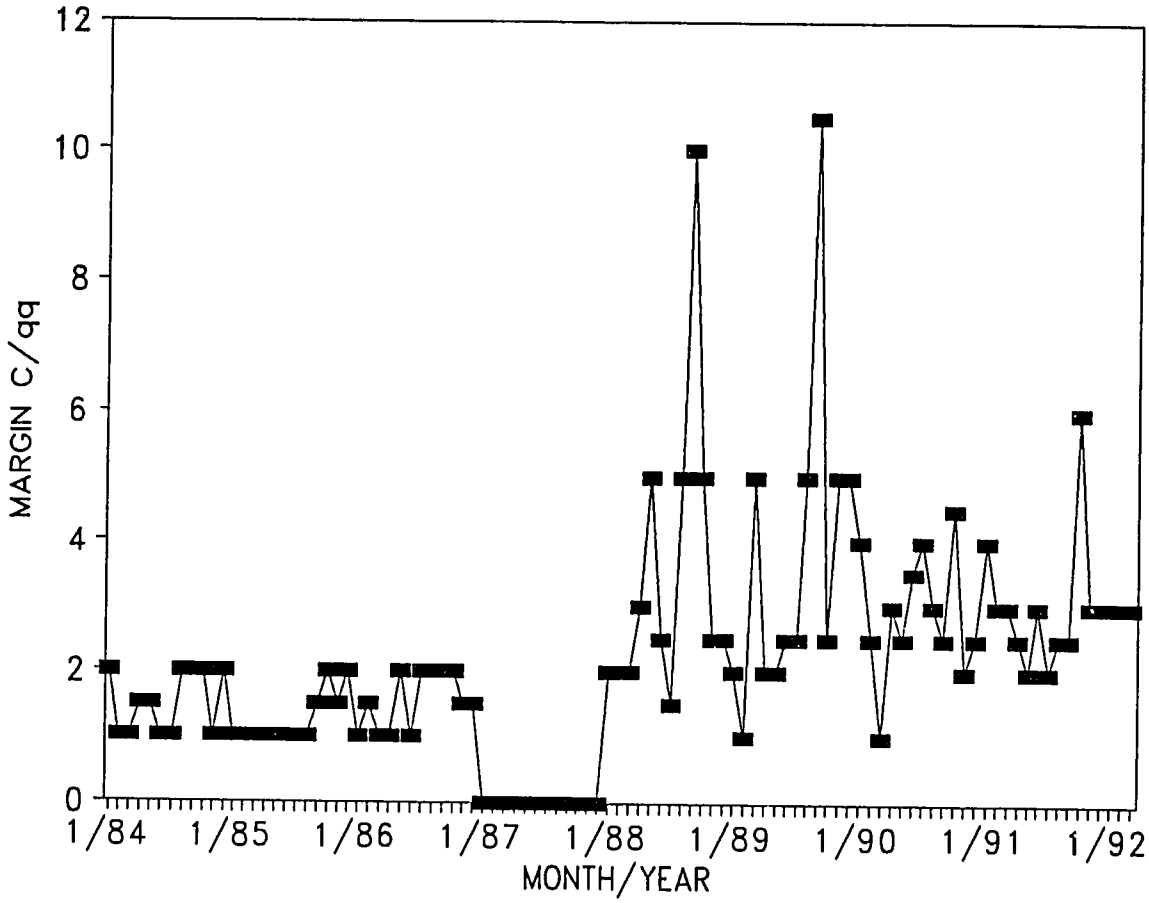


FIGURE 4-9

RETAILER MARGIN FOR CORN
IN SAN SALVADOR (1984-1992)

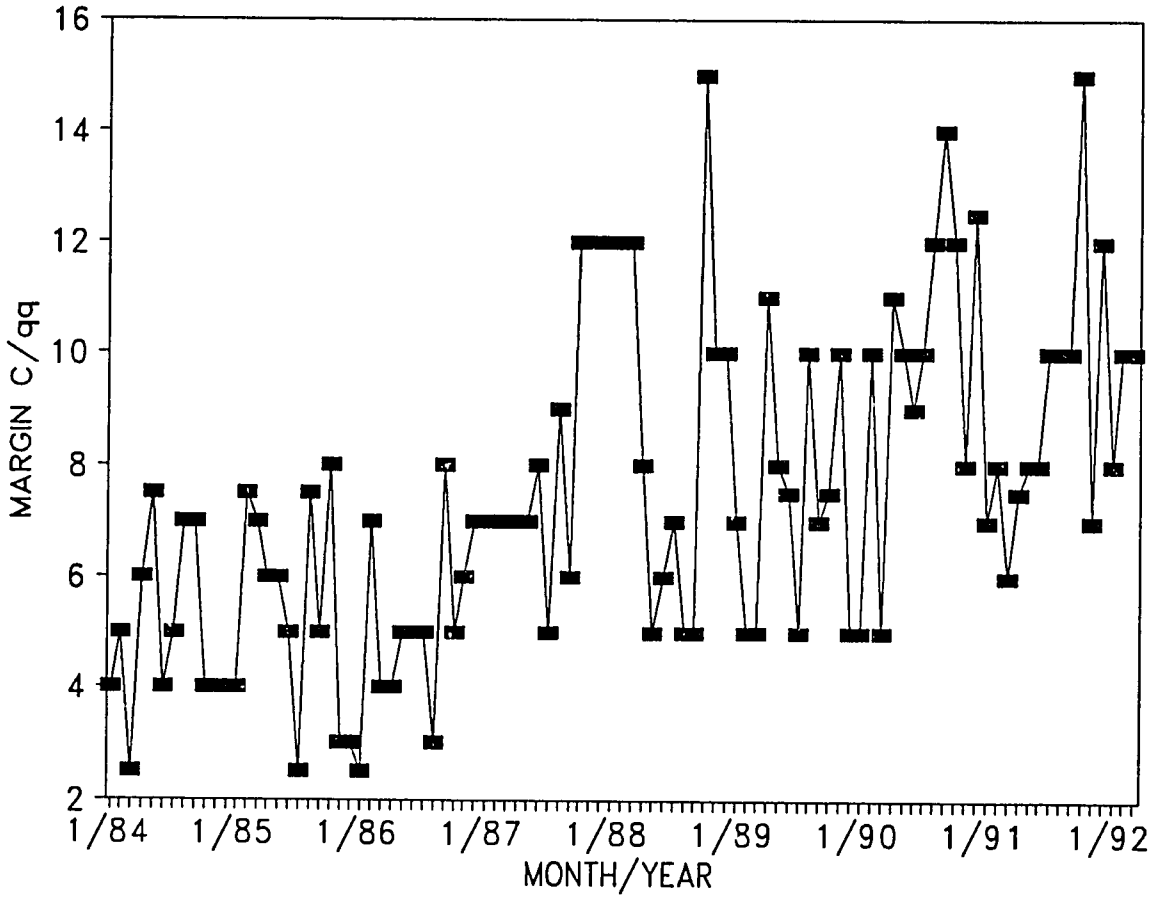


FIGURE 4.10

TRUCKER MARGIN FOR SORGHUM
IN SAN SALVADOR (1984-1992)

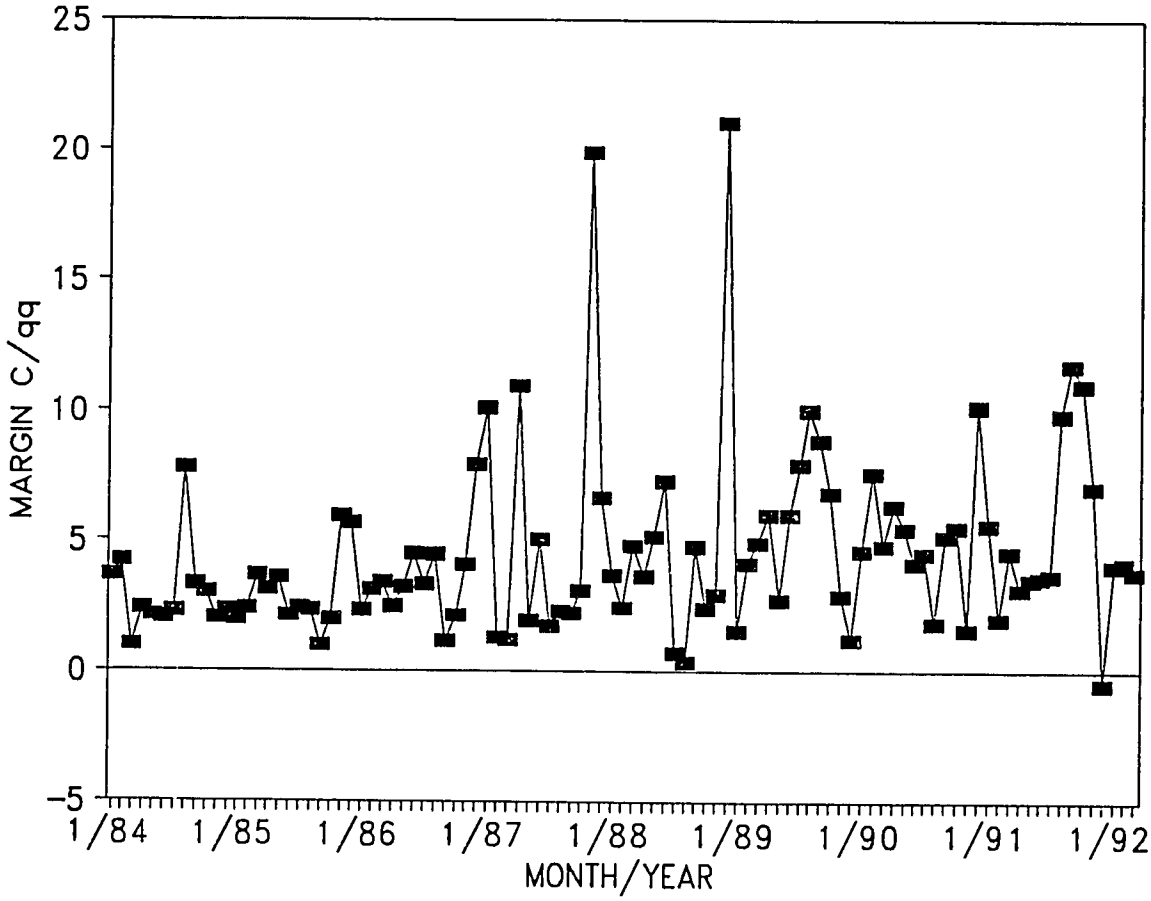


FIGURE 4-11

WHOLESALER MARGIN FOR SORGHUM
IN SAN SALVADOR (1984-1992)

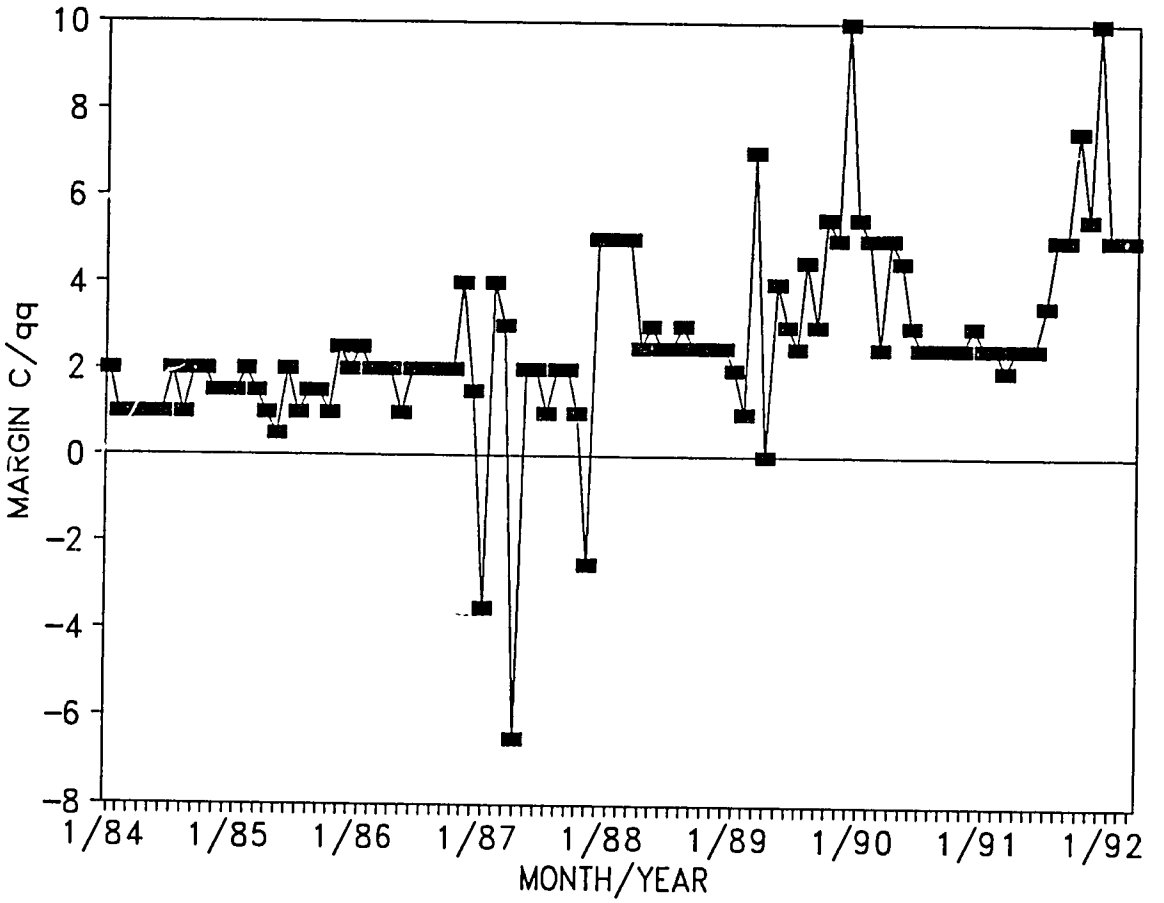


FIGURE 4-12

RETAILER MARGIN FOR SORGHUM
IN SAN SALVADOR (1984-1992)

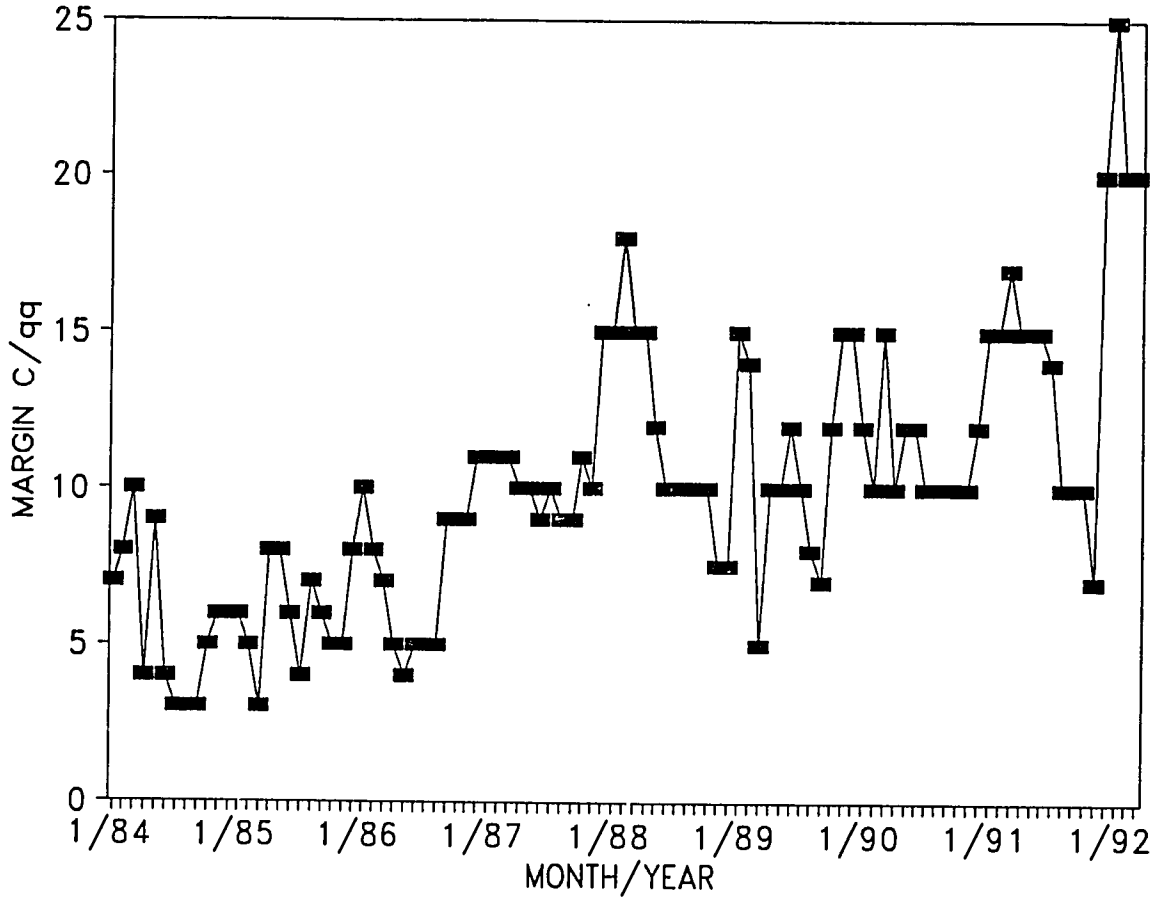


FIGURE 4-13

TRUCKER MARGIN FOR BEANS
IN SAN SALVADOR (1984-1992)

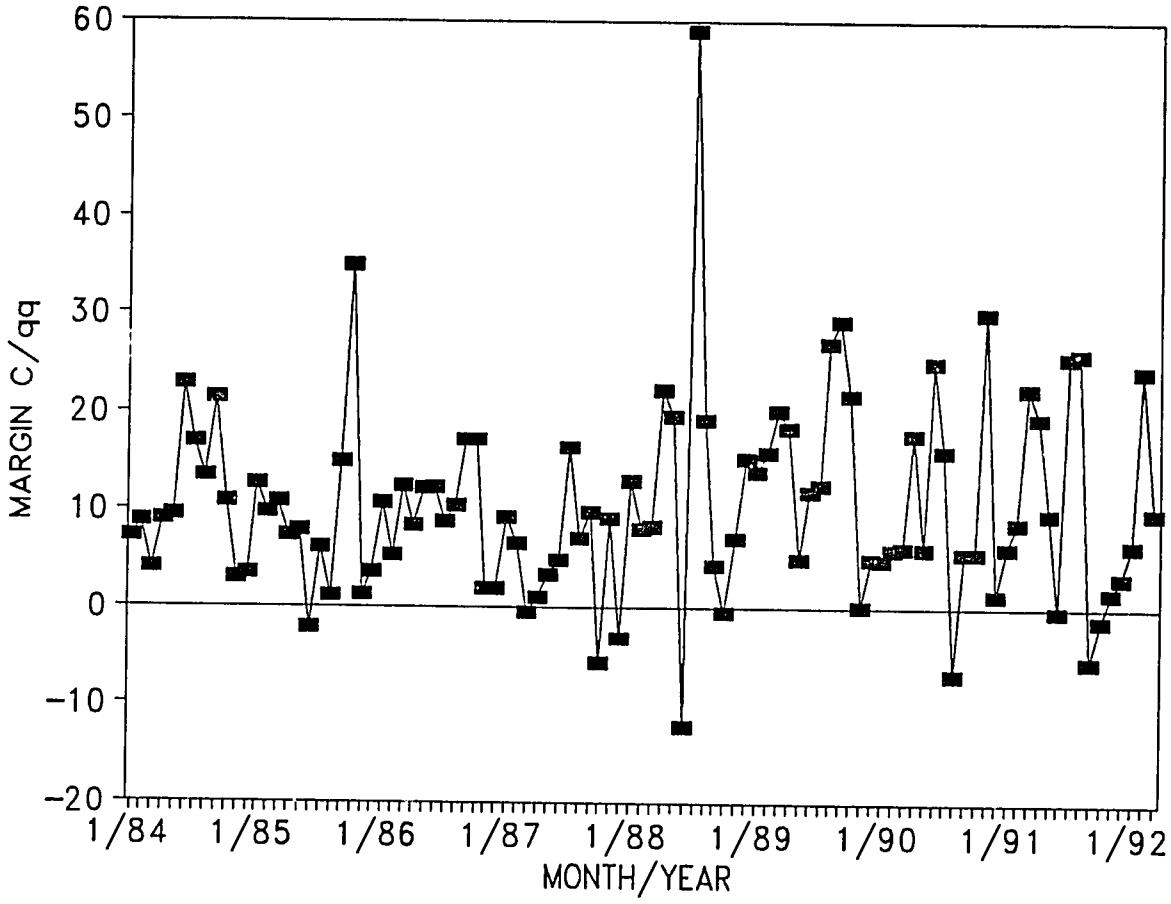


FIGURE 4-14

WHOLESALER MARGIN FOR BEANS
IN SAN SALVADOR (1984-1992)

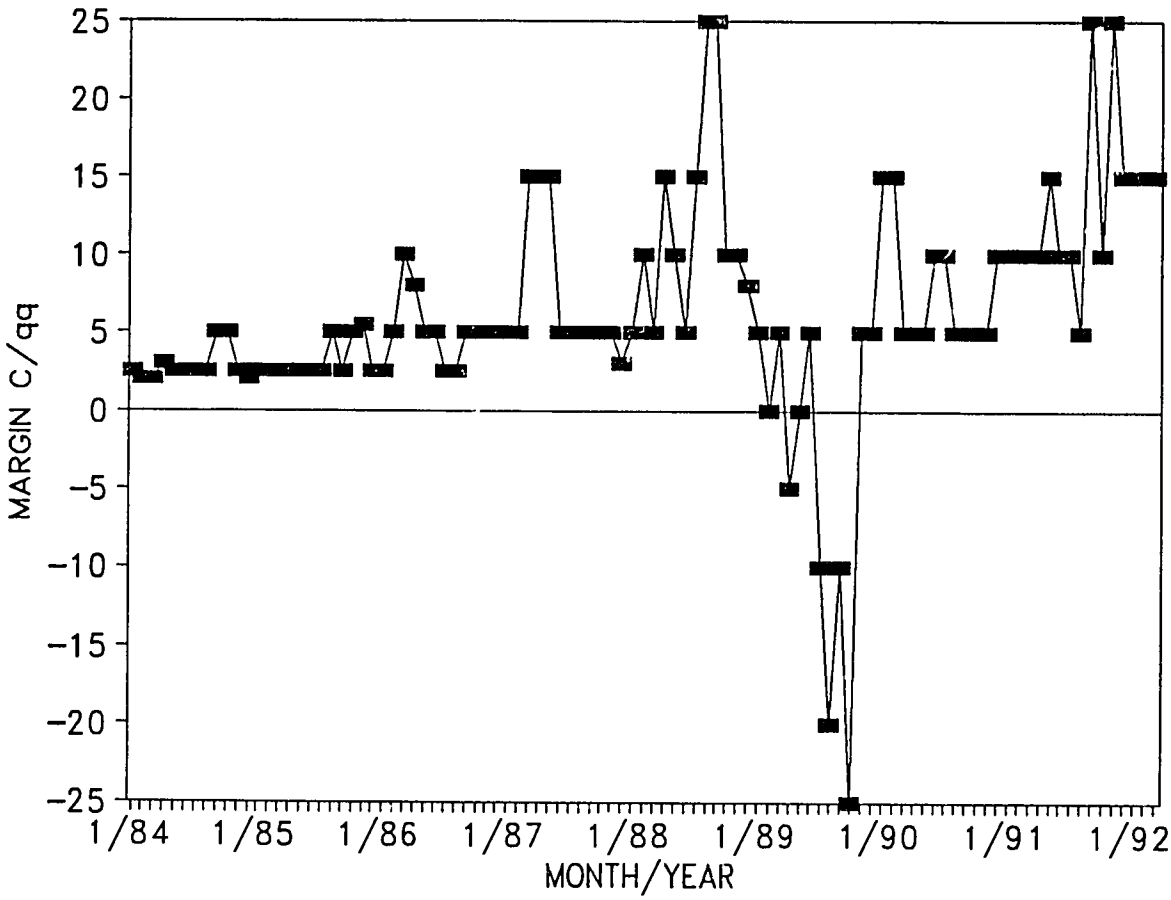


FIGURE 4-15

RETAILER MARGIN FOR BEANS
IN SAN SALVADOR (1984-1992)

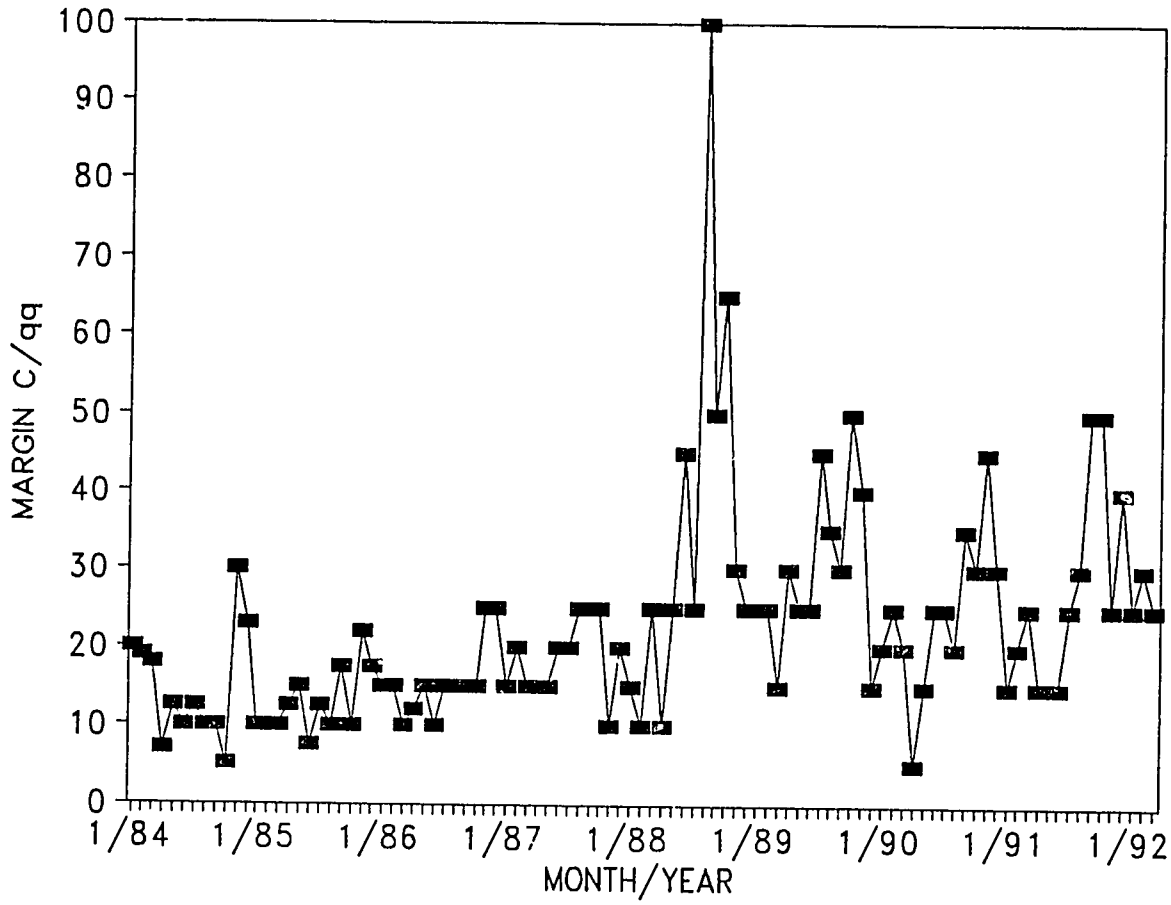


FIGURE 4-16

TRUCKER MARGIN FOR RICE
IN SAN SALVADOR (1984-1992)

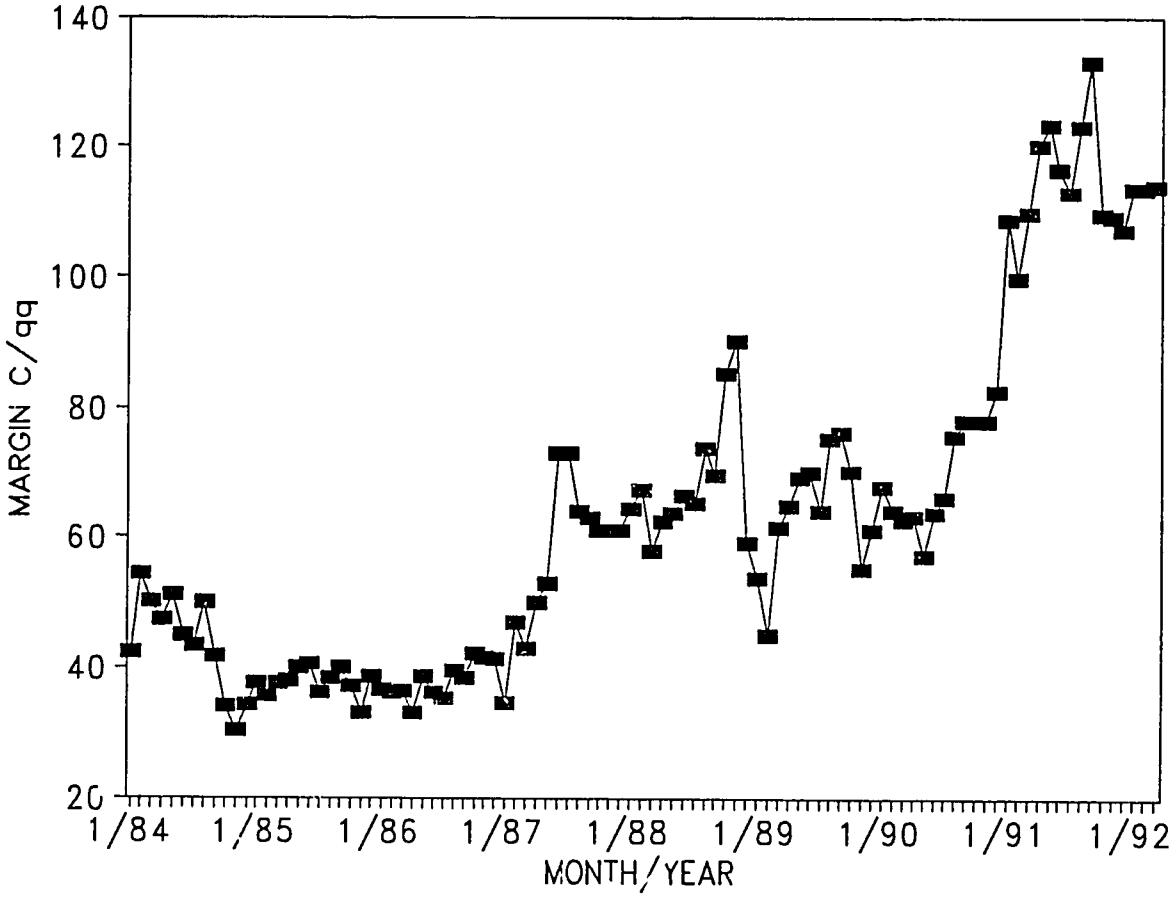


FIGURE 4-17

WHOLESALER MARGIN FOR RICE
IN SAN SALVADOR (1984-1992)

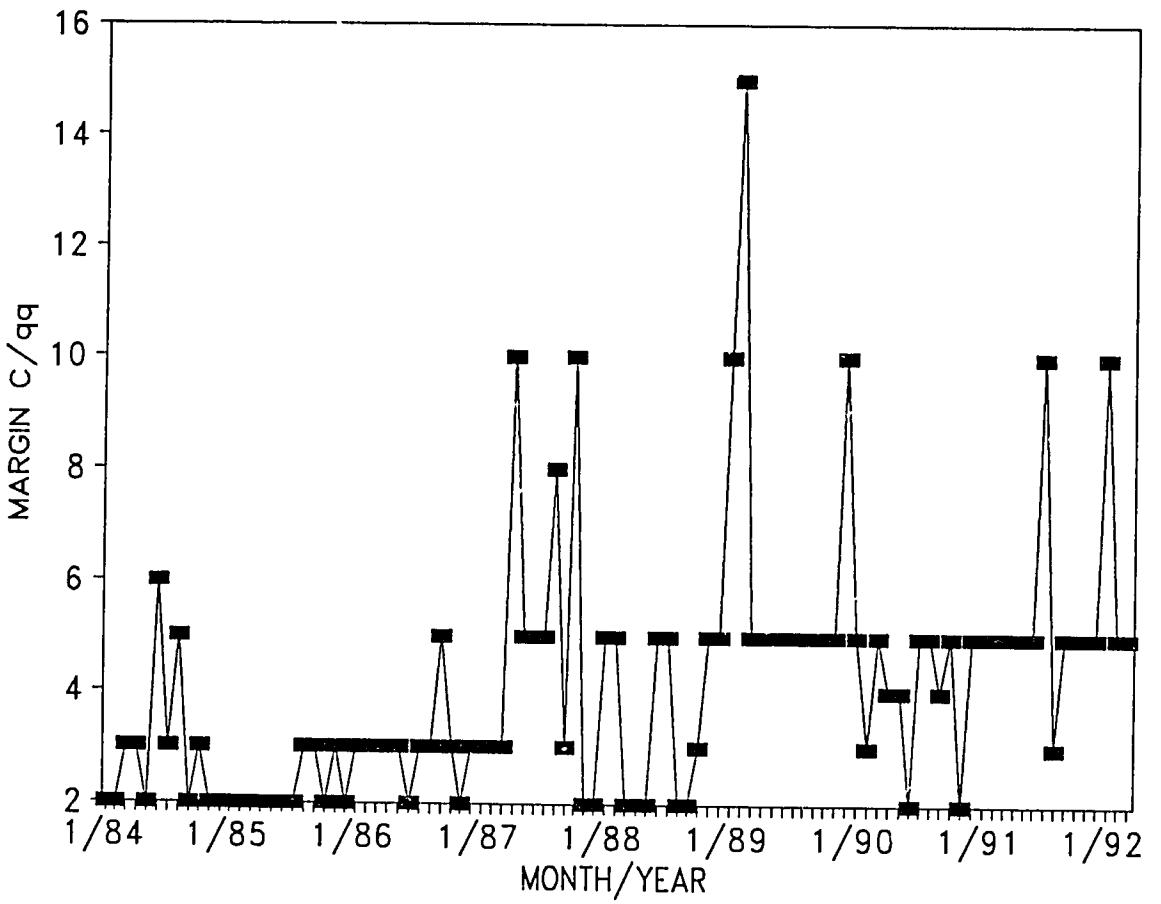


FIGURE 4-18

RETAILER MARGIN FOR RICE
IN SAN SALVADOR (1984-1992)

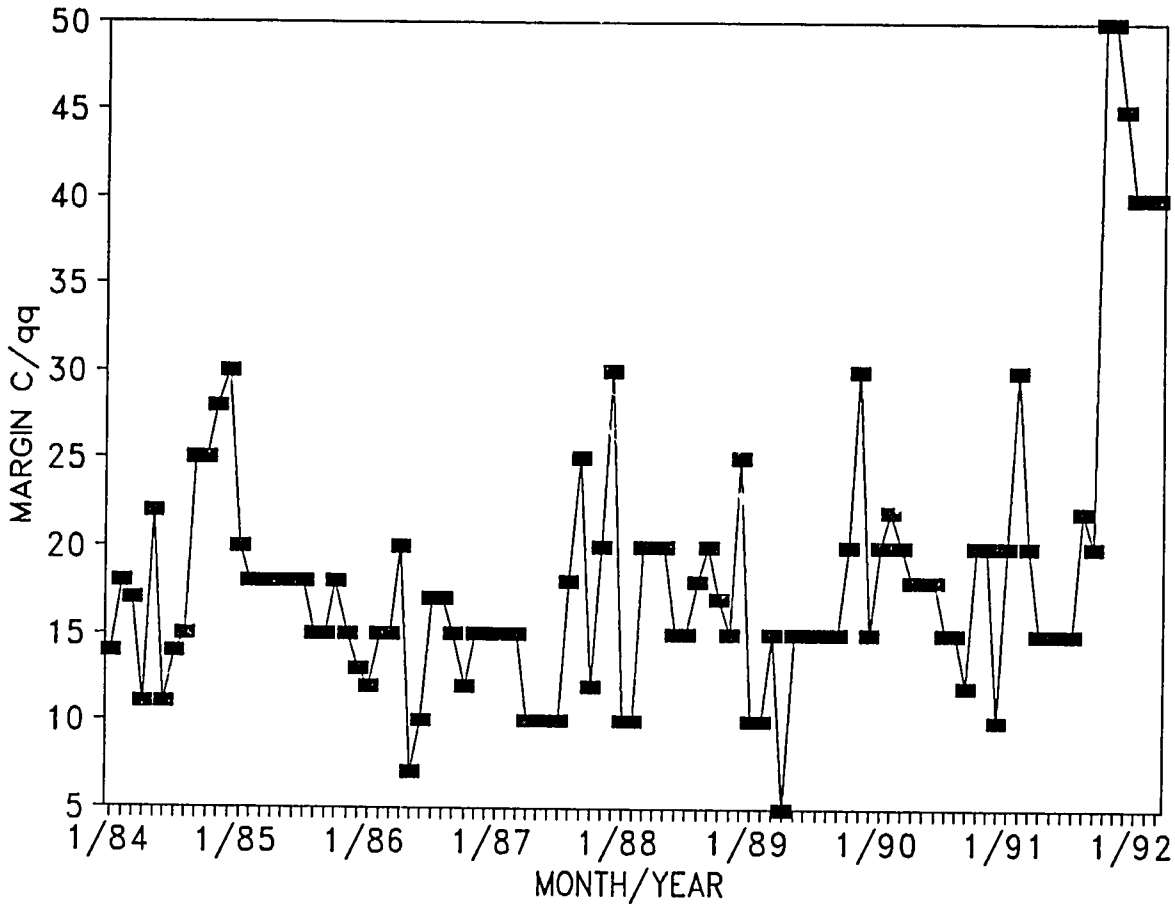


FIGURE 4-19

PRICES AND MARGINS FOR CORN
IN SAN SALVADOR (1984-1992)

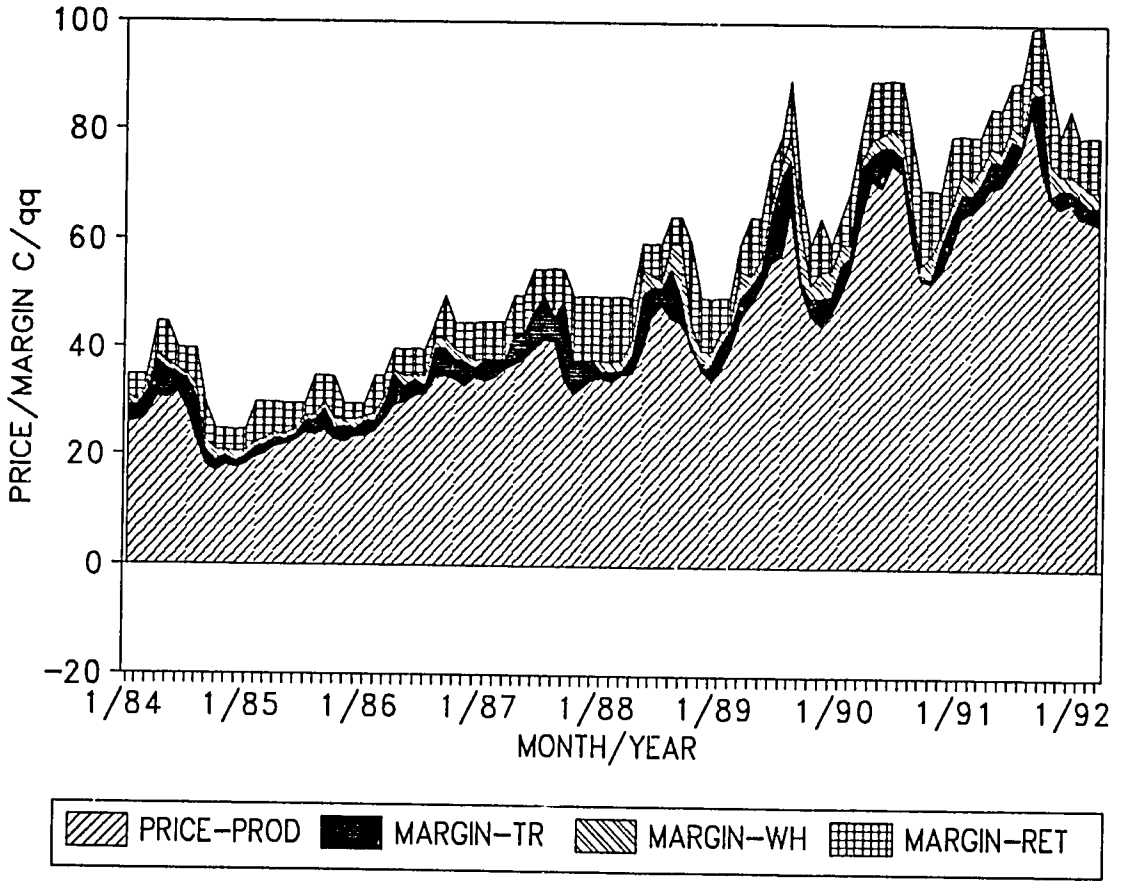


FIGURE 4-20

PRICES AND MARGINS FOR SORGHUM
IN SAN SALVADOR (1984-1992)

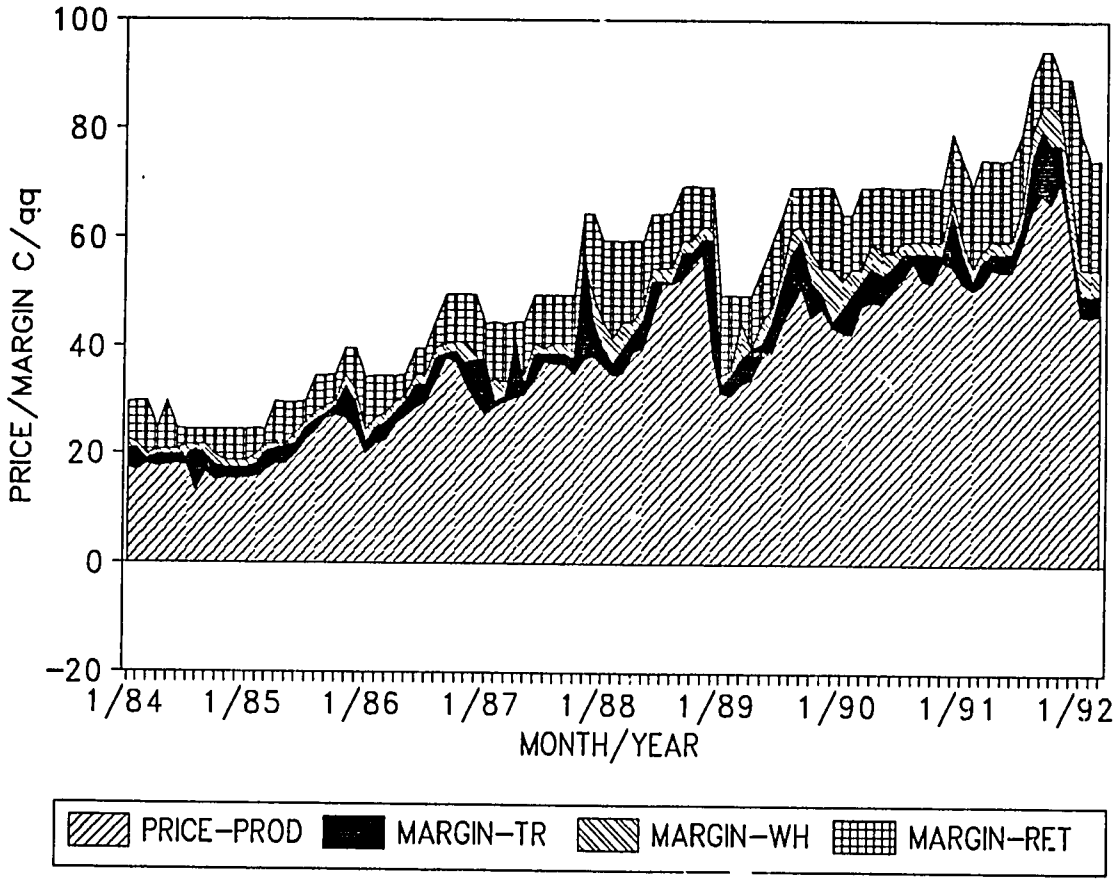


FIGURE 4-21

PRICES AND MARGINS FOR BEANS
IN SAN SALVADOR (1984-1992)

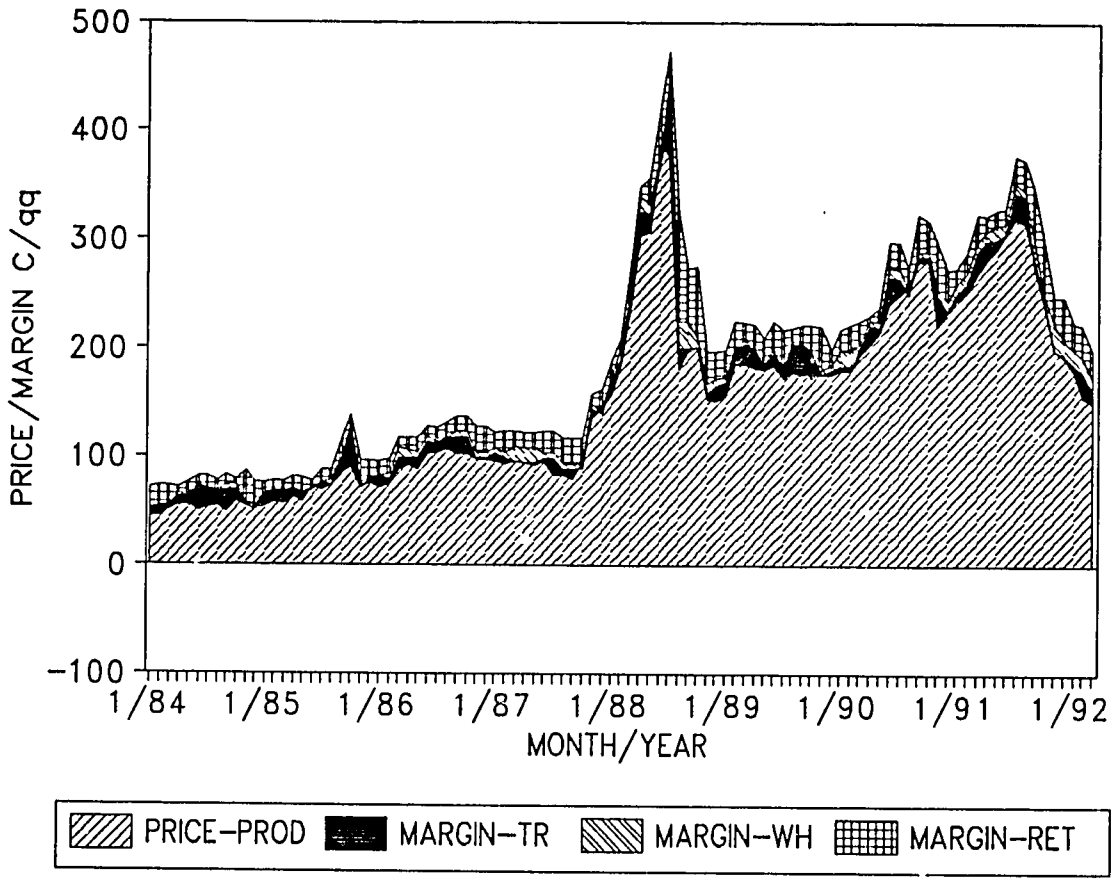


FIGURE 4-22

PRICES AND MARGINS FOR RICE
IN SAN SALVADOR (1984-1992)

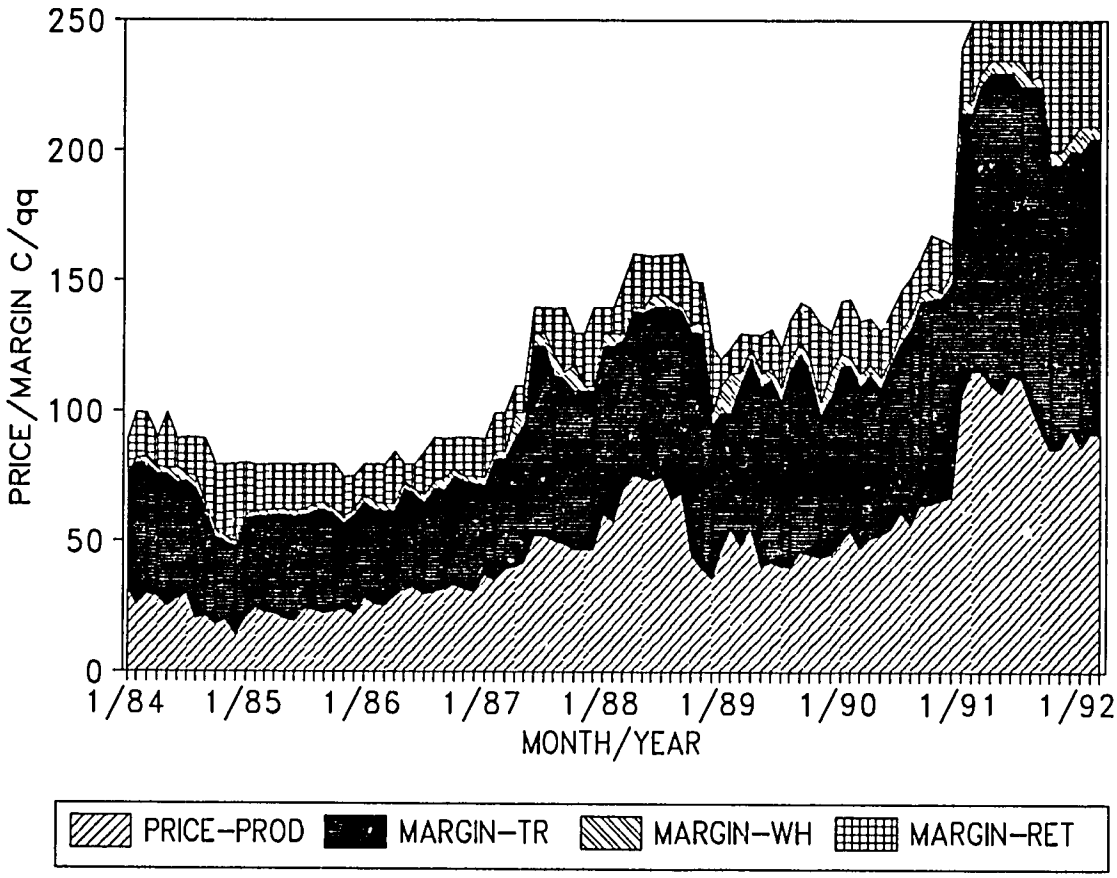


TABLE 4.4

TRUCKER/PRODUCER CORN MARGIN (C/QQ)
IN THE PLAZA OF SAN SALVADOR

	1984	1985	1986	1987	1988	1989	1990	PROM	DESV EST
JAN	3.30	1.70	3.00	4.25	1.55	4.90	5.70	3.49	1.56
FEB	3.05	2.00	2.15	3.60	2.30	4.00	2.75	2.84	0.76
MAR	4.50	1.96	3.40	2.05	1.00	4.60	9.60	3.87	2.86
APR	7.05	1.70	5.80	6.05	3.70	3.70	4.65	4.66	1.80
MAY	5.60	1.10	3.05	5.20	10.35	3.40	7.50	5.17	3.07
JUN	3.60	1.35	3.05	7.35	5.95	8.85	3.45	4.80	2.66
JUL	5.96	2.50	1.80	8.45	3.55	15.00	3.25	4.79	4.66
AUG	8.20	2.85	5.65	4.70	9.30	9.10	4.40	6.31	2.55
SEP	3.00	4.20	5.40	15.10	5.30	0.55	0.35	4.84	4.97
OCT	2.25	2.25	4.00	6.45	-1.20	3.65	1.05	2.64	2.41
NOV	1.95	3.25	4.65	5.20	1.50	5.50	5.50	3.94	1.70
DEC	1.40	1.60	2.10	3.85	3.25	3.50	6.00	3.10	1.70

SECTION V

SPATIAL MARKET ANALYSIS

What is spatial market analysis? Spatial market analysis involves techniques used to characterize the markets separated by space. Cross-sectional and time series data (data collected at one point in time across different markets) on prices in the markets are both important for characterizing the markets spatially. Since it costs to transport grain from the production point to the marketplace, market prices become the determining factor as to where the grain or edible beans are ultimately marketed. In El Salvador, there are no fixed boundaries within the country where staple commodities such as corn, beans, and rice can or cannot be marketed. In many African countries staple commodities cannot be marketed outside of the Region or Department where the commodities were produced.

5.1 Value

Accurate and precise spatial analytical results are required for policy-making or logistical planning by both public and private sectors. For example, if the Government of El Salvador was considering improving the road between, e.g., San Miguel and San Salvador, part of the decision-making approach would certainly include a quantitative study of the effects such a road would have on commerce and trade within the areas neighboring the road. It is likely, the cost of transporting commodities between the two cities would drop. A drop in the cost of transport between the two cities could, in the long run, lead to higher prices for producers.

If improvements in the road connecting San Salvador and San Miguel were made the boundary between markets is likely to change as illustrated in Figure 5.1. The boundary would be further from San Miguel and closer to San Salvador. In other words, coordination of the grain market prices in San Miguel with those prices in San Salvador would likely be stronger than before the improvements were made. Producers in Region IV, the Region containing San Miguel, would likely benefit from having better access to the San Salvador market. It may pay producers in Region IV now to store more of their grain in anticipation of higher prices available from truckers from San Salvador later in the season.

Anticipating how much agricultural producers or consumers would likely benefit from such improvements could be analyzed using weekly price data collected by Economia Agropecuaria. If the consumer price in San Miguel was considerably higher (not very coordinated) than the price in other cities where roads connecting farm to market were better, than the consumer may likely benefit the most from improved infrastructure. If production costs are lowered due to cheaper inputs (if the inputs had to be transported over the same poor roads existing between San Miguel and San Salvador) then producers would likely benefit to some degree from improved infrastructure.

Another example, if roads in a remote Department (such as Cabañas) are particularly poor during the rainy season, making some of the roads all-weather roads could greatly improve the marketing efficiency within the Department. As in the previous example, consumer prices for agricultural commodities may drop and/or producer prices may increase. Other such examples of the benefits of improving roads within and between Departments abound.

Besides the effects of improving roads throughout El Salvador on agricultural commodity producers and consumers, net benefits would accrue to the whole of society. Valuable resources, such as time and gasoline, and expenses on maintenance (due to road wear and tear) of vehicles using the road, would be saved by society. In Section 2 (Value of Information), techniques for determining the net social benefits of such improvements were discussed.

Spatial market analysis may also be important for many firms that are trying to determine the optimal place for locating processing facilities for agricultural

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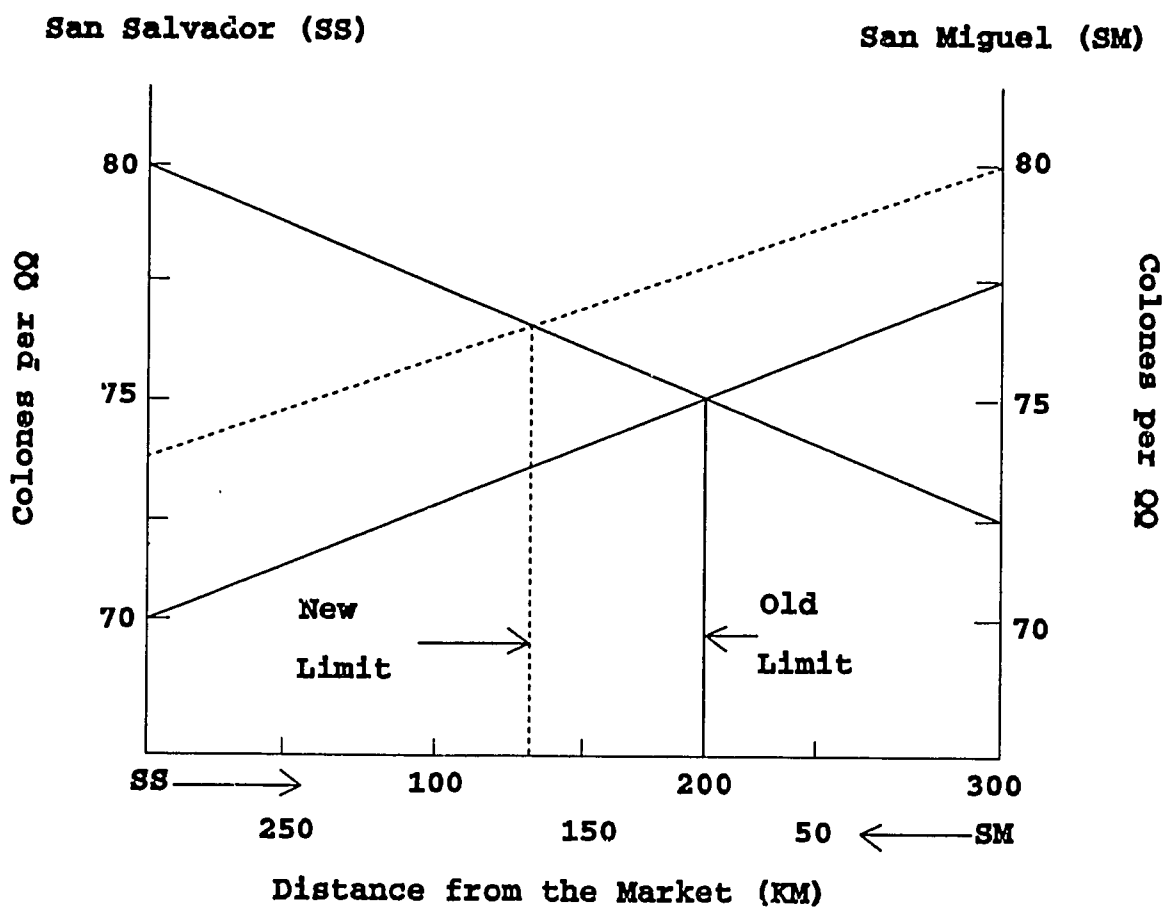
FIGURE 5.1

HYPOTHETICAL CHANGES IN THE BOUNDARIES OF MARKETS WHEN ROADS BETWEEN SAN SALVADOR AND SAN MIGUEL ARE IMPROVED



commodities. Locating such facilities (e.g., feed manufacturing mills, flour mills, rice mills, and specialty food processors) that process staple commodities requires information on the cost of assembly of the staple commodities, the cost of transport of the processed product, etc.

Also, spatial price analysis is critical for private companies that are considering vertically integrating their business. For example, if a specialty food processor is considering having their own truck fleet to transport corn from the producing areas, such a processor needs to know not only the round-trip cost of transport to get the produce to the processing plant but also the current and historical prices paid for having the produce delivered to the plant. If the processor believes that assembly costs can be saved, the processor may find it feasible to have his own trucking facilities. How will this impact the existing producer/trucker margins if food processors or even wholesalers decide to enter the trucking business? It likely will add to competition, causing margins to contract.

5.2 Collection Effort

Collecting and reporting weekly producer and trucker prices in each of the different Departments in El Salvador is imperative where accurate and precise spatial analytical results are required for policy-making or logistical planning by both public and private sectors. DGEA collects producer prices many times during the month but reports those prices only on a monthly (and countrywide basis). Such aggregation does not allow the analyst to analyze properly the dynamic price changes within the month or by Department. The argument by those in the Production Statistics Division of DGEA is that weekly data is not always collected since producers may not be selling grain some weeks. The author looked at a representative sample of their data collected on producer prices and found that out of a stretch of 24 weeks (August 1991-January 1992) prices were not collected in one week in Santa Ana (Department), one week in San Miguel (Department), and four weeks in La Paz (Table 5.1). Where missing data points are found, the DGEA must be in a position to estimate the missing data points if possible. It cannot be overemphasized, however, the need for DGEA reporters to complete all weekly surveys.

Inter- and intra-departmental transport costs need to be surveyed by the Market Statistics Division of DGEA on a regular (possibly bi-monthly or whenever changes in the transport costs are suspected) basis. Changes in such costs may be due to a change in the cost of diesel fuel, a change in the time (labor) it takes to collect produce, a change in truck insurance, etc. Truckers should be interviewed for transport costs from each of the cities where market prices are being collected. An effort should be made by DGEA to collect these transport prices within the same week in each of the cities. This way, average weekly producer and trucker prices can be compared throughout the country with these transport costs. The changes in transport costs, then, can be related with the changes in the marketing margins.

5.3 Analytical Effort

Spatial price analysis in El Salvador involves principally the producer/trucker marketing margin, that is, the cost of transport of the products from farm to market. This margin varies from Department to Department in El Salvador.

Questions that relate to the type of spatial analysis needed in El Salvador include:

Are there opportunities for arbitrage among the various Departments in the country?

TABLE 5.1

EXAMPLE OF MISSING DATA POINTS IN REPORTED WEEKLY PRODUCER PRICES IN SANTA ANA (SA), SAN MIGUEL (SM), Y SAN SALVADOR (SS)

WEEK/MONTH/YEAR	PRICE PRODUCER-SA	PRICE PRODUCER-SM	PRICE PRODUCER-SS
	----------C/QQ----------		
1 AUG 91	87.90	80.00	80.00
2 AUG 91	81.70	82.80	82.83
3 AUG 91	78.00	76.70	71.33
4 AUG 91	80.00	75.50	76.73
1 SEP 91	81.17	73.89	75.50
2 SEP 91	75.86	75.20	
3 SEP 91	85.00	76.33	78.00
4 SEP 91	75.00	74.13	71.50
1 OCT 91	65.00	73.00	71.33
2 OCT 91	66.25	73.25	72.80
3 OCT 91	66.50	70.00	
4 OCT 91	62.00	71.92	65.33
1 NOV 91	65.13	71.22	66.03
2 NOV 91	65.08	66.46	66.43
3 NOV 91	65.00	68.39	63.60
4 NOV 91	66.46	67.85	65.58
1 DEC 91	67.35	69.80	
2 DEC 91	65.50		65.00
3 DEC 91	70.00	68.50	
4 DEC 91	63.33	70.00	63.25
1 JAN 92	61.88	67.70	61.40
2 JAN 92	57.75	65.53	66.00
3 JAN 92	61.50	66.27	65.44
4 JAN 92	59.67	63.00	69.17

SOURCE: DGEA

Are such arbitrage opportunities more likely in pre-harvest months when the supply of staple grains and edible beans is less and when meeting the quantity demanded is often times an acute problem within the marketing system?

Do trucker prices in San Salvador impact trucker prices in other cities?

How do improvements in telecommunications and road infrastructure impact market efficiency, transport costs, etc?

5.3.1. Transport costs

The producer/trucker marketing margin is influenced mostly by transport costs. Transport costs vary from one production area to the next and then depending, of course, upon the destination. An example of the transport revenues and costs (in December 1992) are given as follows:

ORIGIN	ZACATECOLUCA	SONSONATE	ZACATECOLUCA	COMALAPA (NEAR INT.AIRPORT)
DISTANCE TO DESTINATION -SAN SALVADOR (KM)	65	70	65	38
PRODUCT	Corn	Corn	Corn	Corn
SOURCE OF THE GRAIN (COOPERATIVE/ NUMBER OF PRODUCERS)	2 Prod	1 Prod	Coop	Coop
NUMBER OF SACKS IN TRUCK	40	45	100	100
TRUCKER PRICE (C/SACK)	124	118	125	120
PRODUCER PRICE (C/SACK)	110	102	110	110
GROSS MARGIN (C/SACK)	14	16	15	10
(TOTAL)	560	720	1500	1000
COSTS OF TRANSPORT (TOTAL-COLONES)	330	310	678	654
-diesel	50	75	80	100
-helpers	50	30	160	100
-conductor	50	30	80	100
-sacks	6aa	7aa	16aa	16aa
-oil	9a	7b	12c	12c
-tires	4d	4d	12e	12e
-road fees	4		4	
-repairs	27f	27f	54g	54g
-amortization payment for the truck	130h	130h	260i	260i
NET BENEFIT (C/SACK)	5.75	9.11	8.22	3.46

aa Based on a cost of colones 8/sack, each sack used 50 times.

a Based on changing the oil one time per month with a cost of 200 colones per change, 21.7 trips to the market per month (260 trips/year).

b Based on changing the oil one time per month at a cost of colones 150/change.

c Based on changing the oil every other month at a cost of colones 500/change, 21.7 trips to the market per month (260 trips/year).

d Based on replacing a tire (at a cost of 500 colones/tire) once every 6 months.

e Based on replacing a tire (at a cost of 1500 colones) once every 6 months.

f Based on 5% (per annum) of the cost of a used truck (estimated at 130,000 colones).

g Based on 5% (per annum) of the cost of used truck (estimated at 260,000 colones).

h Based on a loan for 5 years at 18% interest on a truck costing 130,000 colones, using the truck approximately 25% of the time for grain transport.

i Based on a loan for 5 years at 18% interest on a truck costing 260,000 colones using the truck approximately 25% of the time for grain transport.

Much of the transport costs (including the cost of oil and the change of oil (if not specified by the truckers), the cost of tires, the cost of repairs, and the amortization costs) are uniform for each type of vehicle (in the example above, two types of vehicles with different capacities were surveyed). Those cost items that are not uniform between truckers are the items most critical to be surveyed.

Another example of the costs and the profits of transport (as collected in September 1990) for a standard cargo of white corn (denoted truck number 1 in the table below) including 100 sacks of 200 pounds each, and a mixed cargo (denoted truck number 2) consisting of 200-pound sacks of corn, beans and sorghum, are presented as follows:

	Truck Number 1	Truck Number 2		
	Corn 100 sacks	Corn 50 sacks	Beans 30 sacks	Sorghum 20 sacks
	Colons			
Gross Margin	500	250	480	160
Handling and Transport				
Sacking (0.5/sack)	50	25	15	10
Load (0.5/sack)	50	25	15	10
Transport* (3/sack)	300	150	90	60
Unloading (0.5/sack)	50	25	15	10
Total Handling & Transport	450	225	135	90
Net Benefits	50	25	345	70

* Costs of Transport:

Drive: C50 per trip
Helpers: 2 helpers x 25 colons per trip
Diesel: 4-5 km/gallon
Bribe in the weighing of the truck
General wear and tear on the truck
Payment for the parking space in the wholesale market

Since the costs of transport probably don't change significantly within the same month, the collection of the transport costs in each city could be done twice per month. The truckers interviewed must be asked the transport costs item by item.

Transport costs are typically compared in terms of cost per quintal-kilometer. Examples of transport costs from various production areas to various cities are given in Table 5.2.

Once DGEA has developed a plan for conducting surveys for determining transport costs to each of the larger cities in El Salvador, the changes in transport costs can be related to the changes in the producer/trucker margin. An example of the type of regression that could be run is given in Table 5.3. Notice how poorly transport costs (C/QQ-km) are explained by the distance from the market. The adjusted R-square (which explains how much of the variation in the dependent variable (in this case, rate of transport) is explained by the independent variable (in this case, the distance from San Salvador) is only 0.04 and the regression coefficient for the distance variable is not significant. Additional data point on transport costs would likely improve the regression results (R-square). The tremendous variability in transport costs even from the same city/Department (e.g., from Metapan or from Zacatecoluca) to San Salvador make it difficult to predict transport costs.

Transport costs from a given Department to a specific city market can be compared with the marketing margins between the producer prices from that Department and the trucker price form the city market. If information on producer prices is provided on a weekly basis, the analysis using those weekly prices can be done using the relent transport costs for the same week. Average monthly producer and trucker prices would not represent the marketing margin for that particular week when transport prices were obtained.

Because market prices can change instantaneously, it is essential that the spatial price dynamics of the various markets in the different cities in El Salvador be analyzed on a regular periodic basis.

5.3.2. Arbitrage opportunities

Looking at the spatial price differences among producer and trucker prices among Departments may provide evidence for arbitrage opportunities. Arbitrage opportunities exist in markets separated spatially and by prices that imply abnormal profits. Arbitrage opportunities continue to exist in such markets until potential profits return to a normal level. For example, during the second week in October 1991, the average producer prices for white corn in San Miguel, San Salvador, and Santa Ana were 73.25, 72.80, and 66.25 colons/quintal, respectively (Table 5.1). During the same week in October, the average trucker prices in the same three cities were 75.00, 74.00, and 75.00 colones/quintal, respectively. With these pricing conditions available, it would have been [illegible] truckers from San Miguel, San Salvador, and Santa Ana to buy corn in the Department of Santa Ana and ship the corn to any of the three markets.

It is important to note that if price data among the three cities had been compared on a monthly basis, an arbitrage opportunity such as that identified above would not have been as clearly identified.

TABLE 5.2

COST OF TRANSPORT FROM VARIOUS CITIES TO SAN SALVADOR*

To San Salvador from:	Transport rate --C/QQ--	Distance from SS --km--	C/QQ-km
Achaduro	4	145	0.028
Apastepeque	5	59	0.085
Cara Sucia	4	180	0.022
Metapán	3	108	0.028
Metapán	3.5	108	0.032
Metapán	3	108	0.028
Metapán	3	108	0.028
Sacacoya	2	35	0.057
San Miguel	3	136	0.022
Santa Ana	1	63	0.016
San Vicente	2.5	59	0.042
Suchitoto	3	108	0.028
Usulatán	3	112	0.027
Usulatán	3	112	0.027
Zacatecoluca	5	57	0.088
Zacatecoluca	3.5	57	0.083
Zacatecoluca	3.5	57	0.061

* October 30, 1990

TABLE 5.3

REGRESSION RESULTS WITH TRANSPORT RATE AS A FUNCTION OF DISTANCE

MULTIPLE LINEAR REGRESSION

Dependent Variable: Rate — 17 Valid Cases

Coeff of Determ:	0.0262732		
Adjusted R Square:	-0.0386419	Estimated Constant Term:	2.85328
Multiple Corr Coeff:	0.162090	Standard ERR of Estimate:	0.9887092

Analysis of Variance for the Regression:

Source of Variance	Degrees of Freedom	Sum of Squares	Mean of Squares	F Test	Prob
Regression	1	0.395644	0.395644	0.404732	0.5342
Residuals	15	14.6632	0.977545		
Total	16	15.0588			

Variable	Regression Coefficient	Standardized Coefficient	Standard Error	T	Prob
Dist	0.00402872	0.162090	0.00633261	0.636185	0.5342

5.3.3. Volatility of producer and trucker prices

To determine the volatility in producer prices as compared to trucker prices requires data over a long period of time (preferably at least a couple of years). It is generally considered the case in developing countries such as El Salvador that trucker prices are much less volatile than producer prices. The reason for the greater volatility in producer prices is because of the time lag in producers receiving market information. Also, volatility in trucker prices among cities in El Salvador may be explained partially by the lagged effect of prices in the market. In Table 5.1 is an example that compares the volatility of producer and trucker prices from August 1991 to January 1992. Notice that there are many missing data points making the analysis more difficult and the results less reliable.

5.3.4. Spatial coordination

Further analysis can be run on the level of spatial coordination of prices between markets. Markets that are not integrated may convey inaccurate price information that might distort producer marketing decisions and contribute to inefficient product movements. Also, some regional markets, particularly those declining in relative volume and importance, may not react efficiently to evolving information. Delivery lags between spatial markets and other obstacles to regional trade and arbitrage activities might result in the short-run persistence of deviations from the steady state equilibrium. Spatial market integration brought about by commodity arbitrage necessarily implies a unique long-run equilibrium relationship in which deviations from regional price parity are forced to zero. Coordination tests provide an especially suitable framework in which to consider long-run relationships among prices of various city markets in El Salvador. Coordination is not an absolute test but is a matter of degree (Goodwin and Schroeder, 1991).

An application of testing for spatial coordination in El Salvador could, for example, include comparing weekly trucker prices in the ten cities in which data is reported. Prices in San Salvador, having by far and away the largest grain market, are likely having some influence on prices in other, particularly nearby, cities in El Salvador. It is expected that spatial coordination is strongest for the markets which are relatively close to San Salvador. To test for spatial coordination ordinary least squares regression techniques could be applied. In Table 5.4, weekly trucker prices (from August 1991-May 1992) from San Salvador were regressed on trucker prices from Santa Ana and then regressed on trucker prices from San Miguel. The results indicated that a change in price in San Salvador has a stronger impact on the price in Santa Ana (coefficient =1.16) than it does on the price in San Miguel (coefficient=0.99). For example, if the trucker price of corn increased by 10% in San Salvador, the price for corn in Santa Ana and San Miguel would be expected to increase by 16% and 9%, respectively.

Reversing the variables, trucker prices in Santa Ana and San Miguel were regressed on the trucker prices in San Salvador (Table 5.5). The explanatory variables, trucker prices in Santa Ana and San Miguel, explained the variation (as per the R-square) in the trucker prices in San Salvador about as much as San Salvador trucker prices explained the variation in trucker prices in Santa Ana

TABLE 5.4

SPATIAL COORDINATION REGRESSION RESULTS USING TRUCKER PRICES OF CORN IN SAN SALVADOR TO EXPLAIN TRUCKER PRICES IN SANTA ANA

MULTIPLE LINEAR REGRESSION

Dependent Variable: Santa Ana Corn — 37 Valid Cases

Coeff of Determ:	0.893235		
Adjusted R Square:	0.890185	Estimated Constant Term:	-14.7019
Multiple Corr Coeff:	0.945111	Standard ERR of Estimate:	2.61229

Analysis of Variance for the Regression:

Source of Variance	Degrees of Freedom	Sum of Squares	Mean of Squares	F Test	Prob
Regression	1	1998.24	1998.24	292.823	0.0000
Residuals	35	238.842	6.82406		
Total	36	2237.08			

Variable	Regression Coefficient	Standardized Coefficient	Standard Error	T	Prob
San Salvador Corn	1.16231	0.94511	0.0679237	17.1121	0.0000

SPATIAL COORDINATION REGRESSION RESULTS USING TRUCKER PRICES OF CORN IN SAN SALVADOR TO EXPLAIN TRUCKER PRICES IN SAN MIGUEL

MULTIPLE LINEAR REGRESSION

Dependent Variable: San Miguel Corn — 37 Valid Cases

Coeff of Determ:	0.838537		
Adjusted R Square:	0.833924	Estimated Constant Term:	2.07548
Multiple Corr Coeff:	0.915717	Standard ERR of Estimate:	2.81619

Analysis of Variance for the Regression:

Source of Variance	Degrees of Freedom	Sum of Squares	Mean of Squares	F Test	Prob
Regression	1	1441.59	1441.59	181.768	0.0000
Residuals	35	277.583	7.93095		
Total	36	1719.18			

Variable	Regression Coefficient	Standardized Coefficient	Standard Error	T	Prob
San Salvador Corn	0.98724	0.91572	0.0732256	13.4821	0.0000

TABLE 5.5

SPATIAL COORDINATION REGRESSION RESULTS USING TRUCKER PRICES OF CORN IN SANTA ANA AND SAN MIGUEL TO EXPLAIN TRUCKER PRICES IN SAN SALVADOR

MULTIPLE LINEAR REGRESSION

Dependent Variable: San Salvador Corn 37 Valid Cases

Coeff of Determ:	0.905356		
Adjusted R Square:	0.899789	Estimated Constant Term:	14.5234
Multiple Corr Coeff:	0.951502	Standard ERR of Estimate:	2.02912

Analysis of Variance for the Regression:

Source of Variance	Degrees of Freedom	Sum of Squares	Mean of Squares	F Test	Prob
Regression	2	1339.12	669.560	162.621	0.0000
Residuals	34	139.989	4.11731		
Total	36	1479.11			

Variable	Regression Coefficient	Standardized Coefficient	Standard Error	T	Prob
Santa Ana Corn	0.551386	0.678105	0.112541	4.89941	0.0000
San Miguel Corn	0.267891	0.288814	0.128379	2.08673	0.0445

and San Miguel in the first regression. The number of data points in these examples should be increased in order to cover at least two or three crop years. Finally, the trucker prices in nine cities other than San Salvador were regressed on the trucker prices in San Salvador to see how well these variables explained the changes in trucker prices in San Salvador. Though the R-square may have increased when these other cities (other than Santa Ana and San Miguel) were added, the individual regression coefficients were no longer significant (Table 5.6). Furthermore, there was a statistical problem of high multicollinearity requiring some diagnostics to the problem. Handling econometric problems is not in the scope of work of the DGEA.

The Trainees at DGEA should apply similar data to other cities within El Salvador to gain an understanding of spatial coordination and how it is measured. By doing such an exercise, the Trainees will also experience the need not only for additional data but also the need for having complete data, that is, data without missing data points.

TABLE 5.6

SPATIAL COORDINATION REGRESSION RESULTS USING TRUCKER PRICES OF CORN IN NINE CITIES IN EL SALVADOR TO EXPLAIN TRUCKER PRICES IN SAN SALVADOR

MULTIPLE LINEAR REGRESSION

Dependent Variable: San Salvador Corn 13 Valid Cases

Coeff of Determ:	0.980271		
Adjusted R Square:	0.921083	Estimated Constant Term:	17.9840
Multiple Corr Coeff:	0.990086	Standard ERR of Estimate:	1.30994

Analysis of Variance for the Regression:

Source of Variance	Degrees of Freedom	Sum of Squares	Mean of Squares	F Test	Prob
Regression	9	255.775	28.4195	16.5612	0.0206
Residuals	3	5.14781	1.71594		
Total	12	260.923			

Variable	Regression Coefficient	Standardized Coefficient	Standard Error	T	Prob
AH Corn	-0.799025	-0.790975	0.286294	-2.79093	0.0684
CO Corn	-0.489272	-0.464901	0.601684	-0.813170	0.4757
SM Corn	-0.761542	-0.654571	0.947955	-0.803353	0.4805
SV Corn	-0.00557279	-0.00703400	0.474419	-0.0117466	0.9914
SA Corn	3.41345	3.31725	2.66114	1.28270	0.2897
ST Corn	0.251699	0.247716	0.924007	0.272400	0.8030
SO Corn	0.206938	0.198753	0.343412	0.602593	0.5893
US Corn	-1.42915	-1.49081	0.884490	-1.61579	0.2046
ZA Corn	0.506585	0.440265	0.490745	1.03228	0.3779

SECTION VI

TEMPORAL PRICE ANALYSIS

Temporal price analysis relates to the behavior of prices over time, including seasonal variation, year-to-year fluctuations, trends, and cycles. Prices that are normally investigated for seasonal pricing patterns are the producer and the consumer prices.

6.1. Seasonal Variation

Seasonal variation is the most common type of agricultural price behavior over time. Most agricultural products are characterized by some seasonality in production and marketing patterns. For production of grains in El Salvador, seasonality arises from climatic factors and the biological growth process of the plants. Seasonality in demand (consumption) also exists for agricultural products and is related to factors like climate and holidays (at Christmas, for example, baked goods and festive meals often times cause the demand for grain products to increase). The usual price pattern for a seasonal crop - harvested within a brief period but then sold throughout the year - is for the price to rise through the year as a function of the cost of storing the commodity. However, seasonal price patterns fluctuate each year as a result of many factors coming into play. For example, producers may not have sufficient information to avoid holding excess stocks or selling too much too soon after harvest.

In El Salvador, monthly corn producer prices exhibit strong seasonality (see Figure 6.1). Corn producer prices normally start dropping each September when the corn harvest begins and gradually increase until reaching a high point in July/August. These price changes must be sufficient to induce some to sell and others to continue holding the commodity. As illustrated in the Figure, the magnitude of seasonality in corn producer prices in El Salvador varies from year-to-year. Corn producer prices from 1984-1990 have averaged a low of about 32 (C/QQ) in January and a high of about 43 (C/QQ) in July.

6.2. Uses

The uses of monitoring staple commodity prices for seasonality is multi-fold.

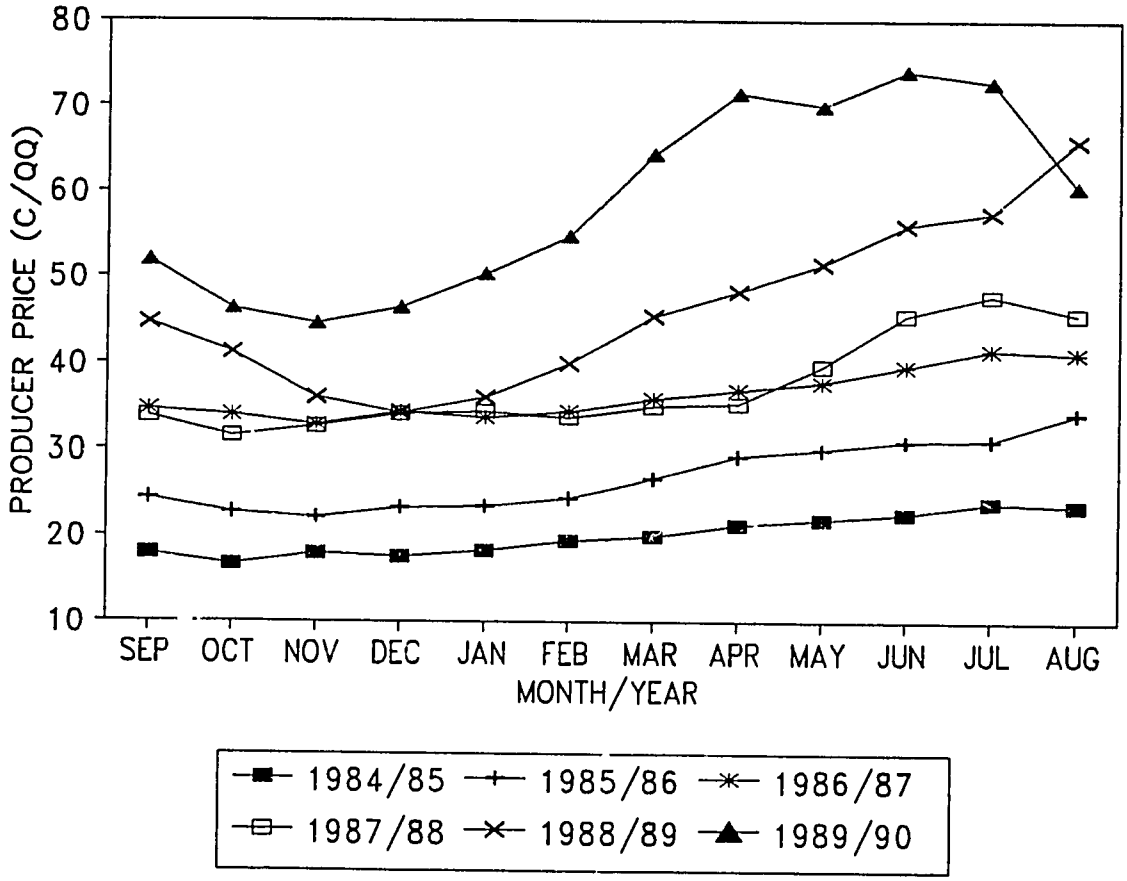
- Information on price seasonality is particularly useful to the private sector that is making storage decisions. If monthly average prices for corn remain as seasonal as in recent years in El Salvador, investing in storage facilities may become a more long-term investment. For small farmholders in El Salvador, the estimated total capacity of storage facilities (granero (granary), troja (crib), bodega (warehouse), others) has fluctuated from year-to-year (see below).

On-Farm Storage Facilities	1990 Jun/Jul	1990 Oct/Nov	1991 Jun/Jul	1991 Oct/Nov
	QQ			
Granero	4,551,719	6,029,310	3,779,629	4,227,757
Troja	349,839	972,733	481,238	397,615
Bodega	2,706,120	1,795,864	1,018,996	1,281,443
Other	1,942,228	4,008,830	2,191,409	2,214,487
TOTAL	9,549,906	12,806,737	7,471,272	8,121,302

SOURCE: DGEA

FIGURE 6.1

MONTHLY PRODUCER PRICES - CORN
1984-1990



A 36% decrease in storage capacity from Oct/Nov 1990 to Oct/Nov 1991 may be easily explained by the temporary nature of some of the storage structures and by the fluctuation of production from year-to-year (the crop was large in 1990 and much smaller in 1991) but it also may explain the apparent incentive to storage among producers. Because the production of corn was very high in 1990 producer prices for corn remained flat from Oct/Nov 1990 until Jun/Jul 1991. Returns to storage during that time were poor and prices did not exhibit the average seasonality pattern of earlier years.

If, however, permanent storage facilities for non-perishable commodities are being considered by private sector, the average monthly price seasonality from post-harvest to pre-harvest and the volatility of the seasonal factor may provide the most meaningful basis for determining the financial feasibility of such facilities.

If one subtracts the average seasonal pattern from the product price one can measure various other factors which impact prices. Major factors that may be built into the price of a given commodity are the price expectations for the commodity for the next crop year, the international or least regional intraseasonal supply/demand conditions for that commodity, and the storeability of the commodity. If a poor crop (due to no rainfall) is forecasted in the subsequent year, price expectations for that commodity may be high, boosting prices beyond the normal seasonal price pattern.

In addition, if regional supplies of the same commodity are impacted adversely by the low rainfall, price expectations may be driven even higher.

Finally, storeability of the crop may in some years be less than adequate if the crop had to be harvested when it was still high in moisture and drying conditions were poor. Also, when a crop is damaged by insects its storeability is lessened.

- Information on seasonality in commodity prices and the dynamics that accompanies the seasonal pricing patterns provides subject matter for further market research efforts in El Salvador.

6.3 Collection Efforts

The DGEA collects both producer and consumer prices on a weekly basis in ten different Departments in El Salvador.

- Producer prices and volumes of sales - the DGEA should continue to collect volumes of sales along with prices. The number interviewed, selection process of those interviewed, and the reliability of the prices and volumes reported needs to be substantiated by the reporters.

- Consumer prices and volume of sales - since consumer prices tend to be competitive in all cities surveyed and tend not to change during the week, the reporters from the Marketing Statistics Division should continue to spend at least one day a week in each city collecting consumer prices and possibly seasonality in prices, collecting volume of sales of the given commodity in each of the cities is important.

- Volume of sales to consumers have not been collected regularly by the Market Statistics Division. A proxy for collecting the consumer's volume of sales is the collection of volume of sales of the truckers and wholesalers in the city markets. The volume of the given commodity sold from trucks (large and small) could be counted on a three day per week basis in each of the cities surveyed. Extensive monthly surveys of wholesaler volumes of sales within each of the cities could be done in order to compare with the quantities being sold by the truckers.

6.4 Analysis

It is typical for monthly seasonality in prices be calculated for agricultural crops that are non-perishable (such as corn and rice). Quarterly seasonality would be using data that is too aggregated to reveal the price dynamics within the grain market (see Figure 6.2). On the other hand, weekly seasonality is too disaggregated and unlikely to reveal significant seasonality. Seasonality can be analyzed using various techniques.

6.4.1. Graphing

One means for detecting seasonality in producer prices of corn in El Salvador is to graph the monthly price movements over many crop years (Figure 6.3). When comparing one crop year to the next one may be able to identify systematic changes in the price seasonality. For example, if short season hybrids are being used more extensively each year or more crops are being irrigated stretching out the production season, the pattern of price seasonality may change.

6.4.2. Seasonal price index

A more quantitative method for determining the normal seasonal pattern to commodity prices is by developing an average seasonal price index. Such an index can be calculated using the MicroX11 software package, the X-11 procedure in PC-SAS, or by using regression (using a software package like ABSTAT).

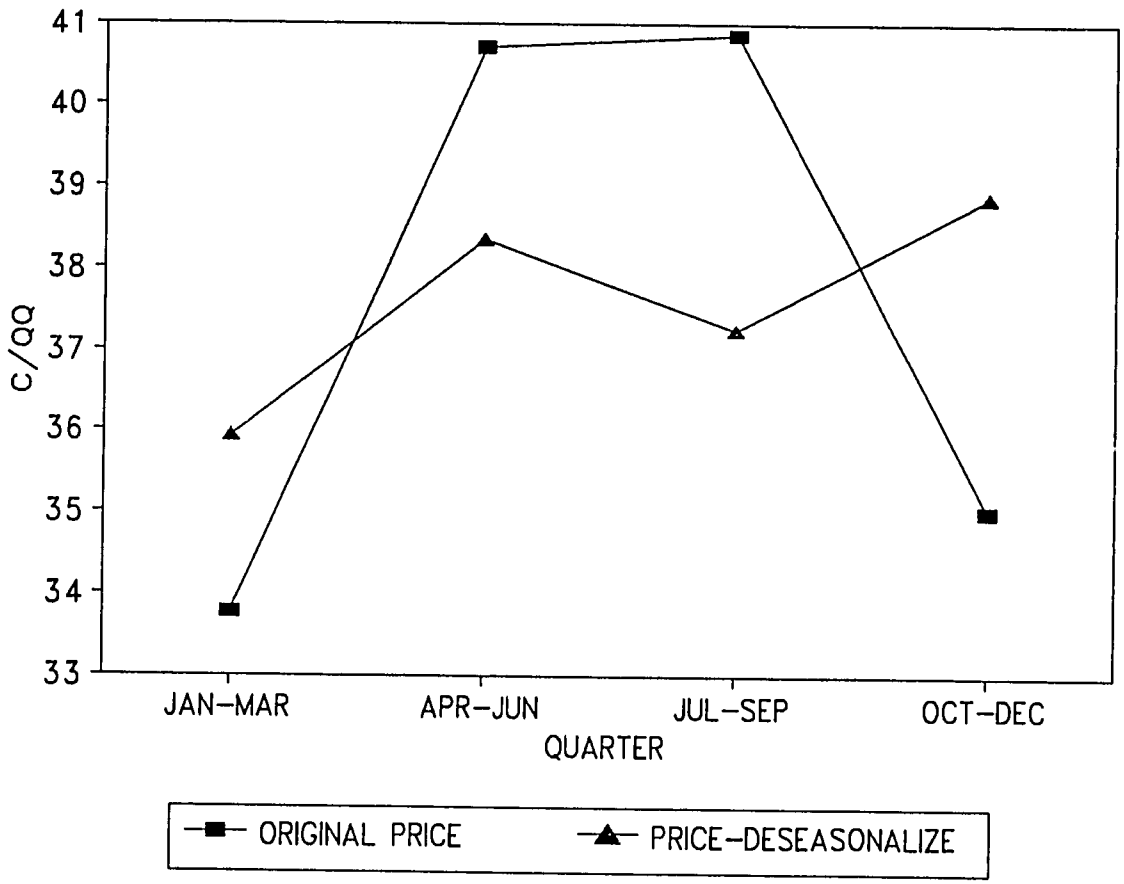
<u>X-11 Procedure</u>

The X-11 procedure was originally developed by the U.S. Bureau of the Census, and has been adapted for use to seasonally adjust monthly or quarterly time series data (with a minimum of three years of data). This procedure separates the seasonal fluctuations in prices from the trend, cyclical, or irregular fluctuations. An outline of the X-11 procedure is given in Annex 3.

The seasonality index expresses each monthly price as a percentage of a twelve-month average. The index for the base period (the 12-month average) for each year is 100 (note in Table 6.1). In the Table, the monthly seasonality producer price index for corn of 93.709 in January 1984 indicates that January prices for 1984 were about 6.3% below the 12-month average. In July 1990, the index number of 118.767 indicates that July prices were 18.8% higher than the 12-month average. The index numbers for the years 1984-1990 indicate progressively greater seasonality to the prices. Notice how the index has dropped from 1984-1990 in the months (Nov-Feb) immediately following harvest and has increased in the months (particularly June-August) before the harvest. Part of the reason for

FIGURE 6.2

PRODUCER PRICE SEASONALITY USING CORN
QUARTERLY AVERAGE PRICES (1984-1990)



PRODUCER PRICE SEASONALITY USING CORN
QUARTERLY AVERAGE PRICES (1984-1990)

QUARTER	ACTUAL PRICE	DESEASONALIZED PRICE
	----------C/QQ----------	
JAN-MAR	33.77	35.93
APR-JUN	40.70	38.34
JUL-SEP	40.85	37.24
OCT-DEC	35.01	38.86

FIGURE 6.3

MONTHLY PRODUCER PRICES FOR CORN
1984-1992

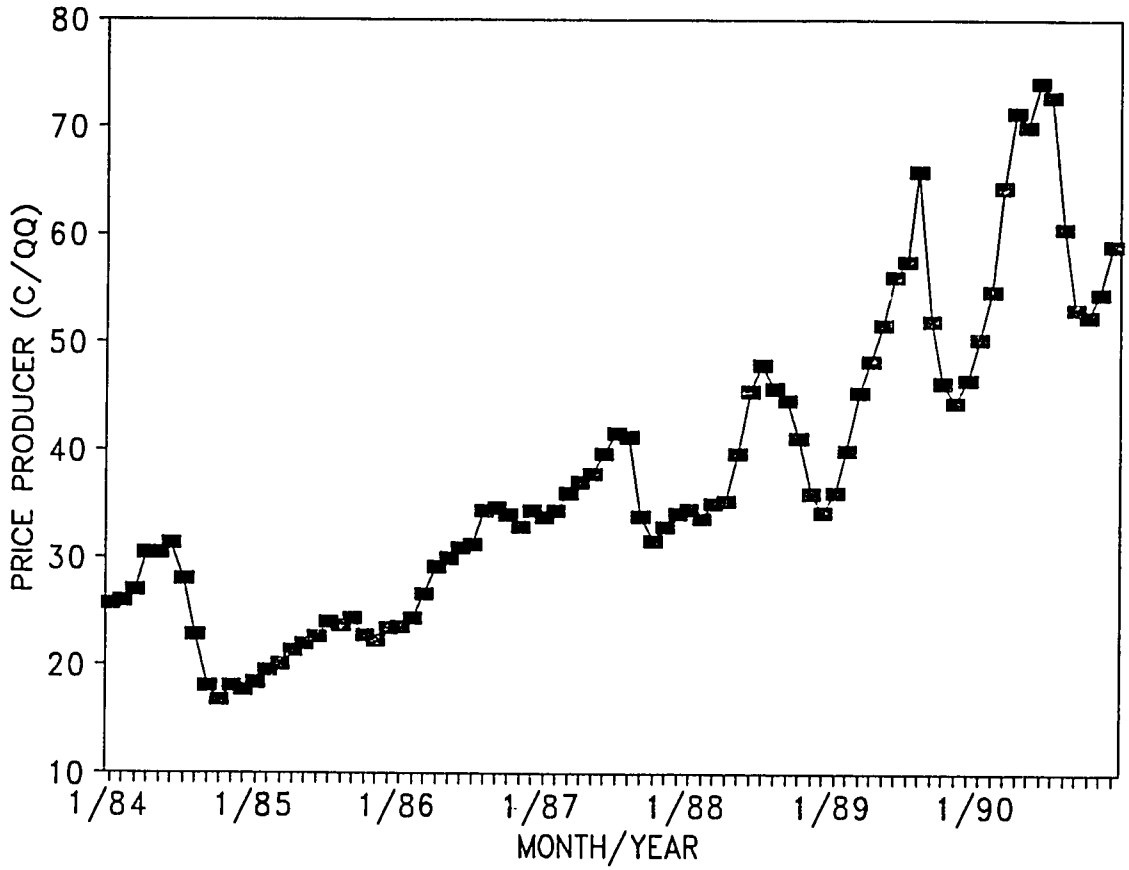


TABLE 6.1

MONTHLY PRODUCER PRICE SEASONALITY

x 11

x-11 Seasonal Adjustment Program
U.S. Bureau of the Census
Economic Research and Analysis Division
November 1, 1968

B1 Original Series

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1984	25.700	25.950	27.000	30.450	30.400	31.400	28.050	22.800	18.000	16.750	18.050	17.000	291.550
1985	18.300	19.500	20.050	21.300	21.900	22.650	24.000	23.650	24.300	22.750	22.250	23.000	263.650
1986	23.500	24.350	26.600	29.200	29.950	30.950	31.200	34.350	34.600	34.000	32.850	34.000	365.550
1987	33.750	34.400	35.950	36.950	37.800	39.650	41.550	41.300	33.900	31.550	32.800	34.000	433.600
1988	34.450	33.700	35.000	35.300	39.650	45.550	47.950	45.700	44.700	41.200	36.000	34.000	473.200
1989	36.100	40.000	45.400	48.300	51.600	56.150	57.500	65.900	51.950	46.350	44.500	46.000	589.750
1990	50.300	54.750	64.400	71.350	70.000	74.050	72.750	60.600	53.150	52.450	54.500	59.000	737.300
Avg	31.729	33.236	36.343	38.979	40.185	42.914	43.286	42.043	37.229	35.007	34.421	35.286	

Total: 31.729 Mean: 37.555 Standard Deviation: 14.1

D10 Final Seasonal Factors

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1984	93.709	94.979	97.881	104.381	105.363	107.037	113.192	105.790	101.929	92.606	91.750	91.647	100.022
1985	93.559	94.637	97.696	103.887	105.198	107.754	113.719	106.340	102.052	92.854	91.363	91.561	100.052
1986	92.640	94.032	97.700	103.124	105.087	109.050	114.488	107.504	102.343	93.293	90.346	91.232	100.070
1987	91.168	92.829	97.823	102.739	105.284	110.928	115.785	108.350	102.495	93.259	88.876	90.342	99.990
1988	89.684	91.907	98.264	102.621	105.749	112.942	117.159	109.227	102.506	92.733	87.685	89.452	99.994
1989	88.552	90.984	98.520	102.845	106.299	114.720	118.372	109.334	102.473	91.965	96.738	88.546	99.946
1990	88.105	90.795	98.726	102.953	106.682	115.787	118.767	109.315	102.547	91.533	86.016	87.959	99.932
Avg	91.060	90.795	98.087	103.221	105.666	111.174	115.926	107.980	102.335	92.606	88.968	90.105	

Total: 8400.1

TABLE 6.1 (continued)

MONTHLY PRODUCER PRICE SEASONALITY

x 11

x-11 Seasonal Adjustment Program
U.S. Bureau of the Census
Economic Research and Analysis Division
November 1, 1968

D11 Final Seasonally Adjusted Prices

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1984	27.425	27.322	27.584	29.172	20.853	29.336	24.781	21.552	17.659	18.087	19.673	18.550	289.994
1985	19.560	20.605	20.523	20.503	20.818	21.020	21.105	22.240	23.811	24.501	24.353	25.120	264.159
1986	25.367	25.895	27.226	28.316	28.500	28.381	27.252	31.952	33.808	36.444	36.360	37.268	366.770
1987	37.020	37.058	36.750	35.965	35.903	35.744	35.885	38.117	33.075	33.830	36.905	37.635	433.887
1988	38.413	36.667	35.618	34.398	37.494	40.331	40.927	41.839	43.607	44.428	41.056	38.009	472.789
1989	40.767	43.964	46.082	46.964	48.542	48.945	48.576	60.274	50.696	50.399	51.304	51.951	588.464
1990	57.091	60.301	65.231	69.303	65.615	63.953	61.254	55.436	51.830	57.302	63.360	67.077	737.754
Avg	35.092	35.973	37.002	37.803	37.961	38.244	37.111	38.773	36.355	37.856	39.002	39.373	

Total: 3153.8 Mean: 37.545 Standard Deviation: 13.51

D12 Final Trend Cycle - Henderson Curve
9 - term Moving Average Applied I/C Ratio is 0.905

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1984	27.129	27.653	28.132	28.552	28.344	26.964	24.607	22.050	20.036	18.868	18.588	18.960	289.884
1985	19.575	20.142	20.504	20.678	20.704	20.924	21.536	22.427	23.392	24.193	24.675	24.979	263.728
1986	25.45[illegible]	26.250	27.093	27.785	28.384	29.072	30.269	32.038	34.008	35.642	36.669	37.147	369.816
1987	37.1[illegible]9	36.958	36.610	36.218	36.038	35.863	35.356	34.662	34.308	34.840	36.114	37.299	431.445
1988	37.553	36.848	36.227	36.523	37.723	39.397	41.148	42.472	43.146	42.990	42.285	41.743	478.057
1989	42.128	43.579	45.526	47.115	48.193	48.877	49.499	49.972	50.276	50.723	51.684	53.740	581.312
1990	57.114	61.013	64.303	66.156	65.834	63.499	60.093	57.346	57.034	58.997	62.069	65.873	739.331
Avg	35.162	36.063	36.914	37.575	37.889	37.799	37.501	37.281	37.457	38.036	38.869	39.963	

Total: 3153.6 Mean: 37.543 Standard Deviation: 13.294

the scronger seasonality pattern in corn prices in recent years is the more liberalized corn market policies instituted by the Government of El Salvador. In analyzing prices for seasonality, the analyst must be cautious about any systematic changes and/or irregularities in a particular crop year that might make the use of historical seasonal price patterns for forecasting the future a less reliable technique.

In some cases, prices may first be deflated to remove the inflationary trend within the data f-before calculating the seasonality index. In Table 6.2 and Figure 6.4, the seasonal price indices for rice, beans, corn, an sorghum are given using deflated prices. Notice in the Tables the standard errors for each month.

The standard error or standard deviation is the average variability of all values from the mean. For example, given the following data set of corn producer prices from the La Paz Department in the first week of October what is the mean and the standard error for this data set? (See Section 4 for the calculation of the variance and the standard deviation (error)).

77,78,70,69,72,65,63,70,78,73

Mean 71.5

In this case,

variance = (51,365 - (511,225/10))/(10-1) = 26.94
standard deviation = 5.19

The average variability from the mean is 5.19 C/QQ. This says that if 100 additional corn producer prices had been collected during that same time period in the same Department, 68% of the prices would fall between 66.31 (71.5 - 5.19) and 76.69 (71.5 + 5.19). If one wanted to know within what range 95% of the prices collected would fall within, two standard deviations would be added and subtracted from the mean. That is, the range would be from 61.12 (71.5 - (5.19 x 2)0 to 81.88 (71.5 + (5.19 x 2)). In graphical terms, the range about the mean can be illustrated as in Figure 6.5.

Besides the seasonal price index, the X-11 procedure gives the final seasonally adjusted price series. In Figure 6.6, the deseasonalized corn monthly average producer prices are as expected much flatter but still include some irregularities explained by other factors. As observed in the Figure, however, seasonality provides the primary basis for determining potential returns to storage.

Regression

Another quantitative method for determining the normal seasonal pattern to commodity prices is by means of ordinary least squares regression. The mechanics in using the regression techniques are explained in Annex 1. The software package that can be installed on your computer and used for running these regression is called ABSTAT. The mechanics in using ABSTAT are given in Annex 1. In the example in Table 6.3, the regression was set up like this:

FIGURE 6.4

SEASONAL PRICE INDEX - CORN

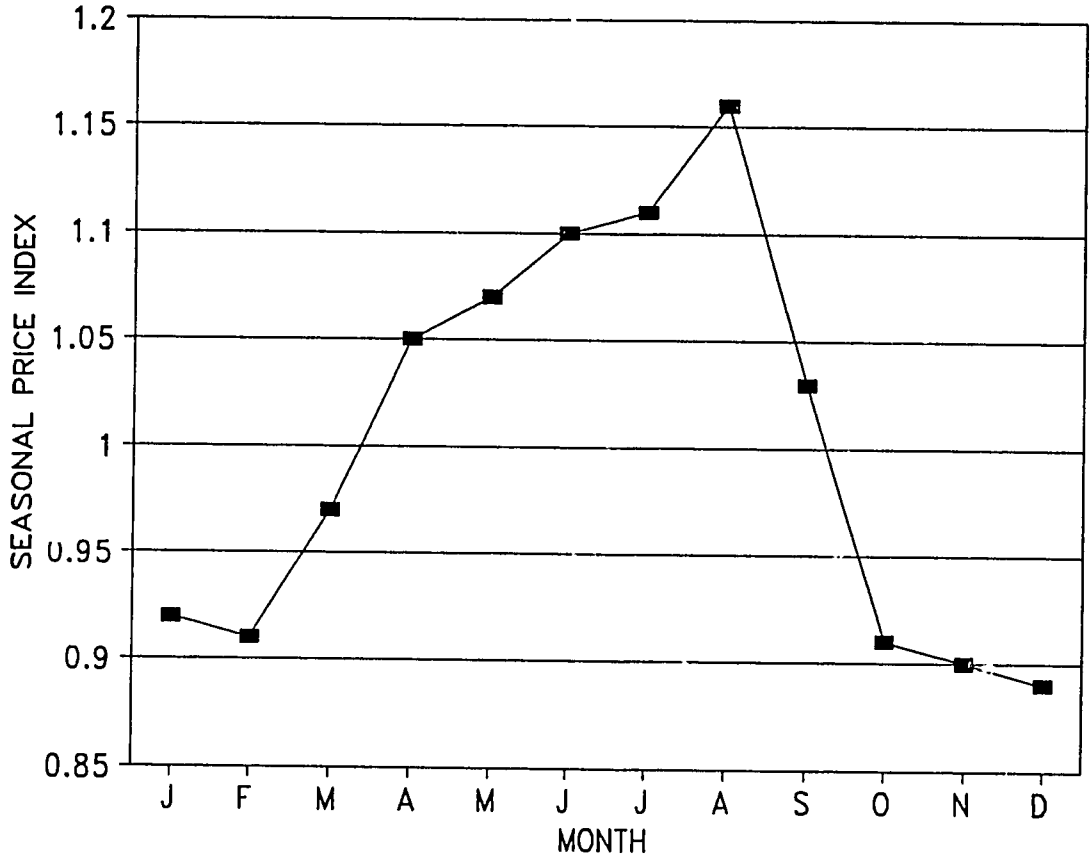


FIGURE 6.4 (continued)

SEASONAL PRICE INDEX - BEANS

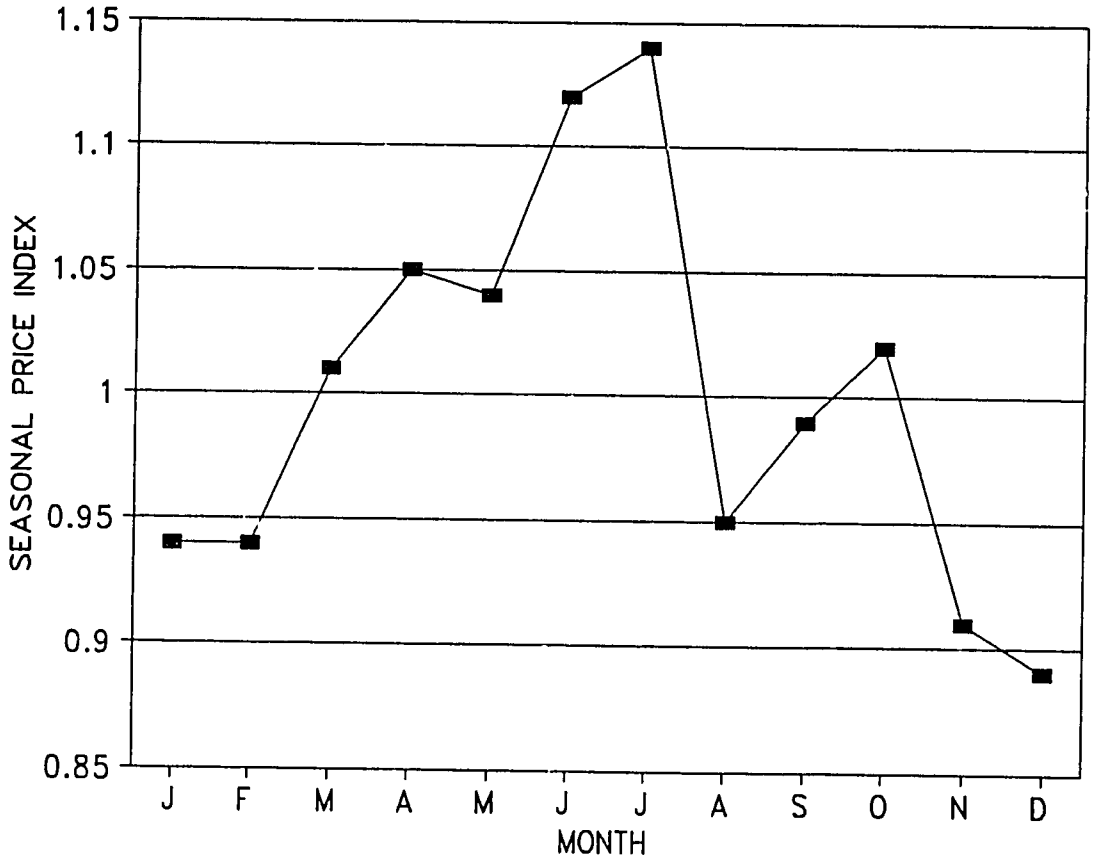


FIGURE 6.4 (continued)

SEASONAL PRICE INDEX - RICE

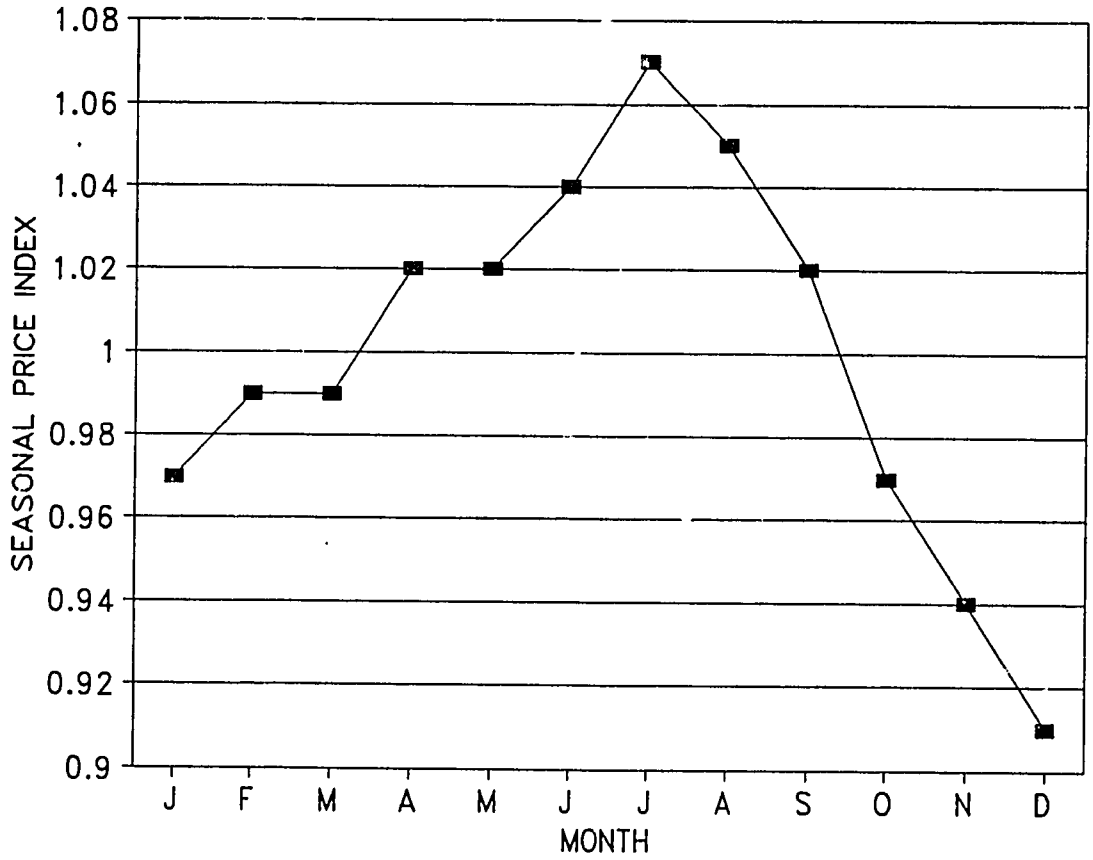


FIGURE 6.4 (continued)

SEASONAL PRICE INDEX - SORGHUM

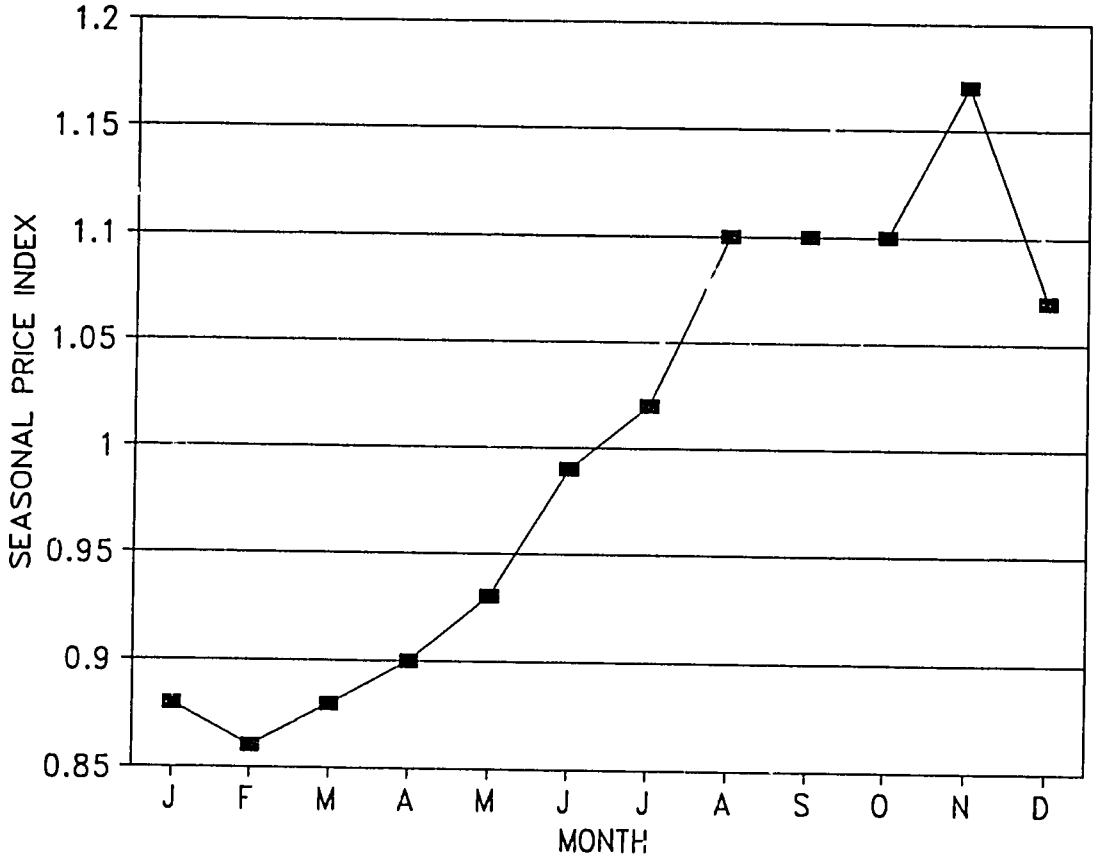


TABLE 6.2

SEASONALITY INDICES

SEASONALITY INDICES - RICE

MONTHS	SEASONAL INDEX	STANDARD ERROR	At 68%	At 95%
JAN	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
APR	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
AUG	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
DEC	0.91	0.0765	0.99	1.07

SEASONALITY INDICES - BEANS

MONTHS	SEASONAL INDEX	STANDARD ERROR	At 68%	At 95%
JAN	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
APR	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
AUG	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
DEC	0.89	0.0735	0.96	1.04

TABLE 6.2 (continued)

SEASONALITY INDICES

SEASONALITY INDICES - CORN

MONTHS	SEASONAL INDEX	STANDARD ERROR	At 68%	At 95%
JAN	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
APR	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
AUG	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
DEC	0.89	0.0572	0.95	1.00

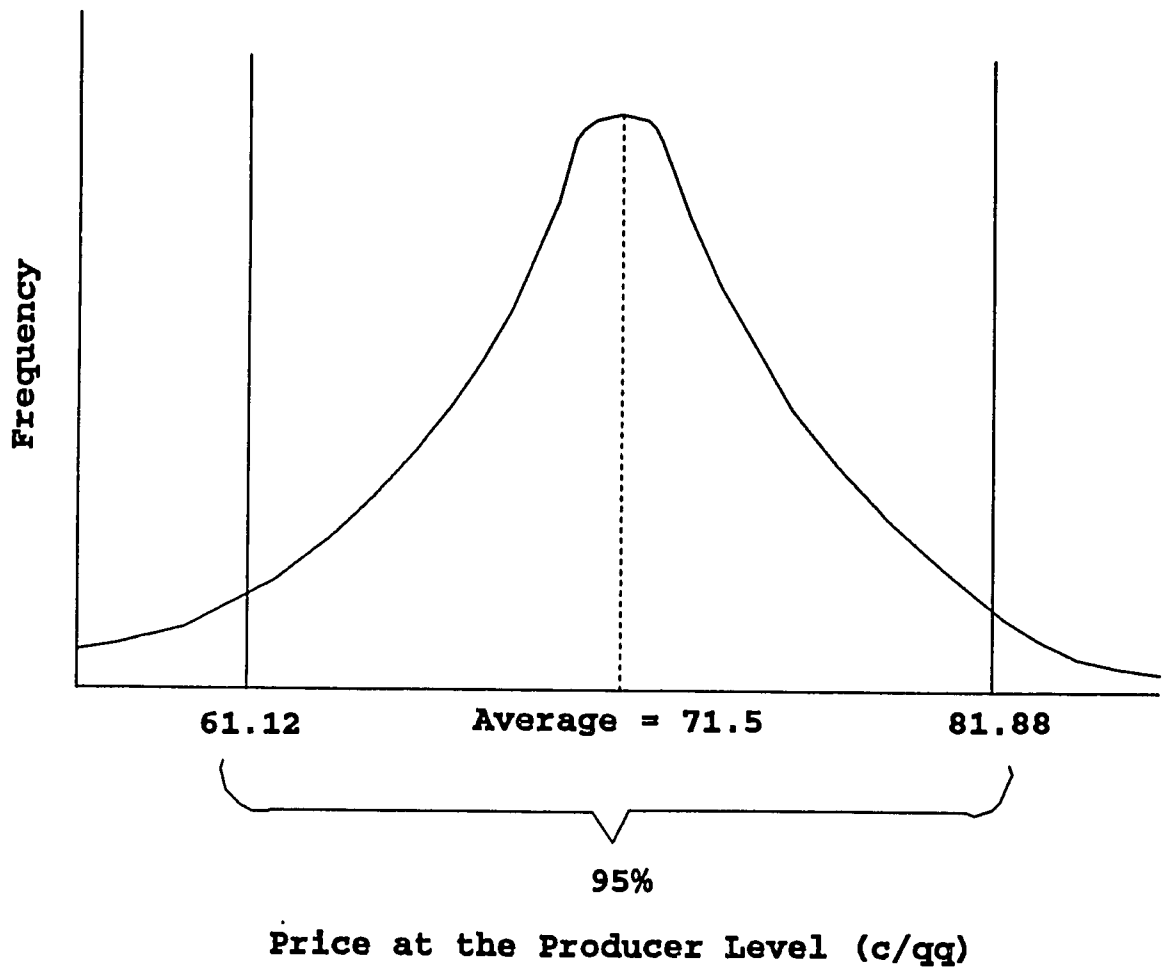
SEASONALITY INDICES - SORGHUM

MONTHS	SEASONAL INDEX	STANDARD ERROR	At 68%	At 95%
JAN	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
APR	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
AUG	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
DEC	1.07	0.0994	0.97	0.87

SOURCE: Ramos, Worman, and Hugo (December 1992)

FIGURE 6.5

PROBABILITY CURVE

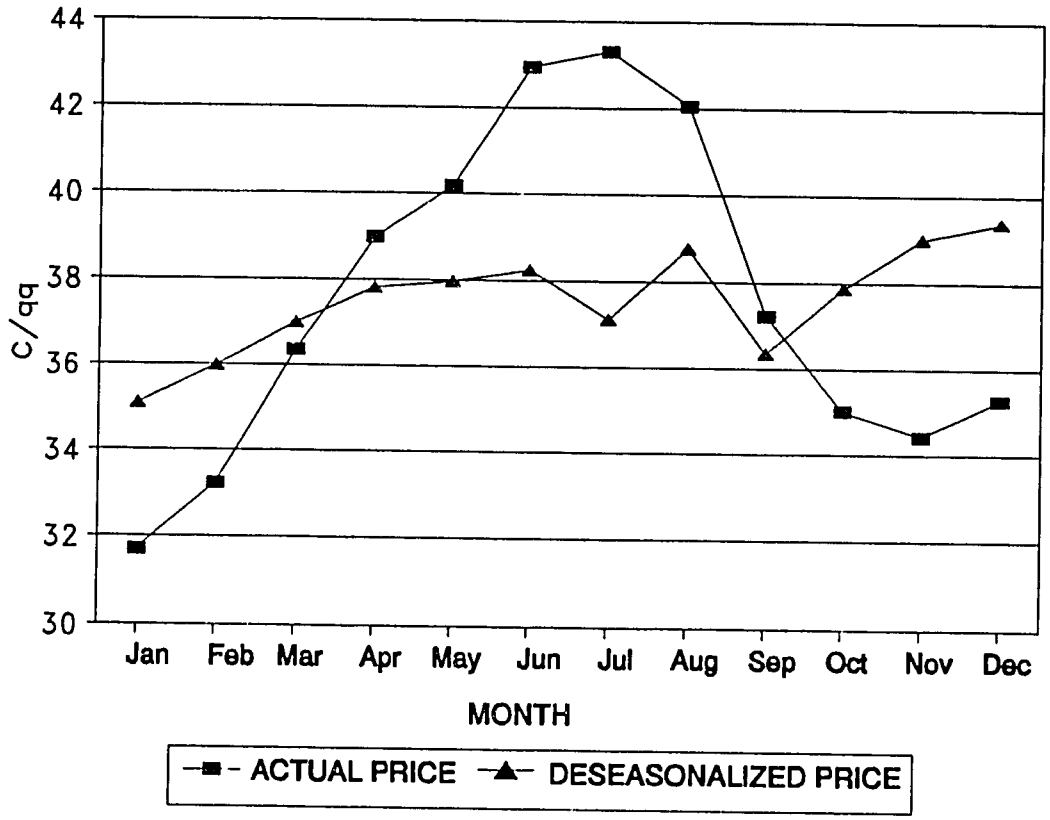


The graph above is an illustration of the normal (bell-shaped) distribution curve. It depicts the relationship between the variable's values (measured on the horizontal axis) and the frequency of those values (measured on the vertical axis).

The mean and standard deviation from the mean is depicted. One standard deviation from the mean represents a 95 percent chance that the producer price will fall between 61.12 and 81.88 C/QQ.

FIGURE 6.6

PRODUCER PRICE SEASONALITY USING MONTHLY AVERAGE CORN PRICES
(1984-1990)



PRODUCER PRICE SEASONALITY USING MONTHLY AVERAGE CORN PRICES
(1984-1990)

MONTH	ACTUAL PRICE	DESEASONALIZED PRICE
	----------C/QQ----------	
JAN	31.73	35.09
FEB	33.24	35.97
MAR	36.34	37.00
APR	38.98	37.80
MAY	40.19	37.96
JUN	42.91	38.24
JUL	43.29	37.11
AUG	42.04	38.77
SEP	37.23	36.36
OCT	35.01	37.86
NOV	34.42	39.00
DEC	35.29	39.37

TABLE 6.3

MULTIPLE LINEAR REGRESSION USING ABSTAT

EXAMPLE FOR SEASONALITY IN PRODUCER PRICES

Dependent Variable: Prodpr 84 Valid Cases

Coeff of Detern:	0.853432		
Adjusted R Square:	0.828661	Estimated Constant Term:	10.3202
Multiple Corr Coeff:	0.923814	Standard ERR of Estimate:	5.87159

Analysis of Variance for the Regression:

Source of Variance	Degrees of Freedom	Sum of Squares	Mean of Squares	F Test	Prob
Regression	12	14252.8	1187.73	34.4515	0.0000
Residuals	71	2447.76	34.4755		
Total	83	16700.6			

Variable	Regression Coefficient	Standardized Coefficient	Standard Error	T	Prob
time	0.520114	0.894397	0.0266934	19.4847	0.0000
d1	2.16411	0.0424198	3.15220	0.686540	0.4946
d2	3.15114	0.0617671	3.14983	1.00042	0.3205
d3	5.73817	0.112477	3.14768	1.82299	0.0725
d4	7.85377	0.153946	3.14575	2.49663	0.0149
d5	8.54080	0.167412	3.14405	2.71649	0.0083
d6	10.7493	0.210701	3.14258	3.42052	0.0010
d7	10.6006	0.207787	3.14133	3.37455	0.0012
d8	8.83760	0.173230	3.14031	2.81424	0.0063
d9	3.50320	0.0686679	3.13952	1.11584	0.2683
d10	0.761657	0.0149296	3.13895	0.242647	0.8090
d11	-0.344172	-0.00674628	3.13861	-0.109657	0.9130

TABLE 6.4

DATA FOR REGRESSION TO ESTIMATE MONTHLY AVERAGE PRODUCER PRICES

CASE	PRODPR	time	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11
1	25.70	1	1	0	0	0	0	0	0	0	0	0	0
2	25.95	2	0	1	0	0	0	0	0	0	0	0	0
3	27.00	3	0	0	1	0	0	0	0	0	0	0	0
4	30.45	4	0	0	0	1	0	0	0	0	0	0	0
5	30.40	5	0	0	0	0	1	0	0	0	0	0	0
6	31.40	6	0	0	0	0	0	1	0	0	0	0	0
7	28.05	7	0	0	0	0	0	0	1	0	0	0	0
8	22.80	8	0	0	0	0	0	0	0	1	0	0	0
9	18.00	9	0	0	0	0	0	0	0	0	1	0	0
10	16.75	10	0	0	0	0	0	0	0	0	0	1	0
11	18.05	11	0	0	0	0	0	0	0	0	0	0	1
12	17.00	12	0	0	0	0	0	0	0	0	0	0	0
13	18.30	13	1	0	0	0	0	0	0	0	0	0	0
14	19.50	14	0	1	0	0	0	0	0	0	0	0	0
15	20.05	15	0	0	1	0	0	0	0	0	0	0	0
16	21.30	16	0	0	0	1	0	0	0	0	0	0	0
17	21.90	17	0	0	0	0	1	0	0	0	0	0	0
18	22.65	18	0	0	0	0	0	1	0	0	0	0	0
19	24.00	19	0	0	0	0	0	0	1	0	0	0	0
20	23.65	20	0	0	0	0	0	0	0	1	0	0	0
21	24.30	21	0	0	0	0	0	0	0	0	1	0	0
22	22.75	22	0	0	0	0	0	0	0	0	0	1	0
23	22.25	23	0	0	0	0	0	0	0	0	0	0	1
24	23.00	24	0	0	0	0	0	0	0	0	0	0	0
25	23.50	25	1	0	0	0	0	0	0	0	0	0	0
26	24.35	26	0	1	0	0	0	0	0	0	0	0	0
27	26.60	27	0	0	1	0	0	0	0	0	0	0	0
28	29.20	28	0	0	0	1	0	0	0	0	0	0	0
29	29.95	29	0	0	0	0	1	0	0	0	0	0	0
30	30.95	30	0	0	0	0	0	1	0	0	0	0	0
31	31.20	31	0	0	0	0	0	0	1	0	0	0	0
32	34.35	32	0	0	0	0	0	0	0	1	0	0	0
33	34.60	33	0	0	0	0	0	0	0	0	1	0	0
34	34.00	34	0	0	0	0	0	0	0	0	0	1	0
35	32.85	35	0	0	0	0	0	0	0	0	0	0	1
36	34.00	36	0	0	0	0	0	0	0	0	0	0	0
37	33.75	37	1	0	0	0	0	0	0	0	0	0	0
38	34.40	38	0	1	0	0	0	0	0	0	0	0	0
39	35.95	39	0	0	1	0	0	0	0	0	0	0	0
40	36.95	40	0	0	0	1	0	0	0	0	0	0	0
41	37.80	41	0	0	0	0	1	0	0	0	0	0	0
42	39.65	42	0	0	0	0	0	1	0	0	0	0	0
43	41.55	43	0	0	0	0	0	0	1	0	0	0	0

TABLE 6.4 (continued)

DATA FOR REGRESSION TO ESTIMATE MONTHLY AVERAGE PRODUCER PRICES

CASE	PRODPR	time	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11
44	41.30	44	0	0	0	0	0	0	0	0	0	0	0
45	33.90	45	0	0	0	0	0	0	0	0	0	0	0
46	31.55	46	0	0	0	0	0	0	0	0	0	0	0
47	32.80	47	0	0	0	0	0	0	0	0	0	0	0
48	34.00	48	0	0	0	0	0	0	0	0	0	0	0
49	34.45	49	1	0	0	0	0	0	0	0	0	0	0
50	33.70	50	0	1	0	0	0	0	0	0	0	0	0
51	35.00	51	0	0	1	0	0	0	0	0	0	0	0
52	35.30	52	0	0	0	1	0	0	0	0	0	0	0
53	39.65	53	0	0	0	0	1	0	0	0	0	0	0
54	45.55	54	0	0	0	0	0	1	0	0	0	0	0
55	47.95	55	0	0	0	0	0	0	1	0	0	0	0
56	45.70	56	0	0	0	0	0	0	0	1	0	0	0
57	44.70	57	0	0	0	0	0	0	0	0	1	0	0
58	41.20	58	0	0	0	0	0	0	0	0	0	1	0
59	36.00	59	0	0	0	0	0	0	0	0	0	0	1
60	34.00	60	0	0	0	0	0	0	0	0	0	0	0
61	36.10	61	1	0	0	0	0	0	0	0	0	0	0
62	40.00	62	0	1	0	0	0	0	0	0	0	0	0
63	45.40	63	0	0	1	0	0	0	0	0	0	0	0
64	48.30	64	0	0	0	1	0	0	0	0	0	0	0
65	51.60	65	0	0	0	0	1	0	0	0	0	0	0
66	56.15	66	0	0	0	0	0	1	0	0	0	0	0
67	57.50	67	0	0	0	0	0	0	1	0	0	0	0
65	51.60	65	0	0	0	0	0	0	0	1	0	0	0
66	56.15	66	0	0	0	0	0	0	0	0	1	0	0
67	57.50	67	0	0	0	0	0	0	0	0	0	1	0
68	65.90	68	0	0	0	0	0	0	0	0	0	0	1
69	51.95	69	0	0	0	0	0	0	0	0	0	0	0
70	46.35	70	0	0	0	0	0	0	0	0	0	0	0
71	44.50	71	0	0	0	0	0	0	0	0	0	0	0
72	46.00	72	0	0	0	0	0	0	0	0	0	0	0
73	50.30	73	1	0	0	0	0	0	0	0	0	0	0
74	54.75	74	0	1	0	0	0	0	0	0	0	0	0
75	64.40	75	0	0	1	0	0	0	0	0	0	0	0
76	71.35	76	0	0	0	1	0	0	0	0	0	0	0
77	70.00	77	0	0	0	0	1	0	0	0	0	0	0
78	74.05	78	0	0	0	0	0	1	0	0	0	0	0
79	72.75	79	0	0	0	0	0	0	1	0	0	0	0
80	60.60	80	0	0	0	0	0	0	0	1	0	0	0
81	53.15	81	0	0	0	0	0	0	0	0	1	0	0
82	52.45	82	0	0	0	0	0	0	0	0	0	1	0
83	54.50	83	0	0	0	0	0	0	0	0	0	0	1
84	59.00	84	0	0	0	0	0	0	0	0	0	0	0

Average monthly producer price was a function of time and the specific month of the crop year. That is:

Prodpr = f(time, d1,d2,d3,d4,d5,d6,d7,d8,d9,d10, and d11)

D1,d2,d3,d4,d5,d6,d7,d8,d9,d10, and d11 represent January, February, March, April, May, June, July, August, September, October, and November, respectively. December is considered the base period and assumes a coefficient of 1. These variables d1 through d12 are called dummy variables. They are called that because of the way they are used. If one looks at the data used in the regression (Table 6.4) one sees that the dummy variables take on only the values 0 and 1. In, for example, the first month (January 1984) of the period considered in the regression, d1 took the value of 1, while all other months (d2,d3,d4,d5,d6,d7,d8,d9,d10, and d11) took the value of 0. In the second period (February 1984), d2 was the only dummy variable that took the value of 1.

Historical information on average monthly producer prices from 1984-1990 was used to estimate the coefficients on each of the dummy variables (all months except December). Each of the estimated coefficients for the dummy variables are presented in Table 6.3 along with their standard errors and their level of significance. In order to obtain the coefficient for December a second regression could be run using a different base month.

Using the estimated regression coefficients in Table 6.3, a seasonality price index can be calculated. The base period December would take on a seasonality price index of 1.00. Index numbers for the other months would be:

D1	(January)	index number = 1.0216	(1.00 + 0.0216)
D2	(February)	index number = 1.0315	(1.00 + 0.0315)
D3	(March)	index number = 1.0574	(1.00 + 0.0574)
D4	(April)	index number = 1.0785	(1.00 + 0.0785)
D5	(May)	index number = 1.0854	(1.00 + 0.0854)
D6	(June)	index number = 1.1075	(1.00 + 0.1075)
D7	(July)	index number = 1.1060	(1.00 + 0.1060)
D8	(August)	index number = 1.0884	(1.00 + 0.0884)
D9	(September)	index number = 1.0350	(1.00 + 0.0350)
D10	(October)	index number = 1.0076	(1.00 + 0.0076)
D11	(November)	index number = 0.9966	(1.00 - 0.0034)

Using a similar method of calculation, the standard errors given in Table 6.3 can be converted into index numbers. Sixty-eight percent of the time producer prices for each respective month would be expected to fall plus or minus .0315 from the monthly seasonal price index given above. For example, the seasonality price index for predicting producer prices in June would be 1.1075 with a standard error between 1.0761 and 1.1389.

Such a seasonality price index updated using current data available, then, can be used with caution in predicting producer prices later in the same crop year. For example, if the producer price in December 1992 was 80 C/QQ, using the above calculated seasonality price index as the only explanatory variable for producer prices, one would predict that the producer price would increase to 88.60 C/QQ (with an expected range from 85.46 to 91.74 C/QQ).

Moving Average

Another technique that is used for estimating a seasonal price index involves a 12-month moving average. A variation of this technique has already been used by the Market Statistics Division for determining historical price indices for the basic grains. However, the moving average that is being used by the DGEA to estimate a monthly seasonality index includes the most recent six months and the next six months. To obtain a seasonality index for the next 12 months, it is only possible to use the last 12 months' prices for computing the most current moving average. Once moving averages are calculated, the price index is determined by dividing the producer price by the moving average price (see Table 6.5). An index is calculated for all months dating back as many years as seasonality in prices appears to be evident. In years where grain prices were strictly controlled by the Government and little variation in the prices were allowed, data from such years should not be used for calculating indices. In the example given in this section, data from the years 1984-90 was used to obtain the seasonality price indices for each month from January 1984 to December 1990. The seasonality indices most useful for projecting prices in coming months in this example are the average indices and their standard deviation for each month from 1985-90 (Table 6.6).

The seasonality indices can be used to estimate, in this example, the producer price in the coming months. One method useful for checking the accuracy of an estimation is to compare the estimated price with the actual price in a period already passed. As in the current example for maize, data from 1984-90 can be used to estimate monthly producer prices in 1991. The estimated monthly prices in 1991, then, can be compared with the actual monthly prices in 1991.

To estimate, for example, the producer price in January 1991, the average seasonality index for January (0.97) is multiplied by the 12-month moving average price (61.44) multiplied by the trend index. In this example, the trend index used is the IPC (Consumer Price Index). For the months January-June 1991, the actual IPC as reported by the Reserve Bank was used in this example. The average monthly increase in the IPC from January-June was used to estimate the monthly trend indices in July-December. In determining the trend index for upcoming months, projected monthly inflation rates from the Reserve Bank, World Bank, et.al., can be used. However, the extent of correlation between historical trends (not including the seasonal price movements) in grain (and edible beans) producer prices and historical consumer price indices needs to be analyzed (using, for example, regression analysis) by DGEA, UAP, or some other GOES agency. The relative correlation, then, can be used as the trend index.

For January 1991, the estimated producer price, in the example, is 59.76 C/qq. The actual price in January 1991 was 64.42 C/qq. The difference between the estimated price and the actual price is -4.66. The standard deviation of the estimated price is determined by multiplying the standard deviation of the average seasonality index for January by the 12-month moving average price (61.44) multiplied by the trend index. For January, the standard deviation is 7.90 C/qq (this is fairly high, meaning that additional years of data could possibly lower it significantly). The estimated price (59.76) plus the standard deviation (+ or - 7.90 C/qq) gives a 68% probability range of 67.66 to 51.78

TABLE 6.5

DATA FOR ESTIMATING THE PRICE SEASONALITY INDICES OF CORN (1985-1991)

MONTH/YEAR	PRODUCER PRICE	MOVING AVERAGE	INDEX
	----------C\QQ----------		
1/84	25.70		
2/84	25.95		
3/84	27.00		
4/84	30.45		
5/84	30.40		
6/84	31.40		
7/84	28.05		
8/84	22.80		
9/84	18.00		
10/84	16.75		
11/84	18.05		
12/84	17.60		
1/85	18.30	24.35	0.75
2/85	19.50	23.73	0.82
3/85	20.05	23.19	0.86
4/85	21.30	22.61	0.94
5/85	21.90	21.85	1.00
6/85	22.65	21.14	1.07
7/85	24.00	20.41	1.18
8/85	23.65	20.08	1.18
9/85	24.30	20.15	1.21
10/85	22.75	20.67	1.10
11/85	22.25	21.17	1.05
12/85	23.40	21.52	1.09
1/86	23.50	22.00	1.07
2/86	24.35	22.44	1.09
3/86	26.60	22.84	1.16
4/86	29.20	23.39	1.25
5/86	29.95	24.05	1.25
6/86	30.95	24.72	1.25
7/86	31.20	25.41	1.23
8/86	34.35	26.01	1.32
9/86	34.60	26.90	1.29
10/86	34.00	27.76	1.22
11/86	32.85	28.70	1.14
12/86	34.40	29.58	1.16
1/87	33.75	30.50	1.11
2/87	34.40	31.35	1.10
3/87	35.95	32.19	1.12
4/87	36.95	32.97	1.12
5/87	37.80	33.61	1.12
6/87	39.65	34.27	1.16
7/87	41.55	34.99	1.19
8/87	41.30	35.85	1.15
9/87	33.90	36.43	0.93
10/87	31.55	36.38	0.87
11/87	32.80	36.17	0.91
12/87	34.15	36.17	0.94

TABLE 6.5 (Continued)

DATA USED FOR ESTIMATING PRICE SEASONALITY INDICES FOR CORN (1985-1991)

MONTH/YEAR	PRODUCER PRICE	MOVING AVERAGE	INDEX
	----------C\QQ----------		
1/88	34.45	36.15	0.95
2/88	33.70	36.20	0.93
3/88	35.00	36.15	0.97
4/88	35.30	36.07	0.98
5/88	39.65	35.93	1.10
6/88	45.55	36.08	1.26
7/88	47.95	36.58	1.31
8/88	45.70	37.11	1.23
9/88	44.70	37.48	1.19
10/88	41.20	38.38	1.07
11/88	36.00	39.18	0.92
12/88	34.25	39.45	0.87
1/89	36.10	39.45	0.91
2/89	40.00	39.59	1.01
3/89	45.40	40.12	1.13
4/89	48.30	40.98	1.18
5/89	51.60	42.07	1.23
6/89	56.15	43.06	1.30
7/89	57.50	43.95	1.31
8/89	65.90	44.74	1.47
9/89	51.95	46.43	1.12
10/89	46.35	47.03	0.99
11/89	44.50	47.46	0.94
12/89	46.50	48.17	0.97
1/90	50.30	49.19	1.02
2/90	54.75	50.37	1.09
3/90	64.40	51.60	1.25
4/90	71.35	53.18	1.34
5/90	70.00	55.10	1.27
6/90	74.05	56.64	1.31
7/90	72.75	58.13	1.25
8/90	60.60	59.40	1.02
9/90	53.15	58.96	0.90
10/90	52.45	59.06	0.89
11/90	54.50	59.57	0.91
12/90	59.00	60.40	0.98
1/91	64.42	61.44	1.05
2/91	65.73	62.62	1.05
3/91	67.20	63.53	1.06
4/91	69.90	63.77	1.10
5/91	70.56	63.65	1.11
6/91	73.24	63.69	1.15
7/91	76.92	63.63	1.21
8/91	83.57	63.97	1.31
9/91	73.11	65.89	1.11
10/91	68.28	67.55	1.01
11/91	66.40	68.87	0.96
12/91	67.26	69.86	0.96

TABLE 6.6

SEASONALITY INDICES (1985-1990)

MONTH	1985	1986	1987	1988	1989	1990	AVERAGE	STD. DEV.	COEFF. OF VAR.
JAN	0.75	1.07	1.11	0.95	0.91	1.02	0.97	0.13	0.13
FEB	0.82	1.09	1.10	0.93	1.01	1.09	1.01	0.11	0.11
MAR	0.86	1.16	1.12	0.97	1.13	1.25	1.08	0.14	0.13
APR	0.94	1.25	1.12	0.98	1.18	1.34	1.14	0.15	0.14
MAY	1.00	1.25	1.12	1.10	1.23	1.27	1.16	0.10	0.09
JUN	1.07	1.25	1.16	1.26	1.30	1.31	1.23	0.09	0.08
JUL	1.18	1.23	1.19	1.31	1.31	1.25	1.24	0.06	0.05
AUG	1.18	1.32	1.15	1.23	1.47	1.02	1.23	0.15	0.13
SEP	1.21	1.29	0.93	1.19	1.12	0.90	1.11	0.16	0.14
OCT	1.10	1.22	0.87	1.07	0.99	0.89	1.02	0.14	0.13
NOV	1.05	1.14	0.91	0.92	0.94	0.91	0.98	0.10	0.10
DEC	1.09	1.16	0.94	0.87	0.97	0.98	1.00	0.11	0.11

C/qq. A graph that includes the estimated producer prices for the months of 1991, the probability range, and the actual producer prices is found in Figure 6.7.

Besides using this moving average method for estimating seasonality in prices, the other method that incorporates dummy variables to estimate seasonality should also be tested by DGEA in order for DGEA to have the choice in the event one method consistently outperforms the other.

For comparison purposes, estimated maize producer prices for 1991 and 1992 (through October) using three different methods with actual producer prices are illustrated in Figures 6.8-6.13 (with the data used for the estimations given in Tables 6-8-6.13). The three methods include using dummy variables (as shown in Table 6.4), X-11 using the 1990 seasonality index, and X-11 using the 1984-90 average seasonality index. The X-11 program is found in SAS (a statistical software package not available at DGEA). It is useful to compare its estimation results along with the results of the methods that use dummy variables and the 12-month moving average.

6.5 Trends

6.5.1. Types

Trends in agricultural prices are associated with general inflation and deflation in the economy and with factors specific to agricultural products, including changes in tastes and preferences of consumers, increases in population and income, and technological changes in production (Tomek and Robinson, 1979).

6.5.2. Collection efforts

DGEA collects data on input prices used in agricultural production of crops. However, because DGEA reports costs of production for only limited types of farming systems, and since the mix of inputs varies greatly from one type farming system to another, any input price inflation index would be unreliable. DGEA should not make the effort of trying to come up with a input price inflation index.

6.5.3. Trend analysis

A good way to examine the data for trends is to plot the data over time (many years). In Figure 6.3, inflation in producer prices of basic grains and edible beans in El Salvador is apparent along with the seasonality. Deseasonalized producer prices that could be examined for trends can be obtained using the X-11 procedure in PC-SAS (see Table 6.1). Once seasonality and inflation-related trends have been removed from, for example, producer prices, there is potential for examining the residual prices for the impact of technological advances (that might improve yields or lower input costs) on such prices. The percentage of producers using such advances would need to be clearly investigated before any meaningful interpretations related to price trends could be made.

FIGURE 6.7

ACTUAL AND ESTIMATED PRODUCER PRICES, AND THE RANGE OF PROBABILITY OF ESTIMATED PRODUCER PRICES BY MONTH IN 1991 - USING THE MOVING AVERAGE PRICE TO ESTIMATE THE MONTHLY SEASONAL PRICE INDEX

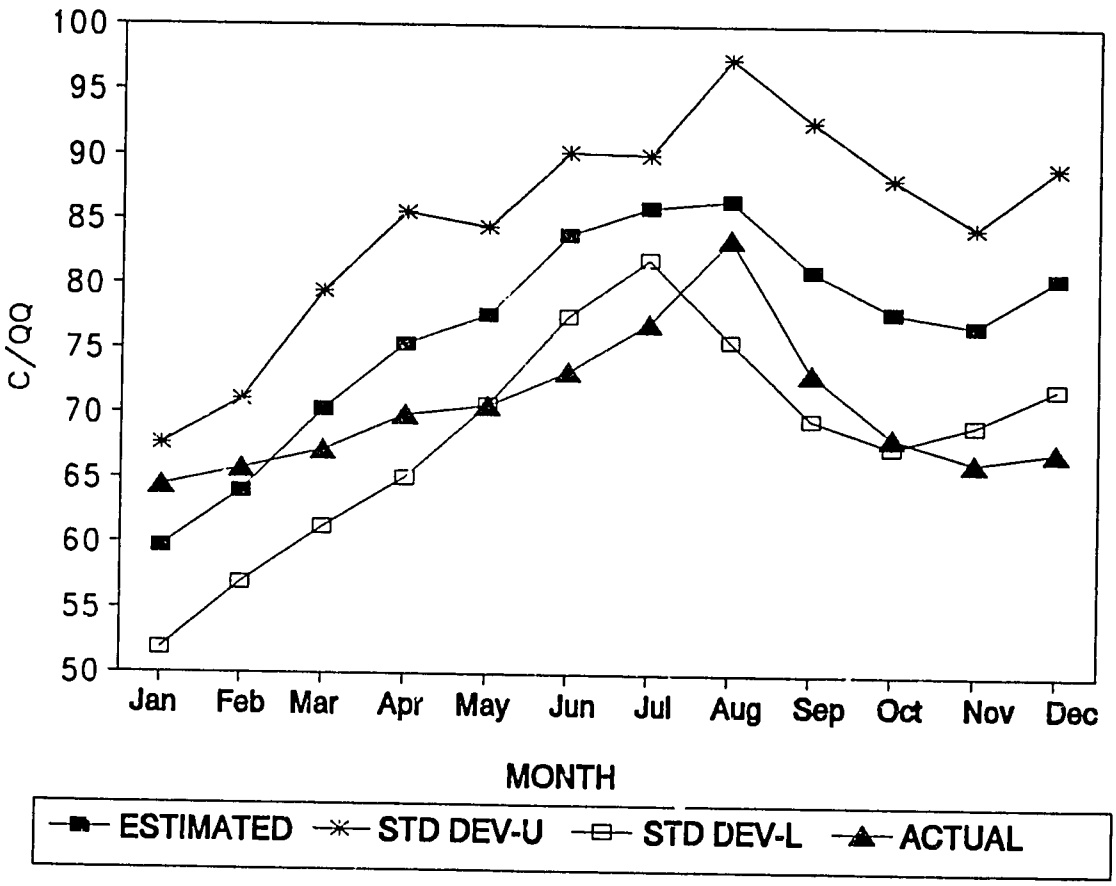


FIGURE 6.8

ACTUAL AND ESTIMATED PRODUCER PRICES BY MONTH IN 1991 - USING DUMMY VARIABLES AND THE MONTHLY SEASONAL PRICE INDICES FROM 1984-1990

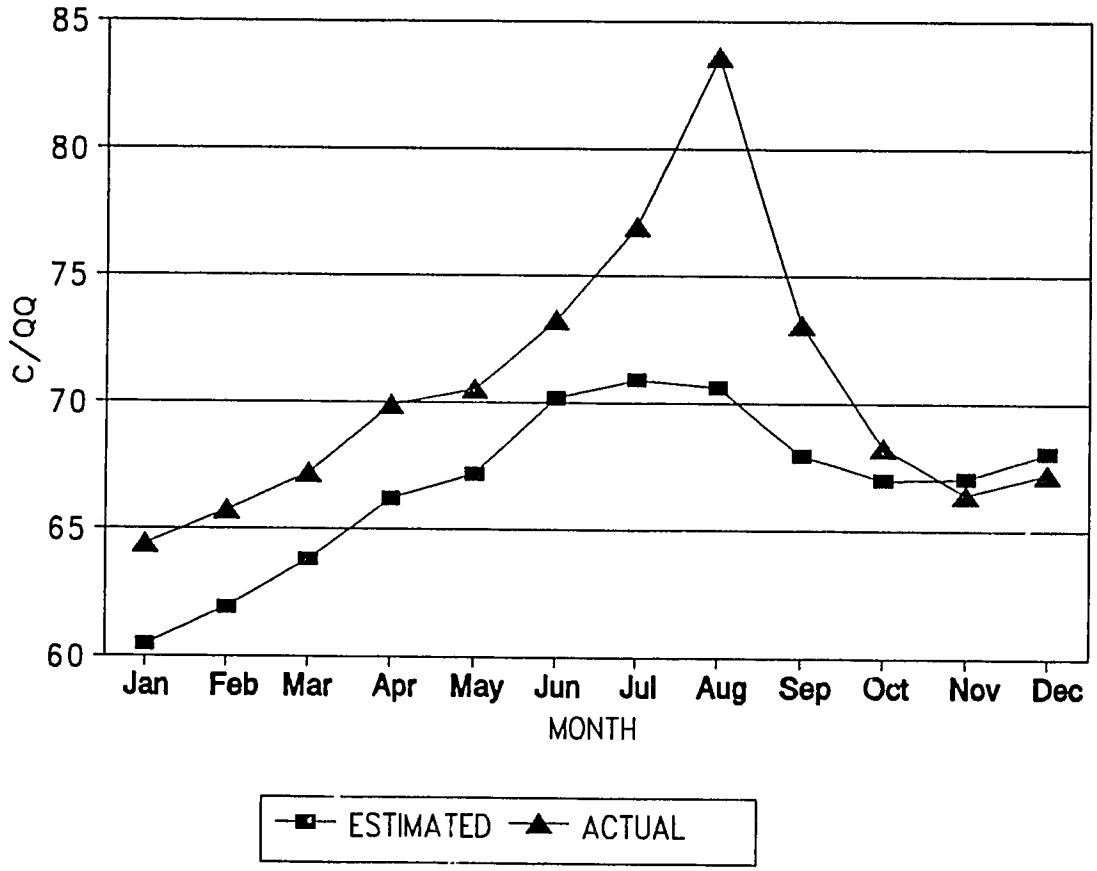


FIGURE 6.9

ACTUAL AND ESTIMATED PRODUCER PRICES BY MONTH IN 1991 - USING X-11 AND THE MONTHLY SEASONAL PRICE INDICES FOR 1990

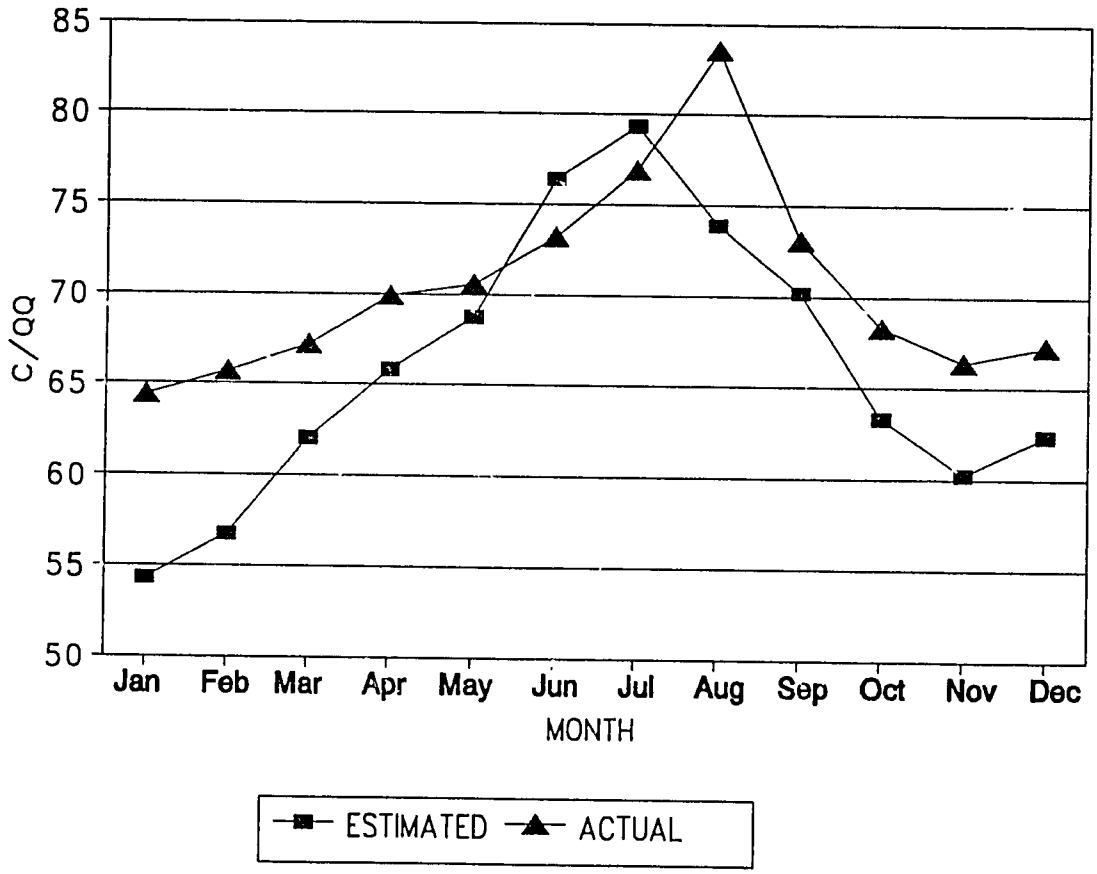


FIGURE 6.10

ACTUAL AND ESTIMATED PRODUCER PRICES BY MONTH IN 1991 - USING X-11 AND THE MONTHLY AVERAGE SEASONAL PRICE INDICES FROM 1984-1990

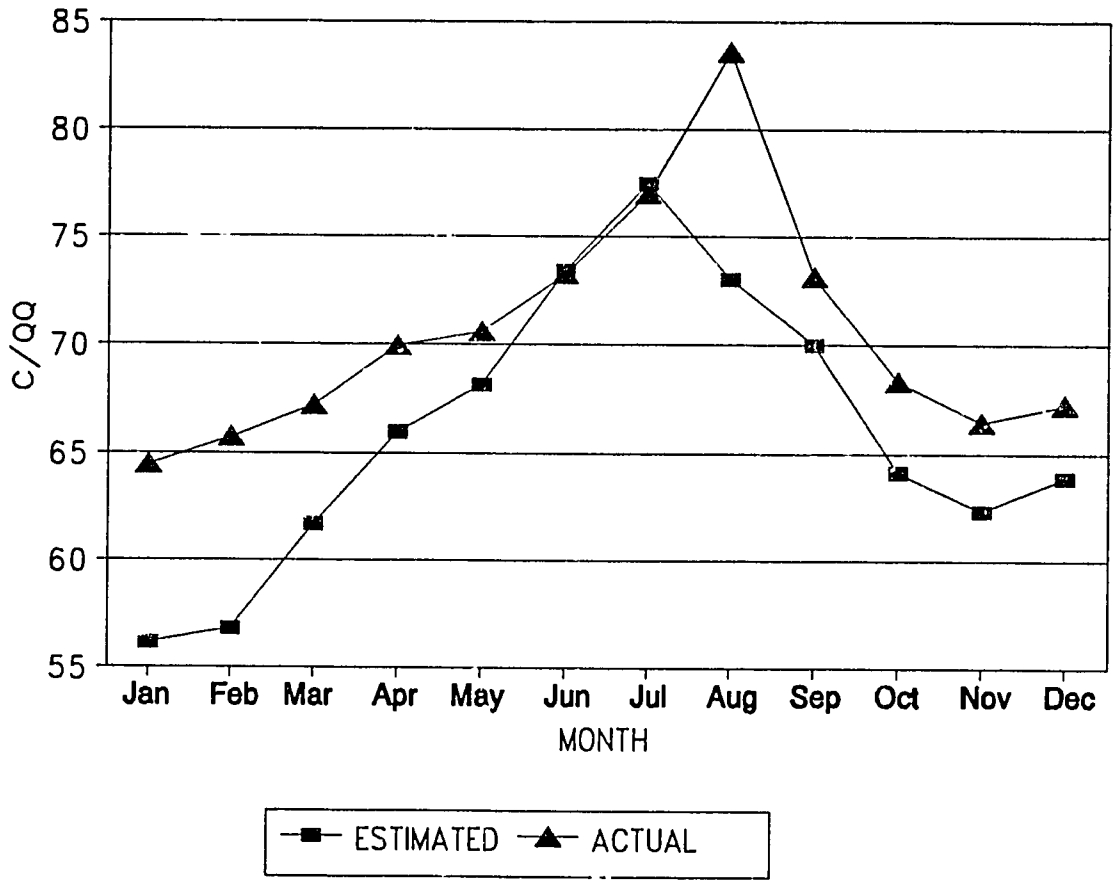


FIGURE 6.11

ACTUAL AND ESTIMATED PRODUCER PRICES BY MONTH IN 1992 - USING DUMMY VARIABLES AND THE MONTHLY SEASONAL PRICE INDICES FROM 1984-1990

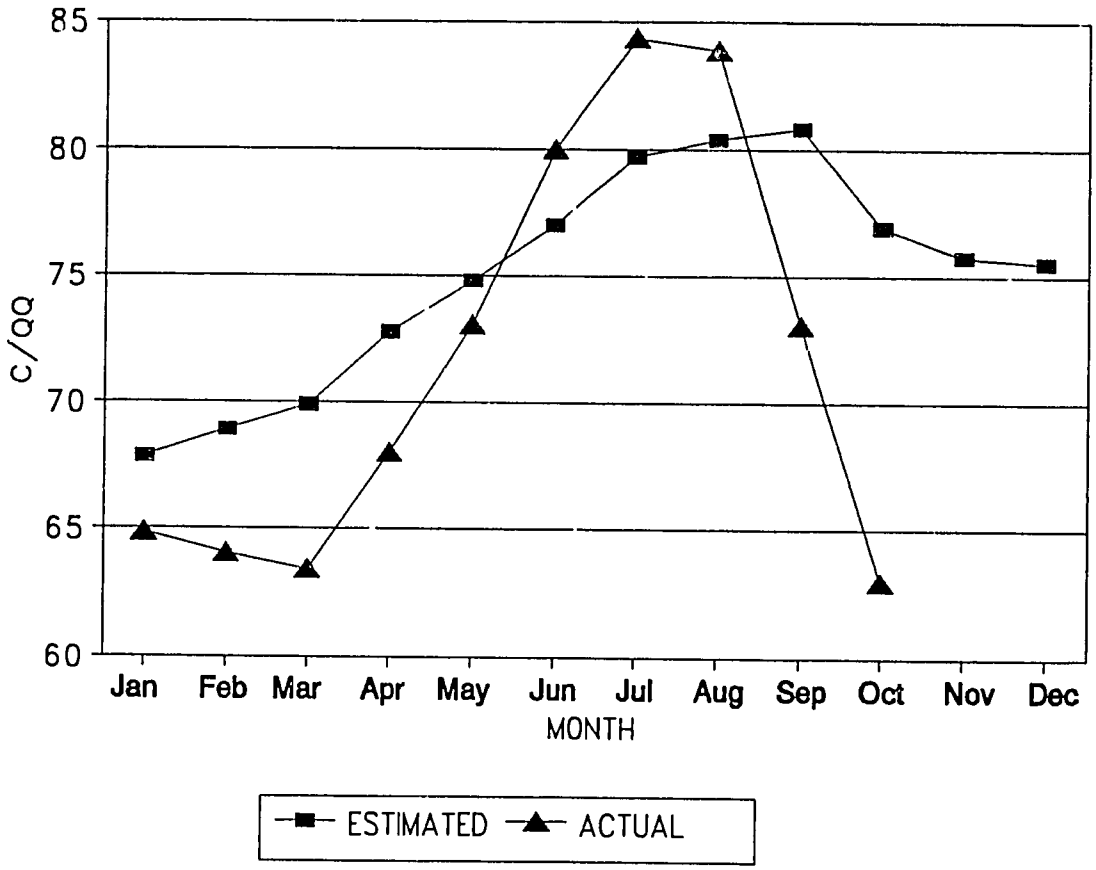


FIGURE 6.12

ACTUAL AND ESTIMATED PRODUCER PRICES BY MONTH IN
1992 - USING X-11 AND THE MONTHLY SEASONAL PRICE INDICES FROM 1990

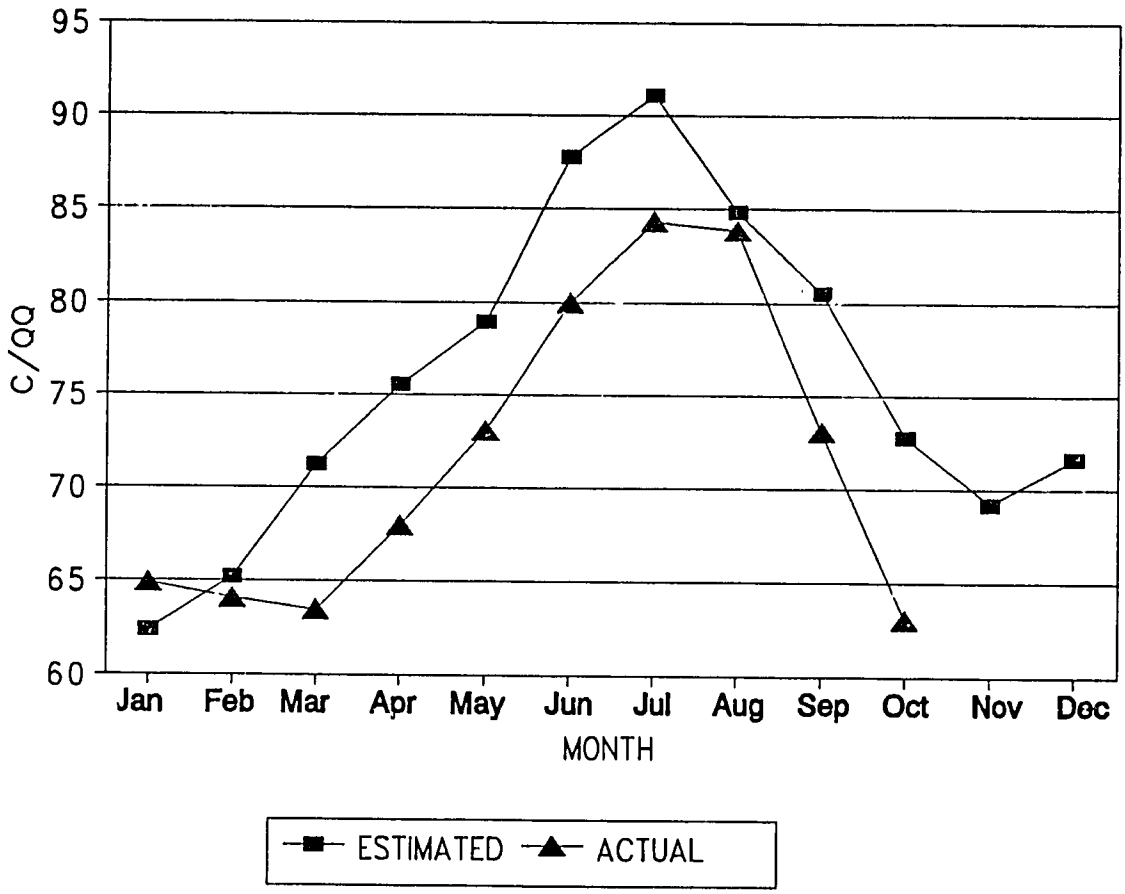


FIGURE 6.13

ACTUAL AND ESTIMATED PRODUCER PRICES BY MONTH IN 1992 - USING X-11 AND THE MONTHLY AVERAGE SEASONAL PRICE INDICES FROM 1984-1990

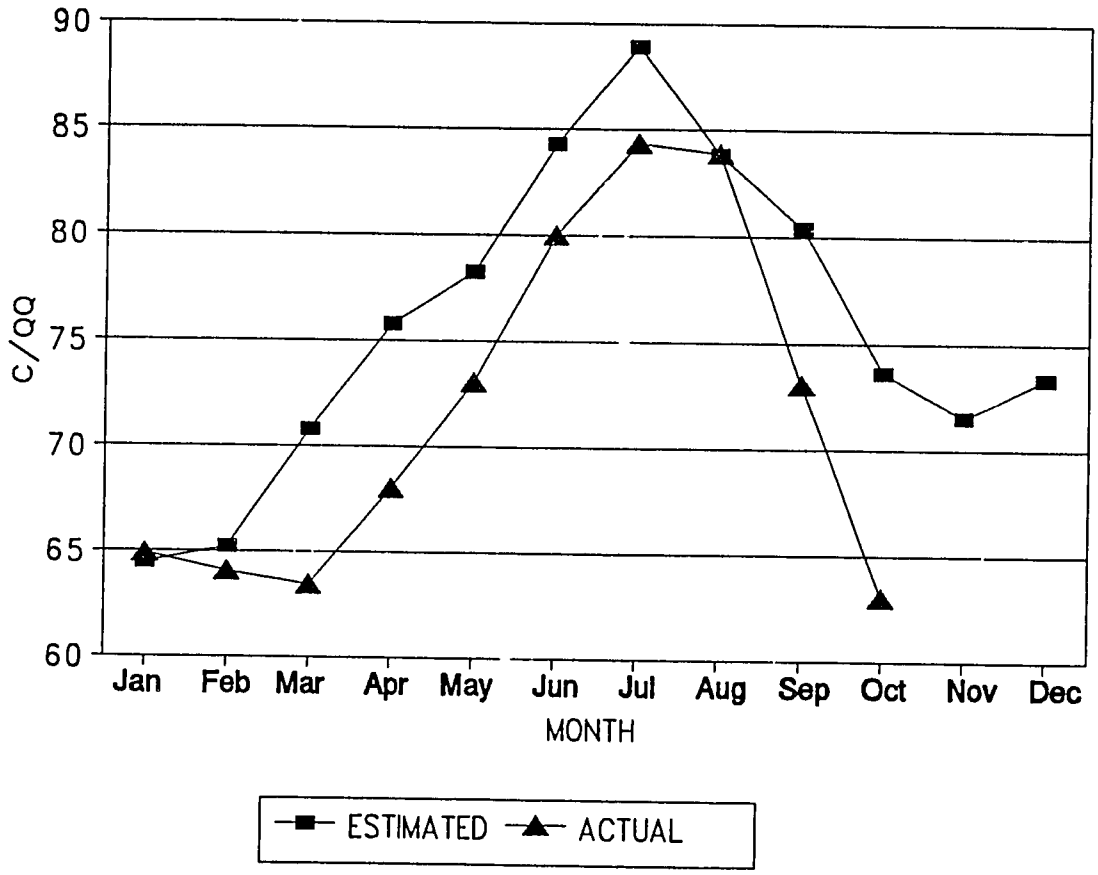


TABLE 6.7

MOVING AVERAGE, ACTUAL AND ESTIMATED PRODUCER PRICES, AND THE STANDARD DEVIATIONS FOR CORN

MONTH	MOVING AVERAGE PRICE	IPC CONSUMER PRICE INDEX	ESTIMATED PRICE	ACTUAL PRICE	DIFFERENCE (ESTIMATED -ACTUAL)	ESTIMATED PRICE + STD. DEV.	ESTIMATED PRICE - STD. DEV.	STD. DEV. ACTUAL
	--C\QQ--		--C\QQ--	--C\QQ--	--C\QQ--	--C\QQ--	--C\QQ--	--C\QQ--
JAN	61.44	1.00	59.76	64.42	-4.66	67.66	51.87	7.90
FEB	62.62	1.02	64.06	65.73	-1.67	71.08	57.03	7.02
MAR	63.53	1.02	70.33	67.20	3.13	79.44	61.22	9.11
APR	63.77	1.04	75.31	69.90	5.41	85.56	65.06	10.25
MAY	63.65	1.05	77.59	70.56	7.03	84.48	70.70	6.89
JUN	63.69	1.07	83.86	73.24	10.62	90.23	77.49	6.37
JUL	63.63	1.09	86.02	76.92	9.10	90.03	82.01	4.01
AUG	63.97	1.10	86.51	83.57	2.94	97.41	75.60	10.90
SEP	65.89	1.11	81.13	73.11	8.02	92.63	69.63	11.50
OCT	67.55	1.13	77.89	68.28	9.61	88.27	67.50	10.39
NOV	68.87	1.14	76.88	66.40	10.48	84.51	69.24	7.64
DEC	69.86	1.15	80.68	67.26	13.42	89.24	72.12	8.56

TABLE 6.8

ESTIMATED PRODUCER PRICES OF CORN (1991)
USING DUMMY VARIABLES FOR ESTIMATING THE SEASONALITY INDEX

MONTH	PRICE ON DEC 1990	SEASONAL INDEX	IPC	EST	ACT	DIFF
	--C\QQ--			--C\QQ--	--C\QQ--	--C\QQ--
Jan	59.00	1.0216	1.0033	60.47	64.42	-3.95
Feb	59.00	1.0315	1.0175	61.92	65.73	-3.81
Mar	59.00	1.0574	1.0228	63.81	67.20	-3.39
Apr	59.00	1.0785	1.0405	66.21	69.90	-3.69
May	59.00	1.0854	1.0490	67.18	70.56	-3.38
Jun	59.00	1.1075	1.0742	70.19	73.24	-3.05
Jul	59.00	1.1060	1.0871	70.94	76.92	-5.98
Aug	59.00	1.0884	1.1001	70.64	83.57	-12.93
Sep	59.00	1.0350	1.1133	67.98	73.11	-5.13
Oct	59.00	1.0076	1.1267	66.98	68.28	-1.30
Nov	59.00	0.9966	1.1402	67.04	66.40	0.64
Dec	59.00	1.0000	1.1539	68.08	67.26	0.82
AVERAGE						-3.76

TABLE 6.9

ESTIMATED PRODUCER PRICE OF CORN (1991)
USING X-11 FOR ESTIMATING THE SEASONALITY INDEX OF 1990

MONTH	AVERAGE PRICE (1990)	SEASONAL INDEX (1990)	IPC	EST	ACT	DIFF
	--C\QQ--			--C\QQ--	--C\QQ--	--C\QQ--
Jan	61.44	0.8810	1.0033	54.31	64.42	-10.11
Feb	61.44	0.9080	1.0175	56.76	65.73	-8.97
Mar	61.44	0.9873	1.0228	62.04	67.20	-5.16
Apr	61.44	1.0295	1.0405	65.81	69.90	-4.09
May	61.44	1.0668	1.0490	68.76	70.56	-1.80
Jun	61.44	1.1579	1.0742	76.42	73.24	3.18
Jul	61.44	1.1877	1.0871	79.33	76.92	2.41
Aug	61.44	1.0932	1.1001	73.89	83.57	-9.68
Sep	61.44	1.0255	1.1133	70.15	73.11	-2.96
Oct	61.44	0.9153	1.1267	63.36	68.28	-4.92
Nov	61.44	0.8602	1.1402	60.26	66.40	-6.14
Dec	61.44	0.8796	1.1539	62.36	67.26	-4.90
AVERAGE						-4.43

TABLE 6.10

ESTIMATED PRODUCER PRICES OF CORN (1991)
USING X-11 FOR ESTIMATING THE SEASONALITY INDEX (1984-1990)

MONTH	AVERAGE PRICE (1990)	SEASONAL INDEX	IPC	EST	ACT	DIFF
	--C\QQ--			--C\QQ--	--C\QQ--	--C\QQ--
Jan	61.44	0.9106	1.0033	56.13	64.42	-8.29
Feb	61.44	0.9080	1.0175	56.76	65.73	-8.97
Mar	61.44	0.9809	1.0228	61.64	67.20	-5.56
Apr	61.44	1.0322	1.0405	65.99	69.90	-3.91
May	61.44	1.0567	1.0490	68.10	70.56	-2.46
Jun	61.44	1.1117	1.0742	73.37	73.24	0.13
Jul	61.44	1.1593	1.0871	77.43	76.92	0.51
Aug	61.44	1.0798	1.1001	72.98	83.57	-10.59
Sep	61.44	1.0234	1.1133	70.00	73.11	-3.11
Oct	61.44	0.9261	1.1267	64.11	68.28	-4.17
Nov	61.44	0.8897	1.1402	62.33	66.40	-4.07
Dec	61.44	0.9011	1.1539	63.88	67.26	-3.38
AVERAGE						-4.49

TABLE 6.11

ESTIMATED PRODUCER PRICES OF CORN (1991)
USING DUMMY VARIABLES FOR ESTIMATING THE SEASONALITY INDEX

MONTH	PRICE ON DEC 1991	SEASONAL INDEX	IPC	EST	ACT	DIFF
	--C\QQ--			--C\QQ--	--C\QQ--	--C\QQ--
Jan	67.26	1.0057	1.0033	67.87	64.85	3.02
Feb	67.26	1.0072	1.0175	68.93	64.03	4.90
Mar	67.26	1.0163	1.0228	69.91	63.42	6.49
Apr	67.26	1.0396	1.0405	72.76	68.00	4.76
May	67.26	1.0603	1.0490	74.81	73.06	1.75
Jun	67.26	1.0659	1.0742	77.01	79.98	-2.97
Jul	67.26	1.0897	1.0871	79.68	84.34	-4.66
Aug	67.26	1.0860	1.1001	80.36	83.85	-3.49
Sep	67.26	1.0792	1.1133	80.81	73.06	7.75
Oct	67.26	1.0151	1.1267	76.93	63.00	13.93
Nov	67.26	0.9880	1.1402	75.77		
Dec	67.26	0.9730	1.1539	75.52		
AVERAGE						3.15

TABLE 6.12

ESTIMATED PRODUCER PRICES OF CORN (1992)
USING X-11 FOR ESTIMATING THE SEASONALITY INDEX OF 1990

MONTH	AVERAGE PRICE 1990	SEASONAL INDEX	IPC	EST	ACT	DIFF
	--C\QQ--			--C\QQ--	--C\QQ--	--C\QQ--
Jan	70.55	0.8810	1.0033	62.36	64.85	-2.49
Feb	70.55	0.9080	1.0175	65.18	64.03	1.15
Mar	70.55	0.9873	1.0228	71.24	63.42	7.82
Apr	70.55	1.0295	1.0405	75.57	68.00	7.57
May	70.55	1.0668	1.0490	78.95	73.06	5.89
Jun	70.55	1.1579	1.0742	87.75	79.98	7.77
Jul	70.55	1.1877	1.0871	91.09	84.34	6.75
Aug	70.55	1.0932	1.1001	84.85	83.85	1.00
Sep	70.55	1.0255	1.1133	80.55	73.06	7.49
Oct	70.55	0.9153	1.1267	72.76	63.00	9.76
Nov	70.55	0.8602	1.1402	69.20		
Dec	70.55	0.8796	1.1539	71.61		
AVERAGE						5.27

TABLE 6.13

ESTIMATED PRODUCER PRICES OF CORN (1992)
USING X-11 FOR ESTIMATING THE SEASONALITY INDEX
(1984-1990)

MONTH	AVERAGE PRICE 1990	SEASONAL INDEX	IPC	EST	ACT	DIFF
	--C\QQ--			--C\QQ--	--C\QQ--	--C\QQ--
Jan	70.55	0.9106	1.0033	64.45	64.85	-0.40
Feb	70.55	0.9080	1.0175	65.18	64.03	1.15
Mar	70.55	0.9809	1.0228	70.78	63.42	7.36
Apr	70.55	1.0322	1.0405	75.77	68.00	7.77
May	70.55	1.0567	1.0490	78.20	73.06	5.14
Jun	70.55	1.1117	1.0742	84.25	79.98	4.27
Jul	70.55	1.1593	1.0871	88.91	84.34	4.57
Aug	70.55	1.0798	1.1001	83.81	83.85	-0.04
Sep	70.55	1.0234	1.1133	80.38	73.06	7.32
Oct	70.55	0.9261	1.1267	73.61	63.00	10.61
Nov	70.55	0.8897	1.1402	71.57		
Dec	70.55	0.9011	1.1539	73.35		
AVERAGE						4.77

To deflate or to remove inflation from prices requires the use of inflationary indices that correspond as near as possible to the makeup of those prices. For example, producer prices are impacted by the inflationary cost of inputs and wages. If the cost of inputs and wages goes up 10% from one year to the next, cost of production may likely increase (depending on the yield), and producer prices may also rise reflecting the increased cost of those inputs and wages. DGEA does collect periodically during the crop year the changes in the cost of inputs and the changes in the average cost of production for basic grains and edible beans. It also collects data periodically on the cost of farm labor. Using an inflationary index based on input and farm labor costs may serve as the most realistic index for deflating producer prices.

An example of how such an index would be used to put actual producer prices in real (deflated) terms would be as follows:

If average input costs and average farm wages increased 10% from one-year to the next for five years and average producer prices increased 2% per year and yields remained the same during this period, the real producer price would be as follows:

(Assume input and farm wages represent 90% of total cost of production, other production costs don't change, average cost of production is 52 C/QQ in the first year, and average producer price is 60 C/QQ in the first year and the yield is 34 qq/manzana.)

Year	Cost of Prod'n	Producer Price Actual	Producer Price Real
	C/QQ		
1	52.00	60.00	60.00
2	57.78	61.20	56.15 (61.20/(1.10 x 0.90)
3	64.20	62.40	57.25 (62.40/(1.10 x 0.90)
4	71.33	63.67	58.41 (63.67/(1.10 x 0.90)
5	79.26	64.95	59.59 (64.95/(1.10 x 0.90)

From this example it is obvious that real producer prices have not kept up with the inflation in costs of production. The need to improve yields to bring down the costs of production in this example is certainly apparent.

In, however, countries like El Salvador, farming systems differ tremendously from slash-and-burn extensive production to intensive agricultural production. As a result, obtaining representative cost of production estimates is very difficult and those that are available are, for all intensive purposes unreliable. Instead, the consumer price index (the price index of a basket of consumer goods) is widely available and widely used for deflating price, including producer and consumer prices. Caution must be used in using such an index in calculating

producer prices since it includes inflation costs of items (for example, the cost of building materials or many durable goods used in the household) that do not relate to the agricultural production process.

For DGEA, the consumer inflation price index represents the best inflationary index for calculating real or deflated prices, whether those prices be producer, trucker, wholesaler, or retailer prices. However, in most cases, DGEA need not deflate prices collected or analyzed. In the case of determining seasonality in producer prices, for example, DGEA need not deflate the prices since the programs that calculate seasonality separate such trends from the determination of seasonal price indices. Other governmental agencies using DGEA's data may do so if they consider it necessary.

Cycles and other irregular components in temporal price analysis are beyond the scope of this training program, and, therefore, are not included as topics.

SECTION VII

BALANCE SHEET FOR BASIC GRAINS

The Market Statistics Division collects market information from truckers, wholesalers, retailers, importers, exporters, custom agents, grain warehouse managers, and industrial firms that process grains. The principal objective of this data collection by the DGEA is to develop a balance sheet for the basic grains and the beans. However, although some market information is regularly collected and is in a representative form, much of the information that is necessary for generating a balance sheet is collected only on an annual basis or not collected at all.

7.1. The Value of the Balance Sheet

The Government of El Salvador is responsible for maintaining the food security in the country. Accurate, precise, and timely information that describes the actual supply and demand situation of basic grains and edible beans is fundamental for making

- price and supply projections on those commodities before the next harvest
- periodic comparisons of the trends in production, consumption, industry use and trade
- preliminary arrangements for a maintaining a strategic reserve and national food security
- timely and reliable announcements to the private sector on import needs.

The balance sheets for grains and beans are needed on a quarterly or monthly basis in order to monitor the impact of changes in:

- the estimation of the next harvest
- free trade in the region, and
- agriculture policies that can have an impact in the short term on production, consumption, and industrial use.

7.2. Collection Effort

DGEA has developed an annual Food Balance Sheet for each of the basic grains (including white corn, yellow corn, sorghum, beans, and milled rice). Examples of balance sheets for each grain are presented in Tables 7.1 to 7.7. The method that is used for collecting each component of the balance sheet, for each grain, and the recommendations for improving the process of collecting (that are to be presented in the training program) are as follows:

Beginning Stocks

The DGEA obtains the beginning stocks by simply copying the amount from last year's ending stocks. Although this procedure is correct, in some balance sheets (see Table 7.1) reported by the Market Statistics Division, the beginning stock and the ending stock of the year before have been different in some years.

In 1991/92, the beginning stock was estimated to be higher (as much as one million quintals higher) than the ending stock of the previous year (Table 7.6). This indicates that problems at the DGEA continue in tabulating the balance sheets, and it emphasizes the need to develop balance sheets with

TABLE 7.1

BALANCE SHEET FOR WHITE CORN (1986/87-1990/91)

ITEM	1986/87	1987/88	1988/89	WHITE CORN 1989/90	WHITE CORN 1990/91
	'000 QQ				
BEGINNING STOCKS	2527.8	1776.4	1061	325.8	1767
PRODUCTION	9500	12575.9	12956.2	12794.3	13100.2
IMPORTS	1661.8	771.1	1380.2	48.5	0
AVAILABLE SUPPLY	13689.6	15123.4	15397.4	13168.6	14867.2
EXPORTS	0	0	0	0	64
INTERNAL DEMAND	11913.2	14062.4	13000	13040.8	13995.8
TOTAL CONSUMPTION				13040.8	
HUMAN CONSUMPTION				11123.5	10380
INDUSTRIAL CONSUMPTION				759.9	948.4
ANIMAL CONSUMPTION				354.2	1867.4
SEEDS & LOSSES				805.2	800
TOTAL DEMAND	11913.2	14062.4	13000	13040.8	14059.8
CONTINGENCY RESERVE	0	0	1100	0	0
TOTAL REQUIREMENT	11913.2	14062.4	14100	13040.8	14059.8
ENDING STOCK	1776.4	1061	1297.4	127.8	807.4

SOURCE:
MINISTER OF AGRICULTURE AND LIVESTOCK
DIRECCION GENERAL DE ECONOMIC AGROPECUARIA
MARKET STATISTICS DIVISION
SAN SALVADOR, EL SALVADOR

TABLE 7.2

BALANCE SHEET FOR YELLOW CORN (1986/87-1990/91)

ITEM	1986/87	1987/88	1988/89	YELLOW CORN 1989/90	YELLOW CORN 1990/91
	----------'000 QQ----------				
BEGINNING STOCKS	2527.8	1776.4	1061	465.6	786.8
PRODUCTION	9500	12575.9	12956.2	0	0
IMPORTS	1661.8	771.1	1380.2	1554.2	732.9
AVAILABLE SUPPLY	13689.8	15123.4	15397.4	2019.8	1519.7
EXPORTS	0	0	0	0	0
INTERNAL DEMAND	11913.2	14062.4	13000	1542.9	1092.3
TOTAL CONSUMPTION				1542.9	
HUMAN CONSUMPTION				0	68.7
INDUSTRIAL CONSUMPTION				1542.9	1015.6
ANIMAL CONSUMPTION				0	5
SEEDS & LOSSES				0	3
TOTAL DEMAND	11913.2	14062.4	13000	1542.9	1092.3
CONTINGENCY RESERVE	0	0	1100	0	0
TOTAL REQUIREMENT	11913.2	14062.4	14100	1542.9	1092.3
ENDING STOCK	1776.4	1061	1297.4	476.9	427.4

SOURCE:
MINISTER OF AGRICULTURE AND LIVESTOCK
DIRECCION GENERAL DE ECONOMIC AGROPECUARIA
MARKET STATISTICS DIVISION
SAN SALVADOR, EL SALVADOR

TABLE 7.3

BALANCE SHEET FOR SORGHUM (1986/87-1990/91)

ITEM	1986/87	1987/88	1988/89	1989/90	1990/91
	----------'000 QQ----------				
BEGINNING STOCKS	170	24.1	8.1	281	228.8
PRODUCTION	3206.8	564.1	3332.7	3249.7	3491.8
IMPORTS	0	0	0	0	0
AVAILABLE SUPPLY	3376.8	588.2	3340.8	3530.7	3720.6
EXPORTS	0	0	0	0	0
INTERNAL DEMAND	3352.7	580.2	3100	13040.8	3416.5
TOTAL CONSUMPTION				3339.5	
HUMAN CONSUMPTION				1040.4	907.2
INDUSTRIAL CONSUMPTION				1249.4	1285.1
ANIMAL CONSUMPTION				862.5	1004.2
SEEDS & LOSSES				187.2	220
TOTAL DEMAND	3352.7	580.2	3100	13040.8	3416.5
CONTINGENCY RESERVE	0	0	0	0	0
TOTAL REQUIREMENT	3352.7	580.2	3100	13040.8	3416.5
ENDING STOCK	24.1	8	240.8	191 2	304.1

SOURCE:
MINISTER OF AGRICULTURE AND LIVESTOCK
DIRECCION GENERAL DE ECONOMIC AGROPECUARIA
MARKET STATISTICS DIVISION
SAN SALVADOR, EL SALVADOR

TABLE 7.4

BALANCE SHEET FOR RICE (1986/87-1990/91)

ITEM	1986/87	1987/88	1988/89	1989/90	1990/91
	----------'000 QQ----------				
BEGINNING STOCKS	226.6	54.8	189.1	253.6	135.5
PRODUCTION	700.6	636.5	809.8	900.4	871.7
IMPORTS	206.8	362.7	334.1	192.5	540.6
AVAILABLE SUPPLY	1134	1054	1333	1346.5	1547.8
EXPORTS	0	0	0	16.9	277.7
INTERNAL DEMAND	1079.2	864.9	990	1194.1	1130
TOTAL CONSUMPTION				1194.1	
HUMAN CONSUMPTION				1114.9	1005
INDUSTRIAL CONSUMPTION				0	45
ANIMAL CONSUMPTION				0	0
SEEDS & LOSSES				79.2	80
TOTAL DEMAND	1079.2	864.9	990	1211	1407.7
CONTINGENCY RESERVE	0	0	0	0	0
TOTAL REQUIREMENT	1079.2	864.9	990	1211	1407.7
ENDING STOCK	54.8	189.1	343	135.5	140.1

SOURCE:
MINISTER OF AGRICULTURE AND LIVESTOCK
DIRECCION GENERAL DE ECONOMIC AGROPECUARIA
MARKET STATISTICS DIVISION
SAN SALVADOR, EL SALVADOR

TABLE 7.5

BALANCE SHEET FOR BEANS (1986/87-1990/91)

ITEM	1986/87	1987/88	1988/89	1989/90	1990/91
	----------'000 QQ----------				
BEGINNING STOCKS	62.1	185.9	178.7	131.6	106.1
PRODUCTION	1093.9	531	1240	968.9	1145.4
IMPORTS	148.7	235.2	6.8	199.1	250
AVAILABLE SUPPLY	1304.7	952.1	1425.5	1299.6	1501.5
EXPORTS	0	0	0	0	28
INTERNAL DEMAND	1118.8	773.4	1293.6	13040.8	1412
TOTAL CONSUMPTION				1193.5	
HUMAN CONSUMPTION				1049.5	1268
INDUSTRIAL CONSUMPTION				0	0
ANIMAL CONSUMPTION				0	0
SEEDS & LOSSES				144	144
TOTAL DEMAND	1118.8	773.4	1293.6	13040.8	1440
CONTINGENCY RESERVE	0	0	100	0	0
TOTAL REQUIREMENT	1118.8	773.4	1300	13040.8	1440
ENDING STOCK	185.9	178.7	125.5	106.1	61.5

SOURCE:
MINISTER OF AGRICULTURE AND LIVESTOCK
DIRECCION GENERAL DE ECONOMIC AGROPECUARIA
MARKET STATISTICS DIVISION
SAN SALVADOR, EL SALVADOR

TABLE 7.6

BALANCE SHEET OF BASIC GRAINS (PRELIMINARY)*
AUGUST 1,1991 - JULY 31,1992

ITEM	WHITE CORN	YELLOW CORN	SORGHUM	GRAND TOTAL	BEANS	RICE
	----------	----------	QQ	----------	----------	----------
BEGINNING STOCKS	1807000[a]	427400	304000	731400	61500	140000
PRODUCTION	10962800		3540900	14503700	1461600	868100
IMPORTS	2500000[b]	2206580		2206580	450000	427436
AVAILABLE SUPPLY	15269800	2633980	3844900	21748680	1973100	1435536
HUMAN CONSUMPTION	10492000	6000	950000	11448000	1620700	1023600
INDUSTRIAL CONSUMPTION	375270	2202880	932445	3510595		45000
ANIMAL CONSUMPTION	1725000		1090600	2815600		
SEED	140000		25000	165000	115000	50000
POST-HARVEST LOSSES	880000	81600	200000	1161600	1161600	50000
EXPORTS	8764			8764	6130	8500
TOTAL CONSUMPTION	13621534	2290480	3198045	19110059	1791830	1157100
ENDING STOCKS	1648266	343500	646855	2638621	181270	278436

* SEPTEMBER 24,1992

[a] The September beginning stocks of white corn are higher than the amount calculated.
[b] Total imports from Honduras and Guatamal are higher than that recorded by customs in El Salvador.

SOURCE:
MINISTER OF AGRICULTURE AND LIVESTOCK
DIRECCION GENERAL DE ECONOMIA AGROPECUARIA
MARKET STATISTICS DIVISION
SAN SALVADOR, EL SALVADOR

TABLE 7.7

BALANCE SHEET OF BASIC GRAINS (PROJECTED)*
AUGUST 1,1992 - JULY 31,1993

ITEM	WHITE CORN	YELLOW CORN	SORGHUM	GRAND TOTAL	BEANS	RICE
	----------QQ----------					
BEGINNING STOCKS	1648266	343500	646855	2638621	181270	278436
PRODUCTION	13816200		4754400	18570600	1635000	987350
IMPORTS		1700000		1700000	250000	250000
AVAILABLE SUPPLY	15464466	2043500	5401255	22909221	2066270	1515786
HUMAN CONSUMPTION	10752100	10000	1000000	11762100	1661000	1049000
INDUSTRIAL CONSUMPTION	375000	1500000	1500000	3375000		45000
ANIMAL CONSUMPTION	1500000		1300000	280000C		
SEEDS	145000		25000	170000	120000	45000
POST-HARVEST LOSSES	1105300	80000	270000	1455300	60000	35000
EXPORTS	10000			10000		
TOTAL CONSUMPTION	13867400	1590000	4095000	19572400	1841000	1174000
ENDING STOCKS	1577066	453500	1306255	3336821	225270	341786

* SEPTEMBER 24,1992

SOURCE:
MINISTER OF AGRICULTURE AND LIVESTOCK
DIRECCION GENERAL DE ECONOMIA AGROPECUARIA
MARKET STATISTICS DIVISION
SAN SALVADOR, EL SALVADOR

more detail on a more frequent basis, that is, three or four times per year.

Production

The production of basic grains is obtained directly from the Agricultural Statistics Division's surveys. The recommendations for improving the production surveys included in the part of the training manual that includes the area frame sampling and production estimation.

Imports

The quantity of imported basic grains is derived from regular reportings by customs and quarantine offices, the Central Bank, World Food Program (WFP), and from information obtained directly from private importers. DGEA receives monthly reports from customs and the Central Bank on the quantity, source, name of importer, and date of basic grains imported. A very common problem in countries like El Salvador, with a free market in the region, is in maintaining accurate data on the market quantities and prices of neighboring countries.

Because a large percentage of the actual imports of basic grains occurs informally (without reporting to customs or the Central Bank), the actual quantity of imports is only a best guess by the DGEA. The direct inquiries made by DGEA officials with actual importers of basic grains are haphazard without any idea of the percentage of total imports reported.

For example, the total reported imports of white corn was 553,594 quintals in 1991/92. However, the Market Statistics Division was of the opinion that this represented as little as 20% of the total imports (Table 7.8).

Though the WFP sends to the DGEA reports on the total grains imported through their program from, for example, the EEC, Canada, Denmark, Japan, and the USA, these reported donations do not explain the total imports.

Recommendation: Since the Market Statistics Division receives periodic (weekly) lists on the agricultural commodity prices in neighboring countries (see Table 7.9), it is possible, if additional information on the demand/supply situation in each country is obtained, that the Market Statistics Division can anticipate the flow of grains and edible beans regionally, and in particular, the flow to and from El Salvador.

For example, edible beans are typically imported from Honduras. There are a certain number of truckers and wholesalers in certain cities in El Salvador who are involved actively in these border market activities. These truckers and wholesalers who are regularly consulted for prices (and in the future, volume information) also can be asked about current importing activities. The most probable manner for determining the total volume of imports will be that the DGEA increase their number and diversity of information sources. For this, the market reporters need to pursue information and leads provided to them by existing sources. When the information on imports is obtained, the information must be dated and put in DGEA's database, that is, the database that is used in the calculations of the balance sheet.

TABLE 7.8

IMPORTS OF BASIC GRAINS
(AUGUST/1991 - JULY/92)

MONTH	DGEA	BCR	CEPA	DGEA	BCR	CEPA
	----------QQ----------			----------QQ----------		
AUG			146739			
SEP	158902	60920	762739			
OCT	421404	12163				27674
NOV	813109		504761			
DEC	838567	1409463	666217			
JAN			110152	527576		499913
FEB	110156	172491				
MAR		18683				
APR	396			1148		
MAY	59672		59674	5450		
JUN				19420		
JUL						
TOTAL	2402200	1673720	2250282	553594		527587

SOURCE: DGEA-BCR-CEPA

IMPORTS OF BASIC GRAINS
(AUGUST/1991 - JULY/92)

MONTH	POLISHED RICE		PADDY RICE		BEANS	
	DGEA	BCR	DGEA	BCR	DGEA	BCR
	----------QQ----------		----------QQ----------			
AUG	49178	10028			11737	7830
SEP	16900	95748			41261	37930
OCT	16894	4048			29124	
NOV	23800	21324		26259	36498	
DEC	28441	48800		4670	26609	
JAN	46520	2318			36491	
FEB	26070	34346	2150	5959	25217	
MAR	22667	17150	1365		22457	
APR	2491				9850	
MAY	28663				7696	
JUN	107230				4554	
JUL						
TOTAL	368854	233762	3515	36888	251494	

SOURCE: DGEA-BCR-CEPA

TABLE 7.9

INFORMATION ON AGRICULTURAL PRODUCTS IN CENTRAL AMERICA

Date: April 24,1992

No.	ITEM	CHARACTERISTICS	MEASUREMENT UNIT	Costa Rica	E. Salvador	Guatemala	Honduras	Nicaragua
1	Beans	Black, to the producer	TM	569.87	---	427.17	---	---
2	Beans	Black, to the consumer	KILO	0.79	---	0.52	---	---
3	Beans	Red, to the producer	TM	569.87	393.47	385.00	289.87	217.39
4	Beans	Red, to the consumer	KILO	0.79	0.53	0.63	0.40	0.51
5	Rice	Paddy, dried to the producer	TM	263.41	237.36	---	184.97	261.00
6	Rice	Polished, first	KILO	0.60	0.66	0.68	0.72	0.75
7	Rice	Polished, popular	KILO	0.54	0.59	0.64	0.61	0.59
8	Corn	Yellow, to the producer	TM	133.40	---	152.00	---	---
9	Corn	Yellow, to the consumer	KILO	0.18	---	0.22	---	---
10	Corn	White, to the producer	TM	186.10	165.80	150.00	145.50	130.43
11	Corn	White, to the consumer	KILO	0.30	0.24	0.20	0.19	0.20
12	Sorghum	To the producer	TM	110.54	121.40	128.26	139.88	143.47

* Converted to US$.

--- Information not available.

SOURCE: Information supplied by the countries of Central America.

Human Consumption

Quantifying the human, animal, and commercial consumption of basic grains has been given limited attention by the Market Statistics Division of the DGEA. Human consumption of basic grains is estimated roughly by DGEA by multiplying the approximate per capita annual consumption of basic grains by the total population in El Salvador. Currently it's calculated on the basis of a per capita consumption rate of approximately 308 grams (246 grams of corn, 38 grams of beans, and 24 grams of rice) per day (MIDPLAN, 1988). Although the total human consumption of basic grains estimated by DGEA approximates (within 15%) the probable consumption of grains within El Salvador, it is an extremely cursory method that could easily be improved upon. No attention is given to the fact that consumption rates vary among rural and urban and among children and adults. Furthermore, no volume of marketings of basic grains is surveyed in the commercial markets throughout the country. Moreover, no use is made of the data collected in DGEA's own surveys on the quantity of basic grains consumed within the rural household.

Recommendation - Total human consumption (marketable surplus plus rural household consumption) should be estimated based on a number of different techniques. The majority of marketable surplus of basic grains used for human consumption can be estimated by DGEA by regularly collecting the volume of grains marketed in the cities within El Salvador. Reporters need to collect quantity (volume) data from truck operators, wholesalers, and wholesalers/retailers. Basic grains are brought daily into the markets within the cities in 10-ton, 3-ton, and 1.5-ton trucks. Daily, weekly, monthly, and seasonal changes in marketed quantities of basic grains in these cities should be analyzed and the results used for projecting consumption trends, producer and consumer prices, import needs, export possibilities, etc.

To complement the data collected on grain quantities marketed in the cities, data should be collected on the quantity and the monthly change in quantity of on-farm grain stocks. Although this information is collected in DGEA's first and second production surveys (Primera and Segunda Encuestas de Propositos Multiples), the monthly surveys need to be done by the enumerators in order to capture the monthly marketing activity of producers.

For measuring rural household consumption, the Primera and Segunda Encuestas de Propositos Multiples provide some useful information. In particular, these surveys solicit information as to how much of the individual household's grain production is, among other things, held in storage for household consumption. The quantity held for human consumption does not necessarily represent an entire year's supply. Rural households may buy a portion of their grain for household consumption during, especially, the latter months of the crop year. It is necessary that the DGEA be able to approximate how much of the total grain consumed by producers is derived from their own production.

A third measure of total human consumption would include collecting data on per capita consumption by age, income, and rural/urban groups. This

type of work, i.e., household demand studies, is being undertaken by the Ministry of Planning.

Surveys on consumer demand also can be conducted by the DGEA on a periodic basis. In this way, the DGEA has a means of checking their estimates of human consumption of basic grains and edible beans.

Industrial Consumption

Industrial consumption of basic grains is estimated based on annual reports sent to DGEA by DIANA, FAMOSSA, AVES, and other organizations. Grain for commercial uses includes corn for snack foods and Nixtamasa, and corn and sorghum for feeding chickens and other livestock. The reports from these companies are usually delinquent or, in some cases, not being sent. Little follow-up attention by the Market Statistics Division is given to maintain the least bit of rapport with the industrial sector.

Recommendation - DGEA needs to be in much closer contact with these organizations. When the author (accompanied by the Market Statistics Division Chief) met with the Directors/General Managers of these companies, monthly purchases and uses of the basic grains were immediately made available. Given a closer working relationship with these organizations, accessing monthly production and demand information in a timely fashion should not be a problem.

Animal Consumption

Data on grain for feed for livestock (on-farm) is being collected in the Primera and Segunda Encuestas de Propositos Multiples.

Recommendation - The rate of use of grain for feed needs to be collected on a monthly basis through its regular surveying mechanisms. The total use of grain for feed should be cross checked with the animal production on the farm (information already collected on the farm).

Seeds

The quantity of basic grains that is used as seeds is estimated by DGEA based on an average seed planting rate multiplied by the total planted acreage derived from DGEA's surveys, then, minus the quantity of seeds supplied to the producers by the private seed industry. In the past three years (1989/90 - 1991/92), DGEA has estimated the Seed and Grain Losses in the corn balance sheet to be approximately 800,000 quintals, though corn production has varied significantly during this period (Table 7.8).

Recommendation - DGEA already gathers information on seed type, quantity used, and price paid by producers in its Primera and Segunda Encuesta de Propositos Multiples. The use of self-produced corn seed for corn production in El Salvador represents about 65.5% of the total seed needs for corn producers. Using this percentage, about 79,100 quintals of corn seed in 1990/91 and 86,100 quintals of corn seed in 1991/92 were produced and stored on-farm. This type of calculation needs to be incorporated into DGEA's seed use estimation.

Furthermore, given an ambitious certified seed marketing campaign by the private seed producers, the potential demand for certified corn seeds could approximate 60% of the total seed used in the country. If there is

a consequent drop in the use of on-farm (non-certified) produced and stored seed, the decrease from a current level of 65.5% would need to be reflected in the corn balance sheet.

It is recommended that DGEA add to its Primera and Segunda Encuesta de Propositos Multiples questions that clearly request the percentage and quantity of non-certified corn used. Through these surveys DGEA will be able to get an accurate estimation of the use of seeds.

Grain Losses

Grain losses are not directly measured or regularly surveyed for by the DGEA. For the past three years, DGEA, in its annual Corn Balance Sheet, has estimated Seed and Grain Losses at approximately 800,000 quintals (Table 7.2). If the quantity of seed calculated above (see this Section under Seeds) is assumed to be a good approximation for the years 1990/91 and 1991/92, corn losses, as estimated by DGEA would have been about 720,900 quintals (800,000-79,100) or about 6.8% of the production and 713,900 quintals (800,000-86,100) or about 5.5% of the production, respectively, as given in the annual food balance sheets. There is no basis for this estimate, furthermore, it is likely to have underestimated the losses.

The DGEA has separated grain losses from seed use in their calculations of the current balance sheet. The correct estimation of the grain losses, as a percentage of the total production, reported by the Market Statistics Division is approximately 8% for corn, 5.7% for sorghum, 3.7% for beans, and 3.5% for rice (Table 7.7). These percentages are based on reports on postharvest losses in Honduras. How good these percentages reflect conditions of storage and drying or market circumstances in El Salvador has not been determined.
Recommendation - Grain losses need to estimated based on information provided by producers, industry users of grain, and other users. Again, within the Primera and Segunda Encuesta de Propositos Multiples, the estimate of losses should be investigated when the questions on the destination for the grains are being asked.

DGEA has indicated their desire to develop a methodology for determining grain postharvest losses. The other users of grains (e.g., DIANA, FAMOSSA) should also be asked about their grain losses.

Exports

DGEA collects reports on the quantity and price of grains exported from customs and the Central Bank. The DGEA needs to investigate through their regular surveying activities the quantity, the price, the destination, and the dates the grain was exported. This is especially critical now that the border countries have undertaken a free trade pact.

For example, wholesalers, especially in San Salvador, San Miguel, and other cities situated near Nicaragua, have found it profitable exporting beans in 1992. Those wholesalers have been very open with this information when DGEA has requested it. In San Salvador, there are only a few wholesalers that are handling the majority of the grain export activities. The DGEA has to make the effort of continually finding out about the imports and the exports of these wholesalers, and, if possible, to try to obtain additional information about other channels frequently used for the

marketing of grains and edible beans. The overall objective of the DGEA must be to expand the number of sources of information on imports and exports.

Food Security Stocks

Since 1990/91, DGEA has not been including food security stocks as a separate item in the balance sheet. Instead, the stocks are included in the beginning stock category, which is not the correct place for accounting for such stocks. The Banco Fomento de Agropecuaria (BFA) holds as part of its
food security stocks up to 1,000,000 quintals of corn and up to 100,000 quintals of beans. Because the BFA buys and sells corn and beans regularly, the level of stocks held changes from one month to another. In 1989/90, stocks were held an average of 21 months. In 1990/91, stocks were held an average of 10 months. Currently, BFA is trying to turnover its stocks rapidly. BFA has a total storage capacity of 2,019,600 quintals of corn.

In addition, WFP maintains about 4,000 mt of corn and 1,000 mt of beans in the country. WFP uses these stocks, which are bought and distributed by the Direccion General Logistic Alimentos (DGLA), in four programs, including programs in soil conservation, rural infrastructure, the National Reconstruction Plan, and for vulnerable groups (in, e.g., school feeding programs and mother health care centers). WFP has implemented food for work programs in soil conservation and in the National Reconstruction Plan.

In the past, WFP has bought stocks directly from BFA. However, because of BFA's supplying poor quality corn to WFP, WFP now has DGLA tender for corn and beans in the market. WFP has monetized its imported wheat in order to raise the funds for buying the corn used in their programs.

Recommendation - The food security stocks (corn and beans) need to be accounted for separately in quarterly or monthly food balance sheets. In the Team's meeting with Max Montana of BFA, all information regarding the monthly change in the stocks, costs of the stocks, etc. was made readily available. Again, DGEA needs to be in much closer contact with WFP and BFA when it comes to food security stocks.

Ending Stocks

The ending stocks are currently calculated by subtracting the total quantity demanded (utilization + contingency reserve) from the total quantity available. This procedure is correct, however, in balance sheets in some years, the quantity of ending stocks has not been used as the beginning stock in the following year. In all cases the ending stock has to equal the beginning stock of the following year. If the balance sheet is not in balance from year-to-year, then, the total grain available and the total used must be re-checked, re-surveyed, or verified in some other way.

7.3 Focus for Improvement of the Balance Sheet

Apart from the recommendations mentioned above, the focus for improving the balance sheet must include a database completely disaggregated for each one of

the grains. The details as to how the each item in the balance sheet was calculated must be kept within a database in order to have the potential for estimating the projected error in the estimations. For example:

- concerning imports, each one of the estimates made by the various sources of information (BFA, customs, Central Bank, private importers, etc.) must be included separately in the balance sheet, for their use in the final tabulation of the imports. The import prices (CIF to at least the border of El Salvador) must also be collected when possible for determining the transport costs, etc., and for comparing the actual import prices with the producer prices in the neighboring countries.

- under the category of internal demand, the utilization of each grain by the large industrial companies (DIANA, FAMOSA, AVES, etc.) must be accounted for separately in the balance sheet (understanding that this information is confidential). The historical monthly uses of grains must be maintained in the database in order to determine the trends in usage over time and space and in projecting the industrial use of grains.

- grain losses must be accounted for by DGEA separately. In addition, DGEA must report where the losses occurred (e.g., in the harvesting process, in on-farm storage, off-farm storage, etc.) and what were the causes of the grain losses (e.g., poor harvesting, storage, insect control, or drying practices, poor condition of handling and storage equipment, etc.).

7.4 Potential for Developing Quarterly Balance Sheets

The greatest problem in developing quarterly balance sheets at DGEA is in obtaining timely information about production, storage, and losses of grains and beans.

Since the three surveys (Primera, Segunda, and Apante) are done approximately 4 months apart, and since information on the use of the harvested grain (for household consumption, for seeds, for sale, etc.) is not collected in the Apante survey, it is recommended that mini surveys be conducted at regular intervals (in addition to the major survey efforts) in order to update the estimates for use in quarterly balance sheets.

Given the time spent by DGEA in planning, implementing, and processing the surveys, it is very important that the level of effort given in each survey coincide with the percentage of the total annual harvest of the crops. The percentage of grain and beans harvested in each harvesting period in 1990/91 was the following:

Corn

HARVEST PERIOD	TOTAL	HYBRID	NATIONAL
1st Harvest	92.7%	96.8%	84.2%
2nd Harvest	6.0%	1.9%	14.5%
3rd Harvest	1.3%	1.3%	1.3%

Beans

HARVEST PERIOD	TOTAL	SOLO	ASSOCIADO
1st Harvest	11.5%	6.6%	33.9%
2nd Harvest	82.0%	87.5%	56.8%
3rd Harvest	6.5%	5.9%	9.3%

Sorghum

HARVEST PERIOD	TOTAL	SOLO	ASSOCIADO
1st Harvest	- - -	- - -	- - -
2nd Harvest	100%	48.2 %	51.8%
3rd Harvest	- - -	- - -	- - -

Rice

HARVEST PERIOD	TOTAL	SOLO	ASSOCIADO
1st Harvest	- - -	- - -	- - -
2nd Harvest	100 %	- - -	- - -
3rd Harvest	- - -	- - -	- - -

Source: DGEA, Anuario de Estadisticas Agropecuarias, 1990-1991

The fact that more than 90% of annual corn harvest occurs in the first harvest period, that more than 80% of the annual bean harvest takes place in the second harvest period, and that 100% of sorghum and rice harvesting takes place in the second harvest period, clearly indicates that consideration must be given to changing the level of effort made with respect to each of the three surveys (Primera, Segunda, and Apante). For example, the level of effort given to the Apante survey is not justified since a very small percentage of corn and beans are harvested during this period.

7.5 Evaluation of the Balance Sheets

DGEA should be in a position to critically evaluate quarterly balance sheets with respect to trends in production, imports, consumption, losses, etc. For example, monthly (or if available weekly) reports on the prices and volumes of national and regional grain market supply, demand, and prices should provide the DGEA with appropriate information to determine the likely need and the appropriate time for grains to be imported.

DGEA should revise the figures in the quarterly balance sheets with other available information from other agencies within the Government or the private sector. For example, as the population increases (especially now that the civil conflict is over and many Salvadoreans are returning to El Salvador) the quantity of grains and beans demanded for human consumption will increase significantly. It is also expected that tastes and preferences for grains and beans will change as per capita income increases as would be expected now that the war is over and resources are used for more productive purposes.

SECTION VIII

SUMMARY

The objective of the training for the Market Statistics Division of DGEA is to provide a hands-on approach to improving the data collection, processing, and analytical activities at the DGEA.

The principal topics within the manual include the value of information, the organization of the data collection and analytical activities, the analysis of market margins, the analysis of prices over space, the analysis of prices over time, and the evaluation of the grain (and edible beans) balance sheets. The topics deal with obtaining more reliable agricultural statistics through enhanced collection efforts, the use of more disaggregated data for analysis, and the adoption of more statistically sound analytical procedures. The examples given within the manual use strictly data collected from the DGEA's databases or other sources in El Salvador. The examples are meant to provide the technical staff of the Division with a reference and guide in the event certain calculations or procedures are forgotten.

The manual provides a review of the current collection, processing, and analytical activities of the Division. Emphasis is then given on the adjustments that can be made by DGEA to current collection efforts to improve the overall reliability and usefulness of the data. For example, DGEA should be collecting average market prices (for price analysis) besides the mode prices (for radio broadcasts to the producers, et.al.) in order to improve the reliability of the price analytical results. Adjusting data collection activities to include collecting sales volumes, transport costs, price margins, and import and export information directly from truckers and wholesalers in various cities would greatly improve the analytical potential at DGEA, enhance DGEA's understanding of grain flows and market price dynamics, and, furthermore, give the Government of El Salvador the market information that is critically needed for basing many of its agricultural policies.

Finally, the manual provides a practical approach to DGEA for utilizing the statistical tools (such as, the variance, the standard deviation and the coefficient of variation) that may help in quantifying the data in more meaningful terms and making the analysis of, for example, market prices and margins much easier. Price and margin analysis (including spatial price analysis, price seasonality, and price forecasting) as it relates to the marketing of grain and edible bean products within El Salvador, is, then, provided through the use of various examples and methodologies, including regression.

The impact of the training, that is, the improvements in data collection, processing, and analysis will take time to take shape. The manual will, nevertheless, serve as a valuable reference for the technicians of DGEA as they carry out their surveillance and analytical activities in an environment of ever-changing markets and prices.

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ANNEX 1

Regression is a technique used to determine the relationship between variables. The simplest example would be a linear regression involving only two variables, an explanatory variable and an independent variable. There exists, e.g., a strong relationship between the producer price for sorghum (the explanatory variable) and the trucker price for sorghum (independent variable). To determine the correlation between the national producer price and the trucker price, a regression equation (in this case linear) can be used, where

producer price = constant + (coefficient) x trucker price

The object in using this technique is to fit the data to a straight line that best fits the data, the one which is the best moving average.

Regression analysis is used to predict the value of the producer price from the values of the trucker prices.

One might start with a data set in which the producer and trucker prices are on Quatro-Pro (QP). In the data format in QP, the variable names (preferably 4 or less letters or numbers) should be located in the cell immediately above the data for each variable.

Save the data in this format and record the range of the data.

ABSTAT can be used, then, to run the regression.

First, get out of QP and into ABSTAT.

At the prompt: "Which Command?" type CREATE.

This will create a file for the data to be imported into QP. Then name the file (probably easiest if named the same as the name given in QP) without an extension, for example,

sorgo1

ABSTAT will ask for the number of variables. Give a number that is greater than the number of variables in the data set in QP. The statement given by ABSTAT next explains the number of cases, that is, the number of data points for the variables. Then it saves the file as an ABSTAT file, in this case as

C:\ABSTAT\SORGO1.AB8

To bring or import files from LOTUS 123 or from QP, the LOTUS or QP file must have the extension WK1.

After the next "Which Command?" type READ. This tells ABSTAT to import the data. Then the next response is file name. For this example, use A:transprt.WK1 (this file is being supplied in the training program).

"Enter name of the file with extension"

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A:transprt.WK1

"Enter coordinates of the rows/columns for reading the file"

enter i205..j289

All the data points for the two variables (producer and trucker prices) except those missing in one month are used in the regression (since the objective in this exercise is to estimate the missing data points).

After "Which command?" type LIST

Then answer YES to ABSTAT's question "Are the names of the variables included on the first row?"

Then answer ALL to ABSTAT's question "What variables?"

ABSTAT now reads the data from QP.

Then to run the regression, type REGR

Then ABSTAT asks for the explanatory variable, enter s-prod

After that, ABSTAT asks for the independent variable, enter s-transp

Then additional statistics on a menu can be selected from, including
Estimates, Residuals, Durbin Watson, Stepwise.

By typing <CR> no additional statistics will be given.

The regression results then are given. The equation that was estimated was

s-prod = (estimated constant term) + (coefficient) x (s-transp)

The regression results indicate that the coefficient of determination is 0.938.

The coefficient of determination indicates how much of the change in the producer price (s-prod) is explained by the trucker price (s-transp).

This indicates that the 93.8% of the variation of the producer price of sorghum is explained by the trucker price of sorghum. This value can have a range from 0 to 1.

Values near 0 indicate that the producer price of sorghum is not explained or predicted by the trucker price of sorghum.

The estimated constant term is the value of the dependent variable (s-prod) when the independent variable (s-transp) is equal to 0.

The standard error (deviation) of the estimate describes the variability of the predicted values of the dependent variable (s-prod).

When the standard error of the estimate is close to 0, it indicates that the predicted values of s-prod will likely vary very little from the actual values of s-transp.

The regression coefficient is the weighting factor used to determine an independent variable's contribution to the predicted value itself.

The standard error of the coefficient describes how much variability is expected in the coefficient. A high positive or negative value would lower the significance level of the estimation (the coefficient) as compared to a lower value of the standard error. A high value to the t-statistic (= estimated coefficient/standard error) would indicate a greater significance level to the estimated coefficient. The closer the PROB (probability) is to 0 the greater the significance of the coefficient.

The regression results indicate the following relationship between the producer price and the trucker price:

(producer price) = 0.018 + (0.0884) x 60

where 60 C/QQ represents the trucker price in November 1988 (the month in which the producer price is missing). The coefficient of the regression is highly significant, and represents a good estimation of the relationship between the trucker price and the producer price.

The producer price is estimated to be 57.06 C/QQ.

ANNEX 2

IN SAN SALVADOR MARKET
PRICES/MARGINS OF CORN

MONTH/YEAR	C-PROD[1]	C-TRANSP[2]	C-TR-MR[3]	C-MAYOR[4]	C-MA-MR[5]	C-DETAIL[6]	C-DE-MR[7]
	C/QQ						
1/84	25.70	29.00	3.30	31.00	2.00	35.00	4.00
2/84	25.95	29.00	3.05	30.00	1.00	35.00	5.00
3/84	27.00	31.50	4.50	32.50	1.00	35.00	2.50
4/84	30.45	37.50	7.05	39.00	1.50	45.00	6.00
5/84	30.40	36.00	5.60	37.50	1.50	45.00	7.50
6/84	31.40	35.00	3.60	36.00	1.00	40.00	4.00
7/84	28.05	34.00	5.95	35.00	1.00	40.00	5.00
8/84	22.80	31.00	8.20	33.00	2.00	40.00	7.00
9/84	18.00	21.00	3.00	23.00	2.00	30.00	7.00
10/84	16.75	19.00	2.25	21.00	2.00	25.00	4.00
11/84	18.05	20.00	1.95	21.00	1.00	25.00	4.00
12/84	17.60	19.00	1.40	21.00	2.00	25.00	4.00
1/85	18.30	20.00	1.70	21.00	1.00	25.00	4.00
2/85	19.50	21.50	2.00	22.50	1.00	30.00	7.50
3/85	20.05	22.00	1.95	23.00	1.00	30.00	7.00
4/85	21.30	23.00	1.70	24.00	1.00	30.00	6.00
5/85	21.90	23.00	1.10	24.00	1.00	30.00	6.00
6/85	22.65	24.00	1.35	25.00	1.00	30.00	5.00
7/85	24.00	26.50	2.50	27.50	1.00	30.00	2.50
8/85	23.65	26.50	2.85	27.50	1.00	35.00	7.50
9/85	24.30	28.50	4.20	30.00	1.50	35.00	5.00
10/85	22.75	25.00	2.25	27.00	2.00	35.00	8.00
11/85	22.25	25.50	3.25	27.00	1.50	30.00	3.00
12/85	23.40	25.00	1.60	27.00	2.00	30.00	3.00
1/86	23.50	26.50	3.00	27.50	1.00	30.00	2.50
2/86	24.35	26.50	2.15	28.00	1.50	35.00	7.00
3/86	26.60	30.00	3.40	31.00	1.00	35.00	4.00
4/86	29.20	35.00	5.80	36.00	1.00	40.00	4.00
5/86	29.95	33.00	3.05	35.00	2.00	40.00	5.00
6/86	30.95	34.00	3.05	35.00	1.00	40.00	5.00
7/86	31.20	33.00	1.80	35.00	2.00	40.00	5.00
8/86	34.35	40.00	5.65	42.00	2.00	45.00	3.00
9/86	34.60	40.00	5.40	42.00	2.00	50.00	8.00
10/86	34.00	38.00	4.00	40.00	2.00	45.00	5.00
11/86	32.85	37.50	4.65	39.00	1.50	45.00	6.00
12/86	34.40	36.50	2.10	38.00	1.50	45.00	7.00
1/87	33.75	38.00	4.25	38.00	0.00	45.00	7.00
2/87	34.40	38.00	3.60	38.00	0.00	45.00	7.00
3/87	35.95	38.00	2.05	38.00	0.00	45.00	7.00
4/87	36.95	43.00	6.05	43.00	0.00	50.00	7.00
5/87	37.80	43.00	5.20	43.00	0.00	50.00	7.00
6/87	39.65	47.00	7.35	47.00	0.00	55.00	8.00

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IN SAN SALVADOR MARKET
PRICES/MARGINS OF CORN

MONTH/YEAR	C-PROD[1]	C-TRANSP[2]	C-TR-MR[3]	C-MAYOR[4]	C-MA-MR[5]	C-DETAL[6]	C-DE-MR[7]
	C/QQ						
7/87	41.55	50.00	8.45	50.00	0.00	55.00	5.00
8/87	41.30	46.00	4.70	46.00	0.00	55.00	9.00
9/87	33.90	49.00	15.10	49.00	0.00	55.00	6.00
10/87	31.55	38.00	6.45	38.00	0.00	50.00	12.00
11/87	32.80	38.00	5.20	38.00	0.00	50.00	12.00
12/87	34.15	38.00	3.85	38.00	0.00	50.00	12.00
1/88	34.45	36.00	1.55	38.00	2.00	50.00	12.00
2/88	33.70	36.00	2.30	38.00	2.00	50.00	12.00
3/88	35.00	36.00	1.00	38.00	2.00	50.00	12.00
4/88	35.30	39.00	3.70	42.00	3.00	50.00	8.00
5/88	39.65	50.00	10.35	55.00	5.00	60.00	5.00
6/88	45.55	51.50	5.95	54.00	2.50	60.00	6.00
7/88	47.95	51.50	3.55	53.00	1.50	60.00	7.00
8/88	45.70	55.00	9.30	60.00	5.00	65.00	5.00
9/88	44.70	50.00	5.30	60.00	10.00	65.00	5.00
10/88	41.20	40.00	-1.20	45.00	5.00	60.00	15.00
11/88	36.00	37.50	1.50	40.00	2.50	50.00	10.00
12/88	34.25	37.50	3.25	40.00	2.50	50.00	10.00
1/89	36.10	41.00	4.90	43.00	2.00	50.00	7.00
2/89	40.00	44.00	4.00	45.00	1.00	50.00	5.00
3/89	45.40	50.00	4.60	55.00	5.00	60.00	5.00
4/89	48.30	52.00	3.70	54.00	2.00	65.00	11.00
5/89	51.60	55.00	3.40	57.00	2.00	65.00	8.00
6/89	56.15	65.00	8.85	67.50	2.50	75.00	7.50
7/89	57.50	72.50	15.00	75.00	2.50	80.00	5.00
8/89	65.90	75.00	9.10	80.00	5.00	90.00	10.00
9/89	51.95	52.50	0.55	63.00	10.50	70.00	7.00
10/89	46.35	50.00	3.65	52.50	2.50	60.00	7.50
11/89	44.50	50.00	5.50	55.00	5.00	65.00	10.00
12/89	46.50	50.00	3.50	55.00	5.00	60.00	5.00
1/90	50.30	56.00	5.70	60.00	4.00	65.00	5.00
2/90	54.75	57.50	2.75	60.00	2.50	70.00	10.00
3/90	64.40	74.00	9.60	75.00	1.00	80.00	5.00
4/90	71.35	76.00	4.65	79.00	3.00	90.00	11.00
5/90	70.00	77.50	7.50	80.00	2.50	90.00	10.00
6/90	74.05	77.50	3.45	81.00	3.50	90.00	9.00
7/90	72.75	76.00	3.25	80.00	4.00	90.00	10.00
8/90	60.60	65.00	4.40	68.00	3.00	80.00	12.00
9/90	53.15	53.50	0.35	56.00	2.50	70.00	14.00
10/90	52.45	53.50	1.05	58.00	4.50	70.00	12.00
11/90	54.50	60.00	5.50	62.00	2.00	70.00	8.00
12/90	59.00	65.00	6.00	67.50	2.50	80.00	12.50
1/91	64.42	69.00	4.58	73.00	4.00	80.00	7.00

IN SAN SALVADOR MARKET
PRICES/MARGINS OF CORN

MONTH/YEAR	C-PROD[1]	C-TRANSP[2]	C-TR-MR[3]	C-MAYOR[4]	C-MA-MR[5]	C-DETAL[6]	C-DE-MR[7]
	----------	----------	----------	C/QQ	----------	----------	----------
2/91	65.73	69.00	3.27	72.00	3.00	80.00	8.00
3/91	67.20	71.00	3.80	74.00	3.00	80.00	6.00
4/91	69.90	75.00	5.10	77.50	2.50	85.00	7.50
5/91	70.56	75.00	4.44	77.00	2.00	85.00	8.00
6/91	73.24	79.00	5.76	82.00	3.00	90.00	8.00
7/91	76.92	78.00	1.08	80.00	2.00	90.00	10.00
8/91	83.57	87.50	3.93	90.00	2.50	100.00	10.00
9/91	73.11	87.50	14.39	90.00	2.50	100.00	10.00
10/91	68.28	69.00	0.72	75.00	6.00	90.00	15.00
11/91	66.40	70.00	3.60	73.00	3.00	80.00	7.00
12/91	67.26	70.00	2.74	73.00	3.00	85.00	12.00
1/92	64.85	69.00	4.15	72.00	3.00	80.00	8.00
2/92	64.03	67.00	2.97	70.00	3.00	80.00	10.00
3/92	63.42	67.00	3.58	70.00	3.00	80.00	10.00

[1] Producer price
[2] Trucker (assembly) price
[3] Producer-trucker margin
[4] Wholesaler price
[5] Trucker-wholesaler price
[6] Retailer price
[7] Wholesaler-retailer margin

Source: DGEA

IN SAN SALVADOR MARKET
PRICES/MARGINS OF SORGHUM

MONTH/YEAR	S-PROD[1]	S-TRANSP[2]	S-TR-MR[3]	S-MAYOR[4]	S-MA-MR[5]	S-DETAL[6]	S-DE-MR[7]
	----------	----------	----------	C/QQ	----------	----------	----------
1/84	17.35	21.00	3.65	23.00	2.00	30.00	7.00
2/84	16.80	21.00	4.20	22.00	1.00	30.00	8.00
3/84	18.00	19.00	1.00	20.00	1.00	30.00	10.00
4/84	17.60	20.00	2.40	21.00	1.00	25.00	4.00
5/84	17.85	20.00	2.15	21.00	1.00	30.00	9.00
6/84	17.95	20.00	2.05	21.00	1.00	25.00	4.00
7/84	17.70	20.00	2.30	22.00	2.00	25.00	3.00
8/84	13.20	21.00	7.80	22.00	1.00	25.00	3.00
9/84	16.70	20.00	3.30	22.00	2.00	25.00	3.00
10/84	15.00	18.00	3.00	20.00	2.00	25.00	5.00
11/84	15.45	17.50	2.05	19.00	1.50	25.00	6.00
12/84	15.15	17.50	2.35	19.00	1.50	25.00	6.00
1/85	15.50	17.50	2.00	19.00	1.50	25.00	6.00
2/85	15.60	18.00	2.40	20.00	2.00	25.00	5.00
3/85	16.85	20.50	3.65	22.00	1.50	25.00	3.00
4/85	17.90	21.00	3.10	22.00	1.00	30.00	8.00
5/85	17.95	21.50	3.55	22.00	0.50	30.00	8.00
6/85	19.85	22.00	2.15	24.00	2.00	30.00	6.00
7/85	22.55	25.00	2.45	26.00	1.00	30.00	4.00
8/85	24.15	26.50	2.35	28.00	1.50	35.00	7.00
9/85	26.50	27.50	1.00	29.00	1.50	35.00	6.00
10/85	27.00	29.00	2.00	30.00	1.00	35.00	5.00
11/85	26.55	32.50	5.95	35.00	2.50	40.00	5.00
12/85	24.30	30.00	5.70	32.00	2.00	40.00	8.00
1/86	20.15	22.50	2.35	25.00	2.50	35.00	10.00
2/86	21.90	25.00	3.10	27.00	2.00	35.00	8.00
3/86	22.60	26.00	3.40	28.00	2.00	35.00	7.00
4/86	25.50	28.00	2.50	30.00	2.00	35.00	5.00
5/86	26.80	30.00	3.20	31.00	1.00	35.00	4.00
6/86	28.50	33.00	4.50	35.00	2.00	40.00	5.00
7/86	29.70	33.00	3.30	35.00	2.00	40.00	5.00
8/86	33.55	38.00	4.45	40.00	2.00	45.00	5.00
9/86	37.85	39.00	1.15	41.00	2.00	50.00	9.00
10/86	36.85	39.00	2.15	41.00	2.00	50.00	9.00
11/86	32.95	37.00	4.05	41.00	4.00	50.00	9.00
12/86	29.55	37.50	7.95	39.00	1.50	50.00	11.00
1/87	27.45	37.50	10.05	34.00	-3.50	45.00	11.00
2/87	28.70	30.00	1.30	34.00	4.00	45.00	11.00
3/87	29.80	31.00	1.20	34.00	3.00	45.00	11.00
4/87	30.60	41.50	10.90	35.00	-6.50	45.00	10.00
5/87	31.05	33.00	1.95	35.00	2.00	45.00	10.00
6/87	33.95	39.00	5.05	41.00	2.00	50.00	9.00

IN SAN SALVADOR MARKET
PRICES/MARGINS OF SORGHUM

MONTH/YEAR	S-PROD[1]	S-TRANSP[2]	S-TR-MR[3]	S-MAYOR[4]	S-MA-MR[5]	S-DETAL[6]	S-DE-MR[7]
	C/QQ						
7/87	37.25	39.00	1.75	40.00	1.00	50.00	10.00
8/87	36.70	39.00	2.30	41.00	2.00	50.00	9.00
9/87	36.75	39.00	2.25	41.00	2.00	50.00	9.00
10/87	34.95	38.00	3.05	39.00	1.00	50.00	11.00
11/87	37.60	57.50	19.90	55.00	-2.50	65.00	10.00
12/87	38.35	45.00	6.65	50.00	5.00	65.00	15.00
1/88	36.35	40.00	3.65	45.00	5.00	60.00	15.00
2/88	34.55	37.00	2.45	42.00	5.00	60.00	18.00
3/88	35.20	40.00	4.80	45.00	5.00	60.00	15.00
4/88	38.90	42.50	3.60	45.00	2.50	60.00	15.00
5/88	39.85	45.00	5.15	48.00	3.00	60.00	12.00
6/88	45.20	52.50	7.30	55.00	2.50	65.00	10.00
7/88	51.80	52.50	0.70	55.00	2.50	65.00	10.00
8/88	51.65	52.00	0.35	55.00	3.00	65.00	10.00
9/88	52.75	57.50	4.75	60.00	2.50	70.00	10.00
10/88	55.10	57.50	2.40	60.00	2.50	70.00	10.00
11/88	57.06	60.00	2.94	62.50	2.50	70.00	7.50
12/88	38.95	60.00	21.05	62.50	2.50	70.00	7.50
1/89	31.45	33.00	1.55	35.00	2.00	50.00	15.00
2/89	30.90	35.00	4.10	36.00	1.00	50.00	14.00
3/89	33.10	38.00	4.90	45.00	7.00	50.00	5.00
4/89	34.00	40.00	6.00	40.00	0.00	50.00	10.00
5/89	38.30	41.00	2.70	45.00	4.00	55.00	10.00
6/89	39.00	45.00	6.00	48.00	3.00	60.00	12.00
7/89	44.55	52.50	7.95	55.00	2.50	65.00	10.00
8/89	47.50	57.50	10.00	62.00	4.50	70.00	8.00
9/89	51.15	60.00	8.85	63.00	3.00	70.00	7.00
10/89	45.65	52.50	6.85	58.00	5.50	70.00	12.00
11/89	47.15	50.00	2.85	55.00	5.00	70.00	15.00
12/89	43.80	45.00	1.20	55.00	10.00	70.00	15.00
1/90	42.90	47.50	4.60	53.00	5.50	65.00	12.00
2/90	42.40	50.00	7.60	55.00	5.00	65.00	10.00
3/90	47.70	52.50	4.80	55.00	2.50	70.00	15.00
4/90	48.65	55.00	6.35	60.00	5.00	70.00	10.00
5/90	48.05	53.50	5.45	58.00	4.50	70.00	12.00
6/90	50.90	55.00	4.10	58.00	3.00	70.00	12.00
7/90	53.00	57.50	4.50	60.00	2.50	70.00	10.00
8/90	55.65	57.50	1.85	60.00	2.50	70.00	10.00
9/90	52.35	57.50	5.15	60.00	2.50	70.00	10.00
10/90	52.00	57.50	5.50	60.00	2.50	70.00	10.00
11/90	55.90	57.50	1.60	60.00	2.50	70.00	10.00
12/90	54.90	65.00	10.10	68.00	3.00	80.00	12.00
1/91	51.90	57.50	5.60	60.00	2.50	75.00	15.00

IN SAN SALVADOR MARKET
PRICES/MARGINS OF SORGHUM

MONTH/YEAR	S-PROD[1]	S-TRANSP[2]	S-TR-MR[3]	S-MAYOR[4]	S-MA-MR[5]	S-DETAL[6]	S-DE-MR[7]
	C/QQ						
2/91	50.50	52.50	2.00	55.00	2.50	70.00	15.00
3/91	51.45	56.00	4.55	58.00	2.00	75.00	17.00
4/91	54.40	57.50	3.10	60.00	2.50	75.00	15.00
5/91	54.02	57.50	3.48	60.00	2.50	75.00	15.00
6/91	53.93	57.50	3.57	60.00	2.50	75.00	15.00
7/91	58.85	62.50	3.65	66.00	3.50	80.00	14.00
8/91	65.16	75.00	9.84	80.00	5.00	90.00	10.00
9/91	68.28	80.00	11.72	85.00	5.00	95.00	10.00
10/91	66.55	77.50	10.95	85.00	7.50	95.00	10.00
11/91	70.46	77.50	7.04	83.00	5.50	90.00	7.00
12/91	60.50	60.00	-0.50	70.00	10.00	90.00	20.00
1/92	45.98	50.00	4.02	55.00	5.00	80.00	25.00
2/92	45.88	50.00	4.12	55.00	5.00	75.00	20.00
3/92	46.22	50.00	3.78	55.00	5.00	75.00	20.00

[1] Producer price
[2] Trucker (assembly) price
[3] Producer-trucker margin
[4] Wholesaler price
[5] Trucker-wholesaler price
[6] Retailer price
[7] Wholesaler-retailer margin

Source: DGEA

IN SAN SALVADOR MARKET
PRICES/MARGINS OF BEANS

MONTH/YEAR	B-PROD[1]	B-TRANSP[2]	B-TR-MR[3]	B-MAYOR[4]	B-MA-MR[5]	B-DETAL[6]	B-DE-MR[7]
	C/QQ						
1/84	45.30	52.50	7.20	55.00	2.50	75.00	20.00
2/84	45.15	54.00	8.85	56.00	2.00	75.00	19.00
3/84	50.95	55.00	4.05	57.00	2.00	75.00	18.00
4/84	56.05	65.00	8.95	68.00	3.00	75.00	7.00
5/84	55.50	65.00	9.50	67.50	2.50	80.00	12.50
6/84	49.65	72.50	22.85	75.00	2.50	85.00	10.00
7/84	53.10	70.00	16.90	72.50	2.50	85.00	12.50
8/84	54.00	67.50	13.50	70.00	2.50	80.00	10.00
9/84	48.55	70.00	21.45	75.00	5.00	85.00	10.00
10/84	59.15	70.00	10.85	75.00	5.00	80.00	5.00
11/84	54.50	57.50	3.00	60.00	2.50	90.00	30.00
12/84	51.45	55.00	3.55	57.00	2.00	80.00	23.00
1/85	54.85	67.50	12.65	70.00	2.50	80.00	10.00
2/85	57.80	67.50	9.70	70.00	2.50	80.00	10.00
3/85	56.70	67.50	10.80	70.00	2.50	80.00	10.00
4/85	62.70	70.00	7.30	72.50	2.50	85.00	12.50
5/85	59.65	67.50	7.85	70.00	2.50	85.00	15.00
6/85	72.25	70.00	-2.25	72.50	2.50	80.00	7.50
7/85	68.85	75.00	6.15	77.50	2.50	90.00	12.50
8/85	73.85	75.00	1.15	80.00	5.00	90.00	10.00
9/85	85.10	100.00	14.90	102.50	2.50	120.00	17.50
10/85	90.15	125.00	34.85	130.00	5.00	140.00	10.00
11/85	71.25	72.50	1.25	78.00	5.50	100.00	22.00
12/85	76.35	80.00	3.65	82.50	2.50	100.00	17.50
1/86	71.90	82.50	10.60	85.00	2.50	100.00	15.00
2/86	74.65	80.00	5.35	85.00	5.00	100.00	15.00
3/86	87.60	100.00	12.40	110.00	10.00	120.00	10.00
4/86	91.65	100.00	8.35	108.00	8.00	120.00	12.00
5/86	87.85	100.00	12.15	105.00	5.00	120.00	15.00
6/86	102.75	115.00	12.25	120.00	5.00	130.00	10.00
7/86	103.65	112.50	8.85	115.00	2.50	130.00	15.00
8/86	107.10	117.50	10.40	120.00	2.50	135.00	15.00
9/86	102.80	120.00	17.20	125.00	5.00	140.00	15.00
10/86	102.90	120.00	17.10	125.00	5.00	140.00	15.00
11/86	98.10	100.00	1.90	105.00	5.00	130.00	25.00
12/86	98.05	100.00	1.95	105.00	5.00	130.00	25.00
1/87	95.80	105.00	9.20	110.00	5.00	125.00	15.00
2/87	93.45	100.00	6.55	105.00	5.00	125.00	20.00
3/87	95.55	95.00	-0.55	110.00	15.00	125.00	15.00
4/87	93.95	95.00	1.05	110.00	15.00	125.00	15.00
5/87	91.65	95.00	3.35	110.00	15.00	125.00	15.00
6/87	95.20	100.00	4.80	105.00	5.00	125.00	20.00

IN SAN SALVADOR MARKET
PRICES/MARGINS OF BEANS

MONTH/YEAR	B-PROD[1]	B-TRANSP[2]	B-TR-MR[3]	B-MAYOR[4]	B-MA-MR[5]	B-DETAL[6]	B-DE-MR[7]
	C/QQ						
7/87	83.65	100.00	16.35	105.00	5.00	125.00	20.00
8/87	82.90	90.00	7.10	95.00	5.00	120.00	25.00
9/87	80.20	90.00	9.80	95.00	5.00	120.00	25.00
10/87	95.70	90.00	-5.70	95.00	5.00	120.00	25.00
11/87	135.95	145.00	9.05	150.00	5.00	160.00	10.00
12/87	145.20	142.00	-3.20	145.00	3.00	165.00	20.00
1/88	157.05	170.00	12.95	175.00	5.00	190.00	15.00
2/88	181.95	190.00	8.05	200.00	10.00	210.00	10.00
3/88	236.75	245.00	8.25	250.00	5.00	275.00	25.00
4/88	302.80	325.00	22.20	340.00	15.00	350.00	10.00
5/88	305.45	325.00	19.55	335.00	10.00	360.00	25.00
6/88	387.25	375.00	-12.25	380.00	5.00	425.00	45.00
7/88	375.95	435.00	59.05	450.00	15.00	475.00	25.00
8/88	180.85	200.00	19.15	225.00	25.00	325.00	100.00
9/88	195.70	200.00	4.30	225.00	25.00	275.00	50.00
10/88	200.65	200.00	-0.65	210.00	10.00	275.00	65.00
11/88	152.95	160.00	7.05	170.00	10.00	200.00	30.00
12/88	151.90	167.00	15.10	175.00	8.00	200.00	25.00
1/89	156.20	170.00	13.80	175.00	5.00	200.00	25.00
2/89	184.15	200.00	15.85	200.00	0.00	225.00	25.00
3/89	184.90	205.00	20.10	210.00	5.00	225.00	15.00
4/89	181.70	200.00	18.30	195.00	-5.00	225.00	30.00
5/89	180.00	185.00	5.00	185.00	0.00	210.00	25.00
6/89	183.15	195.00	11.85	200.00	5.00	225.00	25.00
7/89	172.50	185.00	12.50	175.00	-10.00	220.00	45.00
8/89	178.00	205.00	27.00	185.00	-20.00	220.00	35.00
9/89	175.75	205.00	29.25	195.00	-10.00	225.00	30.00
10/89	178.30	200.00	21.70	175.00	-25.00	225.00	50.00
11/89	174.95	175.00	0.05	180.00	5.00	220.00	40.00
12/89	175.00	180.00	5.00	185.00	5.00	200.00	15.00
1/90	180.15	185.00	4.85	200.00	15.00	220.00	20.00
2/90	179.10	185.00	5.90	200.00	15.00	225.00	25.00
3/90	193.80	200.00	6.20	205.00	5.00	225.00	20.00
4/90	202.35	220.00	17.65	225.00	5.00	230.00	5.00
5/90	214.00	220.00	6.00	225.00	5.00	240.00	15.00
6/90	240.00	265.00	25.00	275.00	10.00	300.00	25.00
7/90	249.00	265.00	16.00	275.00	10.00	300.00	25.00
8/90	257.00	250.00	-7.00	255.00	5.00	275.00	20.00
9/90	279.40	285.00	5.60	290.00	5.00	325.00	35.00
10/90	279.35	285.00	5.65	290.00	5.00	320.00	30.00
11/90	220.00	250.00	30.00	255.00	5.00	300.00	45.00
12/90	233.75	235.00	1.25	245.00	10.00	275.00	30.00
1/91	243.82	250.00	6.18	260.00	10.00	275.00	15.00

IN SAN SALVADOR MARKET
PRICES/MARGINS OF BEANS

MONTH/YEAR	B-PROD[1]	B-TRANSP[2]	B-TR-MR[3]	B-MAYOR[4]	B-MA-MR[5]	B-DETAL[6]	B-DE-MR[7]
	C/QQ						
2/91	251.30	260.00	8.70	270.00	10.00	290.00	20.00
3/91	267.70	290.00	22.30	300.00	10.00	325.00	25.00
4/91	280.60	300.00	19.40	310.00	10.00	325.00	15.00
5/91	290.35	300.00	9.65	315.00	15.00	330.00	15.00
6/91	305.40	305.00	-0.40	315.00	10.00	330.00	15.00
7/91	319.55	345.00	25.45	355.00	10.00	380.00	25.00
8/91	314.11	340.00	25.89	345.00	5.00	375.00	30.00
9/91	280.60	275.00	-5.60	300.00	25.00	350.00	50.00
10/91	241.44	240.00	-1.44	250.00	10.00	300.00	50.00
11/91	198.53	200.00	1.47	225.00	25.00	250.00	25.00
12/91	191.89	195.00	3.11	210.00	15.00	250.00	40.00
1/92	178.55	185.00	6.45	200.00	15.00	225.00	25.00
2/92	155.86	180.00	24.14	195.00	15.00	225.00	30.00
3/92	150.21	160.00	9.79	175.00	15.00	200.00	25.00

[1] Producer price
[2] Trucker (assembly) price
[3] Producer-trucker margin
[4] Wholesaler price
[5] Trucker-wholesaler price
[6] Retailer price
[7] Wholesaler-retailer margin

Source: DGEA

IN SAN SALVADOR MARKET
PRICES/MARGINS OF RICE

MONTH/YEAR	R-PROD[1]	R-TRANSP[2]	R-TR-MR[3]	R-MAYOR[4]	R-MA-MR[5]	R-DETAL[6]	R-DE-MR[7]
	C/QQ						
1/84	31.70	74.00	42.30	76.00	2.00	90.00	14.00
2/84	25.80	80.00	54.20	82.00	2.00	100.00	18.00
3/84	29.90	80.00	50.10	83.00	3.00	100.00	17.00
4/84	28.70	76.00	47.30	79.00	3.00	90.00	11.00
5/84	24.95	76.00	51.05	78.00	2.00	100.00	22.00
6/84	28.00	73.00	45.00	79.00	6.00	90.00	11.00
7/84	29.70	73.00	43.30	76.00	3.00	90.00	14.00
8/84	20.00	70.00	50.00	75.00	5.00	90.00	15.00
9/84	21.30	63.00	41.70	65.00	2.00	90.00	25.00
10/84	17.95	52.00	34.05	55.00	3.00	80.00	25.00
11/84	19.85	50.00	30.15	52.00	2.00	80.00	28.00
12/84	13.85	48.00	34.15	50.00	2.00	80.00	30.00
1/85	20.45	58.00	37.55	60.00	2.00	80.00	20.00
2/85	24.40	60.00	35.60	62.00	2.00	80.00	18.00
3/85	22.50	60.00	37.50	62.00	2.00	80.00	18.00
4/85	21.95	60.00	38.05	62.00	2.00	80.00	18.00
5/85	20.00	60.00	40.00	62.00	2.00	80.00	18.00
6/85	19.35	60.00	40.65	62.00	2.00	80.00	18.00
7/85	23.85	60.00	36.15	62.00	2.00	80.00	18.00
8/85	23.60	62.00	38.40	65.00	3.00	80.00	15.00
9/85	21.95	62.00	40.05	65.00	3.00	80.00	15.00
10/85	22.85	60.00	37.15	62.00	2.00	80.00	18.00
11/85	23.95	57.00	33.05	60.00	3.00	75.00	15.00
12/85	21.50	60.00	38.50	62.00	2.00	75.00	13.00
1/86	28.35	65.00	36.65	68.00	3.00	80.00	12.00
2/86	25.80	62.00	36.20	65.00	3.00	80.00	15.00
3/86	25.65	62.00	36.35	65.00	3.00	80.00	15.00
4/86	28.90	62.00	33.10	65.00	3.00	85.00	20.00
5/86	31.45	70.00	38.55	73.00	3.00	80.00	7.00
6/86	31.90	68.00	36.10	70.00	2.00	80.00	10.00
7/86	29.75	65.00	35.25	68.00	3.00	85.00	17.00
8/86	30.50	70.00	39.50	73.00	3.00	90.00	17.00
9/86	31.55	70.00	38.45	75.00	5.00	90.00	15.00
10/86	32.85	75.00	42.15	78.00	3.00	90.00	12.00
11/86	31.40	73.00	41.60	75.00	2.00	90.00	15.00
12/86	30.65	72.00	41.35	75.00	3.00	90.00	15.00
1/87	37.35	72.00	34.65	75.00	3.00	90.00	15.00
2/87	35.00	82.00	47.00	85.00	3.00	100.00	15.00
3/87	39.10	82.00	42.90	85.00	3.00	100.00	15.00
4/87	40.10	90.00	49.90	100.00	10.00	110.00	10.00
5/87	42.10	95.00	52.90	100.00	5.00	110.00	10.00
6/87	52.00	125.00	73.00	130.00	5.00	140.00	10.00

IN SAN SALVADOR MARKET
PRICES/MARGINS OF RICE

MONTH/YEAR	R-PROD[1]	R-TRANSP[2]	R-TR-MR[3]	R-MAYOR[4]	R-MA-MR[5]	R-DETAL[6]	R-DE-MR[7]
	C/QQ						
7/87	52.00	125.00	73.00	130.00	5.00	140.00	10.00
8/87	50.00	114.00	64.00	122.00	8.00	140.00	18.00
9/87	49.00	112.00	63.00	115.00	3.00	140.00	25.00
10/87	47.00	108.00	61.00	118.00	10.00	130.00	12.00
11/87	47.00	108.00	61.00	110.00	2.00	130.00	20.00
12/87	47.00	108.00	61.00	110.00	2.00	140.00	30.00
1/88	60.60	125.00	64.40	130.00	5.00	140.00	10.00
2/88	57.55	125.00	67.45	130.00	5.00	140.00	10.00
3/88	70.10	128.00	57.90	130.00	2.00	150.00	20.00
4/88	75.65	138.00	62.35	140.00	2.00	160.00	20.00
5/88	74.35	138.00	63.65	140.00	2.00	160.00	20.00
6/88	73.60	140.00	66.40	145.00	5.00	160.00	15.00
7/88	74.80	140.00	65.20	145.00	5.00	160.00	15.00
8/88	66.30	140.00	73.70	142.00	2.00	160.00	18.00
9/88	68.50	138.00	69.50	140.00	2.00	160.00	20.00
10/88	44.75	130.00	85.25	133.00	3.00	150.00	17.00
11/88	39.75	130.00	90.25	135.00	5.00	150.00	15.00
12/88	35.90	95.00	59.10	100.00	5.00	125.00	25.00
1/89	46.30	100.00	53.70	110.00	10.00	120.00	10.00
2/89	55.00	100.00	45.00	115.00	15.00	125.00	10.00
3/89	48.50	110.00	61.50	115.00	5.00	130.00	15.00
4/89	55.10	120.00	64.90	125.00	5.00	130.00	5.00
5/89	40.80	110.00	69.20	115.00	5.00	130.00	15.00
6/89	41.85	110.00	70.00	115.00	5.00	130.00	15.00
7/89	40.80	110.00	64.00	115.00	5.00	130.00	15.00
8/89	40.00	120.00	75.10	125.00	5.00	140.00	15.00
9/89	46.00	120.00	76.20	125.00	5.00	140.00	15.00
10/89	44.90	115.00	70.10	120.00	5.00	140.00	20.00
11/89	43.80	105.00	55.10	110.00	5.00	140.00	30.00
12/89	44.90	115.00	61.00	125.00	10.00	140.00	15.00
1/90	49.90	115.00	67.70	120.00	5.00	140.00	20.00
2/90	54.00	115.00	63.95	118.00	3.00	140.00	22.00
3/90	47.30	115.00	62.70	120.00	5.00	140.00	20.00
4/90	51.05	118.00	63.20	122.00	4.00	140.00	18.00
5/90	52.30	118.00	57.00	122.00	4.00	140.00	18.00
6/90	54.80	120.00	63.70	122.00	2.00	140.00	18.00
7/90	61.00	130.00	65.95	135.00	5.00	150.00	15.00
8/90	56.30	140.00	75.60	145.00	5.00	160.00	15.00
9/90	64.05	144.00	78.00	148.00	4.00	160.00	12.00
10/90	64.40	145.00	78.00	150.00	5.00	170.00	20.00
11/90	66.00	148.00	78.00	150.00	2.00	170.00	20.00
12/90	67.00	155.00	82.40	160.00	5.00	170.00	10.00
1/91	106.20	215.00	108.80	220.00	5.00	240.00	20.00

IN SAN SALVADOR MARKET
PRICES/MARGINS OF RICE

MONTH/YEAR	R-PROD[1]	R-TRANSP[2]	R-TR-MR[3]	R-MAYOR[4]	R-MA-MR[5]	R-DETAL[6]	R-DE-MR[7]
	----------	----------	----------	C/QQ	----------	----------	----------
2/91	115.20	215.00	99.80	220.00	5.00	250.00	30.00
3/91	115.20	225.00	109.80	230.00	5.00	250.00	20.00
4/91	110.00	230.00	120.00	235.00	5.00	250.00	15.00
5/91	106.85	230.00	123.15	235.00	5.00	250.00	15.00
6/91	113.55	230.00	116.45	235.00	5.00	250.00	15.00
7/91	112.04	225.00	112.96	235.00	10.00	250.00	15.00
8/91	102.04	225.00	122.96	228.00	3.00	250.00	22.00
9/91	92.04	225.00	132.96	230.00	5.00	250.00	20.00
10/91	85.40	195.00	109.60	200.00	5.00	250.00	50.00
11/91	85.94	195.00	109.06	200.00	5.00	250.00	50.00
12/91	92.94	200.00	107.06	205.00	5.00	250.00	45.00
1/92	86.45	200.00	113.55	210.00	10.00	250.00	40.00
2/92	91.62	205.00	113.38	210.00	5.00	250.00	40.00
3/92	91.12	205.00	113.88	210.00	5.00	250 00	40.00

[1] Producer price
[2] Trucker (assembly) price
[3] Producer-trucker margin
[4] Wholesaler price
[5] Trucker-wholesaler price
[6] Retailer price
[7] Wholesaler-retailer margin

Source: DGEA

ANNEX 3

DATA FOR THE REGRESSION IN TABLES 5.4 - 5.5 TRUCKER PRICES FOR CORN IN SAN SALVADOR, SANTA ANA, AND SAN MIGUEL

CASE	TRUCKER PRICE SAN SALVADOR	SANTA ANA	SAN MIGUEL
	----------	C/QQ	----------
1	87.50	85.00	87.50
2	82.50	80.00	88.00
3	85.00	82.00	88.00
4	85.00	85.00	88.00
5	87.50	87.00	85.00
6	87.50	87.00	87.50
7	80.00	87.00	85.00
8	77.50	75.00	84.00
9	75.00	75.00	75.00
10	74.00	75.00	75.00
11	72.50	75.00	75.00
12	70.00	70.00	75.00
13	69.00	65.00	72.00
14	70.00	65.00	71.00
15	70.00	65.00	70.00
16	71.00	66.00	70.00
17	70.00	66.00	70.00
18	70.00	67.50	70.00
19	70.00	65.00	70.00
20	69.00	65.00	70.00
21	68.50	66.00	70.00
22	69.00	65.00	70.00
23	68.00	62.50	70.00
24	67.50	65.00	70.00
25	67.00	65.50	70.00
26	67.00	62.00	65.00
27	67.00	62.50	67.00
28	66.00	62.50	67.00
29	68.00	63.00	67.00
30	69.00	65.00	75.00
31	75.00	67.00	70.00
32	76.00	70.00	70.00
33	75.00	71.00	75.00
34	75.00	72.00	76.00
35	75.00	71.00	76.00
36	75.00	71.00	74.00
37	75.00	76.00	75.00

ANNEX 4

DATA FOR THE REGRESSION IN TABLE 5.6
TRUCKER PRICES FOR CORN IN TEN CITIES IN EL SALVADOR

CASE	DATE	AHUACHAPAN (AH) CORN	COJUTEPEQUE (CO) CORN	SAN MIGUEL (SM) CORN	SAN SALVADOR (SS) CORN	SAN VICENTE (SV) CORN	SANTA ANA (SA) CORN	SANTA TECLA (ST) CORN	SONSONATE (SO) CORN	USULATAN (US) CORN	ZACATECOLUCA (ZA) CORN
		C/QQ									
1	14/02/92	67.50	75.00	70.00	67.00	66.00	65.50	67.50	65.00	66.00	66.00
2	21/02/92	65.00	70.00	65.00	67.00	64.00	62.00	68.00	64.00	63.00	66.00
3	28/02/92	65.00	70.00	67.00	67.00	66.00	62.50	68.00	65.00	64.00	66.00
4	06/03/92	62.50	70.00	67.00	66.00	66.00	62.50	67.00	65.00	65.00	66.00
5	13/03/92	63.00	70.00	67.00	68.00	66.00	63.00	67.50	66.00	63.00	61.00
6	16/03/92	63.00	75.00	75.00	69.00	69.00	65.00	65.00	67.50	65.00	72.00
7	23/03/92	65.00	75.00	70.00	75.00	70.00	67.00	71.00	68.00	67.50	66.00
8	30/03/92	68.00	80.00	70.00	76.00	72.50	70.00	75.00	71.00	70.00	66.00
9	21/04/92	72.50	77.50	75.00	75.00	75.00	71.50	75.00	75.00	72.00	72.00
10	27/04/92	72.50	80.00	76.00	75.00	75.00	72.00	75.00	70.00	72.00	72.00
11	04/05/92	74.00	75.00	76.00	75.00	78.00	71.00	75.00	73.00	71.00	72.00
12	11/05/92	74.00	80.00	74.00	75.00	77.00	71.00	75.00	75.00	71.00	72.00
13	25/05/92	74.00	82.50	75.00	80.00	83.00	76.00	80.00	77.00	80.00	75.00

ANNEX 5

Chapter 20

The X11 Procedure

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ABSTRACT

The X11 procedure, an adaptation of the U.S. Bureau of the Census X-11 Seasonal Adjustment program, can be used to seasonally adjust monthly or quarterly time series. Optionally, it provides summary measures from input data already seasonally adjusted, makes additive and multiplicative adjustments, and creates an output data set containing the adjusted time series.

INTRODUCTION

Seasonal adjustment of a time series is based on the assumption that seasonal fluctuations can be measured in the original series, O, and separated from trend, cyclical, trading-day, and irregular fluctuations. The seasonal component of a time series, S, is defined as intrayear variation that is repeated constantly or in an evolving fashion from year to year. The trend cycle component, C, includes variation due to the long-term trend, the business cycle, and other cyclical factors. The trading-day component, TD, is the variation that can be attributed to the composition of the calendar. The irregular component, I, is the residual variation. Experience indicates that many economic time series are related in a multiplicative

fashion (O=S×C×TD×I). A seasonally adjusted time series, C×I, consists of only the trend cycle and irregular components. (In the U.S. Bureau of Census documentation for the X-11 seasonal adjustment method (Bureau of Census (1967)), the result of dividing the original series (O=S×C×TD×I) by an estimate of the trend cycle component (C) is termed the *S-I ratio*.)

The input data set must contain either quarterly or monthly time series, and the data must be in chronological order. There must be at least three years of observations (12 for quarterly time series or 36 for monthly) in the input data sets or in each BY group in the input data set if a BY statement is used.

Outline of the Method

The following steps describe PROC X11's analysis of a monthly time series using multiplicative adjustments. Similar descriptions apply if additive adjustments or a quarterly series is specified.

1. The X11 procedure reads and verifies the time series. Optionally, the procedure reads prior monthly factors and divides them into the original series. Seven daily weights can be specified to develop monthly factors to adjust the series for trading-day variation.

   In steps 2, 3, and 4, PROC X11 performs three iterations, each of which provides estimates of the seasonal, trading-day, trend cycle, and irregular components. Each iteration allows the procedure to make refined estimates of extreme values in the irregular components. After extreme values are identified and modified, PROC X11 produces the final estimates of the seasonal component, seasonally adjusted series, trend cycle, and irregular components.
2. Step 2 consists of three substeps:
   a. During the first iteration, the procedure applies a centered 12-term moving average to the original series to provide a preliminary estimate of the trend cycle curve. This moving average combines 12 consecutive monthly values, removing seasonal and irregular variation. Next, it obtains a preliminary estimate of the S-I ratio component by dividing the original series by the trend cycle curve.
   b. The procedure applies a moving average to the S-I ratio component to estimate the seasonal factors. It then divides the S-I ratio series by these seasonal factors to provide an estimate of the irregular component. Next, it calculates a moving standard deviation from the irregular component and uses it to assign a weight to each monthly value for measuring its degree of extremeness. The procedure uses these weights to modify extreme values in the S-I ratio component. It estimates new seasonal factors by applying a moving average to the modified S-I ratio component. PROC X11 obtains a preliminary seasonally adjusted time series by dividing the original series by these seasonal factors. It obtains a second estimate of the trend cycle curve by applying a weighted moving average to this seasonally adjusted series.
   c. PROC X11 uses the same process to obtain second estimates of the seasonally adjusted series and improved estimates of the irregular component. It modifies this irregular component again for extreme values and uses it to provide estimates of trading-day factors and refined weights for the identification of extreme values.

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3. Using the same computations, PROC X11 performs a second iteration on the original series that has been adjusted by the trading-day factors and irregular weights developed in the first iteration. The second iteration produces final estimates of the trading-day factors and irregular weights.
4. PROC X11 performs a third and final iteration using the original series that has been adjusted for trading-day factors and irregular weights computed during the second iteration. During the third iteration, PROC X11 develops final estimates of seasonal factors, the seasonally adjusted series, trend cycle, and irregular components. The procedure computes summary measures of variation and produces a moving average of the final adjusted series.

SPECIFICATIONS

The X11 procedure uses the following statements:

PROC X11 *options;* **MONTHLY** *options;* or **QUARTERLY** *options;*	required statements
BY *variables;* **ID** *variables;* **MACURVES** *option;* **OUTPUT OUT=***SASdataset option;* **PDWEIGHTS** *option;* **TABLES** *tablenames;* **VAR** *variables;*	optional statements

Either the MONTHLY or QUARTERLY statement must be specified, depending on the type of time series data you have. The PDWEIGHTS and MACURVES statements can be used with the MONTHLY statement but not the QUARTERLY statement. The OUTPUT statement controls the creation of an output data set.

PROC X11 Statement

PROC X11 *options;*

The following options can appear in the PROC X11 statement:

DATA=*SASdataset*
names the SAS data set to be used by PROC X11. If it is omitted, the most recently created SAS data set is used.

YRAHEADOUT
adds one-year-ahead forecast values to the output data set if one is created. For monthly data, the option affects only tables C16 (regression trading-day adjustment factors), C18 (trading-day factors from combined daily weights), and D10 (seasonal factors). For quarterly data, only D10 is affected. Variables for all other tables have missing values for the forecast observations. The forecast values for a table are included only if that table is specified in the OUTPUT statement as a table to be included in the output data set.

If the input data are monthly time series, 12 extra observations are added to the end of the output data set. (If a BY statement is used, 12 extra observations are added to the end of each BY group.) For these 12

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observations, the values for the variables correspond to the last 12 values of tables C16, C18, and D10.

If the input data are quarterly time series, four extra observations are added to the end of the output data set. (If a BY statement is used, four extra observations are added to each BY group.)

If the DATE= variable specified in the MONTHLY or QUARTERLY statement is also specified in the ID statement, that variable's values are the forecast dates for the new observations. However, all other ID variables retain the same value they had for the last C16, C18, or D10 observation.

BY Statement

BY *variables;*

A BY statement can be used with PROC X11 to obtain separate analyses on observations in groups defined by the BY variables. When a BY statement appears, the procedure expects the input data set to be sorted in order of the BY variables. If your input data set is not sorted in ascending order, use the SORT procedure with a similar BY statement to sort the data, or, if appropriate, use the BY statement options NOTSORTED or DESCENDING. For more information, consult base SAS documentation.

ID Statement

ID *variables;*

If you are creating an output data set, use the ID statement to put values of the ID variables, in addition to the adjusted time series values, into the output data set. The ID statement has no effect when an output data set is not created. If the DATE= variable specified in the MONTHLY or QUARTERLY statement is also specified in the ID statement, that variable's values are the forecast dates for the new observations. However, all other ID variables retain the same value they had for the last C16, C18, or D10 observation.

MACURVES Statement

MACURVES *option;*

The MACURVES statement specifies the length of the moving-average curves for estimating the seasonal factors for any month. This statement can be used only with monthly time series data.

The option below can appear in the MACURVES statement:

month=specification

specifies the moving average for a given month. Give the *month* (or the first three letters), an equal sign, and then one of these values:

3	specifies a three-term moving average for the month
'3X3'	specifies a three-by-three moving average
'3X5'	specifies a three-by-five moving average
'3X9'	specifies a three-by-nine moving average
STABLE	specifies a stable seasonal factor (average of all values for the month).

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For example, the statement

```
macurves february=3;
```

uses a three-term moving average to estimate seasonal factors for February.

You can include specifications for any number of months. If the specification for a month is omitted, the X11 procedure uses a three-by-three moving average for the first estimate of each iteration and a three-by-five average for the second estimate.

MONTHLY Statement

MONTHLY *options*;

The MONTHLY statement must be used when the input data to PROC X11 are monthly time series. The MONTHLY statement specifies options that determine the computations performed by PROC X11 and what is included in its output. Either the DATE= or START= option must be used.

The options below can appear in the MONTHLY statement:

ADDITIVE
performs additive adjustments. If the ADDITIVE option is omitted, PROC X11 performs multiplicative adjustments.

CHARTS=STANDARD
CHARTS=NONE
CHARTS=ALL
specifies the charts to be produced by the procedure. The default value is STANDARD, which specifies 12 monthly seasonal charts and a trend cycle chart. If you specify ALL, the procedure prints additional charts of irregular and seasonal factors. To print no charts, specify CHARTS=NONE. You must specify both PRINTOUT=NONE and CHARTS=NONE to suppress all printed output.

DATE=*variable*
specifies a variable that gives the date for each observation. The starting and ending dates are obtained from the first and last values of *variable*, which must be SAS date values. The X11 procedure checks values of the specified variable to ensure that the input observations are sequenced correctly. If the DATE= option is not specified, the START= option must be specified.

END=*mmmyy*
adjusts only the part of the input series ending with the month and year given. For example, END=DEC70.

EXCLUDE=*n*
excludes from the trading-day regression irregular values that are more than *n* standard deviations from the mean. The default is EXCLUDE=2.5.

FULLWEIGHT=*n*
assigns weights to irregular values based on their distance from the mean in standard deviation units. The weights are used for estimating seasonal and trend cycle components. Irregular values less than the standard deviation limit specified in the FULLWEIGHT= option are assigned full weights of 1. Values that fall between the two limits (ZEROWEIGHT= and FULLWEIGHT=) are assigned weights linearly graduated between 0 and 1. For example, if ZEROWEIGHT=2 and

FULLWEIGHT=1, a value 1.3 standard deviations from the mean would be assigned a graduated weight. The default is FULLWEIGHT=1.5.

LENGTH
includes length-of-month allowance in computing trading-day factors. If this option is omitted, length-of-month allowances are included with the seasonal factors.

NDEC=*number*
specifies the number of decimal places shown on the output tables. This option has no effect on the precision of the variables in the output data set.

PMFACTOR=*variable*
specifies a variable containing previously specified monthly factors. Use this option if you have previous knowledge of monthly adjustment factors. The PMFACTOR= option can be used to

- adjust the level of all or part of a series with discontinuities
- adjust for the influence of holidays that fall on different dates from year to year, such as the effect of Easter on certain retail sales
- adjust for unreasonable weather influence on series such as housing starts
- adjust for changing starting dates of fiscal years (for budget series) or model years (for automobiles)
- adjust for temporary dislocating events, such as strikes.

PRINTOUT=STANDARD
PRINTOUT=LONG
PRINTOUT=FULL
PRINTOUT=NONE
specifies the tables to be printed by the procedure. If STANDARD is specified, between 17 and 27 tables are printed, depending on the options that are specified. PRINTOUT=LONG prints between 27 and 39 tables, and PRINTOUT=FULL prints between 44 and 59 tables. Specifying NONE results in no tables being printed; however, charts are still printed. You must specify both PRINTOUT=NONE and CHARTS=NONE to have no printed output. If the PRINTOUT= option is omitted, the default value is STANDARD.

START=*mmmyy*
adjusts only the part of the input series starting with the month and year given. When the DATE= option is not used, the START= option gives the year and month of the first input observation. For example, START=JAN66. If DATE= is not specified, START= must be specified.

SUMMARY
specifies that the data are already seasonally adjusted and the procedure is to produce summary measures. If the SUMMARY option is omitted, the X11 procedure performs seasonal adjustment of the input data before calculating summary measures.

TDCOMPUTE=*year*
uses the part of the input series beginning with January of the specified year (*year*) to derive trading-day weights. If this option is omitted, the entire series is used.

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TDREGR=NONE
TDREGR=PRINT
TDREGR=ADJUST
TDREGR=TEST
specifies the treatment of trading-day regression. The value NONE omits the computation of the trading-day regression. The value PRINT computes and prints the trading-day regressions but does not adjust the series. The value ADJUST computes and prints the trading-day regression and adjusts the irregular components to obtain preliminary weights. The value TEST adjusts the final series if the trading-day regression estimates explain significant variation on the basis of an *F* test (or residual trading-day variation if prior weights are used). By default, TDREGR=NONE.

TRENDADJ
modifies extreme irregular values prior to computing the trend cycle estimates. If TRENDADJ is omitted, the trend cycle is computed without modifications for extremes.

TRENDMA=*n*
specifies the number of terms in the moving average to be used by the procedure in estimating the variable trend cycle component. Valid values for *n* are 9, 13, and 23. If the TRENDMA= option is omitted, the procedure selects an appropriate moving average. For information concerning the number of terms in the moving average, see the U.S. Bureau of the Census publication *The X-11 Variant of the Census Method II Seasonal Adjustment Program* (1967).

ZEROWEIGHT=*n*
assigns weights to irregular values based on their distance from the mean in standard deviation units. The weights are used for estimating seasonal and trend cycle components. Irregular values beyond the standard deviation limit specified in the ZEROWEIGHT= option are assigned zero weights. Values that fall between the two limits (ZEROWEIGHT= and FULLWEIGHT=) are assigned weights linearly graduated between 0 and 1. For example, if ZEROWEIGHT=2 and FULLWEIGHT=1, a value 1.3 standard deviations from the mean would be assigned a graduated weight. The default is ZEROWEIGHT=2.5.

OUTPUT Statement

OUTPUT OUT=*SASdataset table=variables . . . ;*

The OUTPUT statement creates an output data set. Any value of the time series calculated by the procedure can be written to the new data set. Write the X11 table identification keyword, an equal sign, and a list of new variable names for each of the time series you want to include. The following can be specified in the OUTPUT statement:

OUT=*SASdataset*
names the output data set. If OUT= is omitted, the SAS System names the new data set using the DATA*n* convention.

table=variables . . .
specifies which table for the adjusted time series is to be in the output data set and which variables are to contain the time series for variables specified in the VAR statement. In the new data set, the first new variable contains the specified time series for the first variable in the VAR statement, the second variable contains the specified time series for the second variable in the VAR statement, and so on. The list of variable

names following the equal sign can be shorter than the list of variables in the VAR statement.

The table numbers that can be used in the OUTPUT statement are given in **Printed Output** later in this chapter. For example, the following statement is valid:

```
output out=a b3=z;
```

PDWEIGHTS Statement

PDWEIGHTS *option;*

The PDWEIGHTS statement can be used to specify one to seven daily weights. The statement can only be used with monthly time series data. These weights are combined into prior trading-day factors used to adjust the original series prior to the seasonal adjustment process. The X11 procedure adjusts the weights so that they total 7.0. The weights also can be corrected by the procedure on the basis of estimates of trading-day variation from the input data.

The option below can appear in the PDWEIGHTS statement:

day=n
specifies a weight, *n*, for a given day. The *day* can be any day, Sunday through Saturday, and *n* must be a numeric value between 0.0 and 10.0. Any number of days can be specified with one PDWEIGHTS statement. The default weight value for any day that is not specified is zero. If you do not use a PDWEIGHTS statement, the program computes daily weights. See the U.S. Bureau of the Census publication *X-11 Information for the User* (1969) for details.

QUARTERLY Statement

QUARTERLY *options;*

The QUARTERLY statement must be used when the input data are quarterly time series. It specifies options that determine the computations performed by the procedure and what is in the printed output. The DATE= option or the START= option must be used.

The options listed below can appear in the QUARTERLY statement:

ADDITIVE
performs additive adjustments. If this option is omitted, the procedure performs multiplicative adjustments.

CHARTS=STANDARD
CHARTS=NONE
CHARTS=ALL
specifies the charts to be produced by the procedure. The default value is STANDARD, which specifies four quarterly seasonal charts and a trend cycle chart. If you specify ALL, the procedure prints additional charts of irregular and seasonal factors. To print no charts, specify CHARTS=NONE. You must specify both PRINTOUT=NONE and CHARTS=NONE to suppress all printed output.

DATE=*variable*
names a variable that identifies the dates of the observations. The beginning and ending dates are obtained from the values of the variable, which must be a SAS date variable. Values of the variable are checked to ensure that the input observations are correctly sequenced. If the DATE= option is not specified, the START= option must be specified.

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END='*yyQq*'
specifies that only the part of the input series ending with the quarter and year given be adjusted. For example, END='73Q4'. The specification must be enclosed in quotes and *q* must be 1, 2, 3, or 4.

FULLWEIGHT=*n*
assigns weights to irregular values based on their distance from the mean in standard deviation units. The weights are used for estimating seasonal and trend cycle components. Irregular values less than the standard deviation limit specified in FULLWEIGHT= are assigned full weights of 1. Values that fall between the two limits (ZEROWEIGHT= and FULLWEIGHT=) are assigned weights linearly graduated between 0 and 1. For example, if ZEROWEIGHT=2 and FULLWEIGHT=1, a value 1.3 standard deviations from the mean would be assigned a graduated weight. The default is FULLWEIGHT=1.5.

NDEC=*number*
specifies the number of decimal places shown on the output tables. This option has no effect on the precision of the variables in the output data set.

PRINTOUT=STANDARD
PRINTOUT=LONG
PRINTOUT=FULL
PRINTOUT=NONE
specifies the tables to print. If STANDARD is specified, between 17 and 27 tables are printed, depending on the options that are specified. PRINTOUT=LONG prints between 27 and 39 tables, and PRINTOUT=FULL prints between 44 and 59 tables. Specifying NONE results in no tables being printed. STANDARD is the default value.

START='*yyQq*'
adjusts only the part of the input series starting with the quarter and year given. When the DATE= option is not used, the START= option gives the year and quarter of the first input observation. For example, START='67Q1'. The specification must be enclosed in quotes and *q* must be 1, 2, 3, or 4. If the DATE= option is not specified, START= must be specified.

SUMMARY
specifies that the input is already seasonally adjusted and the procedure is to produce summary measures. If this option is omitted, the procedure performs seasonal adjustment of the input data before calculating summary measures.

TRENDADJ
modifies extreme irregular values prior to computing the trend cycle estimates. If this option is omitted, the trend cycle curve is computed without modification for extremes.

ZEROWEIGHT=*n*
assigns weights to irregular values based on their distance from the mean in standard deviation units. The weights are used for estimating seasonal and trend cycle components. Irregular values beyond the standard deviation limit specified in the ZEROWEIGHT= option are assigned zero weights. Values that fall between the two limits (ZEROWEIGHT= and FULLWEIGHT=) are assigned weights linearly graduated between 0 and 1. For example, if ZEROWEIGHT=2 and FULLWEIGHT=1, a value 1.3 standard deviations from the mean would be assigned a graduated weight. The default is ZEROWEIGHT=2.5.

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TABLES Statement

TABLES *tablenames;*

The TABLES statement prints the tables specified in addition to the tables that are printed as a result of the PRINTOUT= option in the MONTHLY or QUARTERLY statement or the default value of this option. Valid table names are listed in **Printed Output** later in this chapter. To print only selected tables, specify PRINTOUT=NONE in the MONTHLY or QUARTERLY statement and list the tables to be printed on the TABLES statement. For example, to print only the final seasonal factors and final seasonally adjusted series, specify PRINTOUT=NONE and use the statement

```
tables d10 d11;
```

VAR Statement

VAR *variables;*

The VAR statement can be used to specify the variables in the input data set that are to be analyzed by the procedure. Only numeric variables can be specified. If omitted, all numeric variables are analyzed except those appearing in a BY or ID statement.

DETAILS

Missing Values

Missing values at the beginning of a series to be adjusted are skipped. Processing starts with the first nonmissing value and continues until the end of the series or until another missing value is found.

Missing values are not allowed for the DATE= variable. The procedure terminates if missing values are found for this variable.

Missing values found in the PMFACTOR= variable are replaced by 100 for the multiplicative model (default) and by 0 for the additive model.

Missing values can occur in the output data set. If the time series specified in the OUTPUT statement is not computed by the procedure, the values of the corresponding variable are missing. If the time series specified in the OUTPUT statement is a moving average, the values of the corresponding variable for the first *n* and last *n* observations, depending on the length of the moving average, are missing. If the time series specified is an irregular component modified for extremes, the values of the corresponding variable are missing if the irregular value is not extreme.

Output Data Set

Any table that is a time series and that is computed and printed by the procedure can be placed into an output data set by specifying the table number, an equal sign, and a list of variable names in the OUTPUT statement (see **OUTPUT Statement** earlier in this chapter).

Printed Output

The printed output from PROC X11 depends on whether a monthly or quarterly time series is analyzed, which value of the PRINTOUT= option is specified, and what other procedure options are specified.

The printed output is organized into tables identified by a part letter and a sequence number within the part. A particular table will have the same identification in the STANDARD, LONG, and FULL printouts.

The seven major parts of the X11 procedure are listed below with their corresponding part letter.

- A prior adjustments (optional)
- B preliminary estimates of irregular component weights and regression trading-day factors
- C final estimates of irregular component weights and regression trading-day factors
- D final estimates of seasonal, trend cycle, and irregular components
- E analytical tables
- F summary measures
- G charts.

Most of the tables printed by PROC X11 are time series, although some tables are not; for example, table F1 is a table of summary measures.

The following list defines symbols appearing in the last three columns of **Table 20.1**.

- S printed if PRINTOUT=STANDARD is specified.
- L printed if PRINTOUT=LONG is specified.
- F printed if PRINTOUT=FULL is specified.
- 1 prior adjusted tables will be printed if either the PMFACTOR= or PDWEIGHTS= option is specified.
- 2 printed if CHARTS=STANDARD is specified with MONTHLY statement.
- 3 printed if CHARTS=ALL is specified with MONTHLY statement.
- 4 always printed with QUARTERLY statement.
- 5 printed if PRINTOUT=LONG is specified with QUARTERLY statement.
- Y table can be placed in output data set.
- N table cannot be placed in output data set.
- O table can be placed in output data set. One-year-ahead values can also be added if the YRAHEADOUT option is specified.

Table 20.1 Summary of Printed Output Produced by PROC X11

Number	Title	Monthly	Quarterly	Data Set
A1	original series	1		Y
A2	prior monthly adjustment factors	1		Y
A3	original series adjusted for prior monthly factors	1		Y
A4	prior trading-day adjustments	1		Y
B1	prior adjusted or original series	S	S	Y
B2	trend cycle	L	L	Y
B3	unmodified S-I ratio	F	F	Y
B4	replacement values for extreme S-I ratios	F	F	Y
B5	seasonal factors	F	F	Y
B6	seasonally adjusted series	F	F	Y
B7	trend cycle	L	L	Y
B8	unmodified S-I ratios	F	F	Y
B9	replacement values for extreme S-I ratios	F	F	Y
B10	seasonal factors	L	L	Y
B11	seasonally adjusted series	F	F	Y
B13	irregular series	L	L	Y
B14	extreme irregular values excluded from trading-day regression	L	*	Y
B15	preliminary trading-day regression	L	*	N
B16	trading-day adjustment factors	F	*	Y
B17	preliminary weights for irregular components	L	L	Y
B18	trading-day factors derived from combined daily weights	F	*	Y
B19	original series adjusted for trading-day and prior variation	F	*	Y
C1	original series modified by preliminary weights and adjusted for trading-day and prior variation	L	L	Y
C2	trend cycle	F	F	Y
C4	modified S-I ratios	F	F	Y
C5	seasonal factors	F	F	Y
C6	seasonally adjusted series	F	F	Y
C7	trend cycle	L	L	Y

*Tables B14–B16, B18–B19, C14–C16, C18–C19 are printed if the value of TDREGR is other than NONE. These tables do not apply with the QUARTERLY statement.

(*continued*)

Table 20.1 *(continued)*

Number	Title	Monthly	Quarterly	Data Set
C9	modified S-I ratios	F	F	Y
C10	seasonal factors	L	L	Y
C11	seasonally adjusted series	F	F	Y
C13	irregular series	S	S	Y
C14	extreme irregular values excluded from trading-day regression	S	*	Y
C15	final trading-day regression	S	*	N
C16	final trading-day adjustment factors derived from regression coefficients	S	*	Y
C17	final weight for irregular components	S	S	O
C18	final trading-day factors derived from combined daily weights	S	*	Y
C19	original series adjusted for trading-day and prior variation	S	*	Y
D1	original series modified for final weights and adjusted for trading-day and prior variation	L	L	Y
D2	trend cycle	F	F	Y
D4	modified S-I ratios	F	F	Y
D5	seasonal factors	F	F	Y
D6	seasonally adjusted series	F	F	Y
D7	trend cycle	L	L	Y
D8	final unmodified S-I ratios	S	S	Y
D9	final replacement values for extreme S-I ratios	S	S	Y
D10	final seasonal factors	S	S	O
D11	final seasonally adjusted series			
D12	final trend cycle	S	S	Y
D13	final irregular series	S	S	Y
E1	original series with outliers replaced	S	S	Y
E2	modified seasonally adjusted series	S	S	Y
E3	modified irregular series	S	S	Y
E4	ratios of annual totals	S	S	N
E5	percent changes in original series	S	S	Y

*Tables B14–B16, B18–B19, C14–C16, C18–C19 are printed if the value of TDREGR is other than NONE. These tables do not apply with the QUARTERLY statement.

(continued)

Table 20.1 *(continued)*

Number	Title	Monthly	Quarterly	Data Set
E6	percent changes in final seasonally adjusted series	S	S	Y
F1	MCD moving average	S	S	Y
F2	summary measures	S	S	N
G1	chart of final seasonally adjusted series and trend cycle	2	4	N
G2	chart of S-I ratios with extremes, S-I ratios without extremes, and final seasonal factors	2	4	N
G3	chart of S-I ratios with extremes, S-I ratios without extremes, and final seasonal factors in calendar order	3	5	N
G4	chart of final irregular and final modified irregular series	3	5	N

The same sequence number is given to corresponding tables in parts B, C, and D. Thus, tables B10, C10, and D10 are all tables of seasonal factors. Where no corresponding table exists, the sequence number is not used in that part. Thus, tables B8 and D8 are tables of unmodified seasonal irregular values; however, there is no table C8. Tables C16C, C18C, and D10A have been incorporated into tables C16, C18, and D10.

EXAMPLES

Example 1: Monthly Data

This PROC X11 example uses monthly data and shows trading-day regressions. No charts are printed because CHARTS=NONE is specified. The following statements produce **Output 20.1**.

```
data retail;
   do year=1953 to 1964;
      do month=1 to 12;
         input sales @@;
         date=mdy(month,1,year);
         n+1;
         output;
      end;
   end;
   keep date sales n;
   format date monyy5.;
   label sales=' U. S. Total Retail Sales Millions';
   cards;
```

```
12903 12198 13711 14115 14520 14442 14250 14045 13952 14819 13828 16314
12213 11948 13576 14025 14116 14533 14259 13771 14012 14538 14401 17738
13147 12642 14609 15450 15333 15600 15261 15481 15765 15685 15751 19124
13727 13551 15527 15074 16109 16579 15382 16187 15582 16130 16493 19380
14741 14058 15945 16285 17205 17114 16864 17490 16373 16949 17133 19844
15286 13783 15464 16362 17364 16603 16596 17000 16326 17360 17039 21174
16225 14961 16967 17821 18600 18708 18332 18054 17570 19095 17635 21454
16312 15829 17632 18973 18548 18918 18066 18153 17848 18648 18385 22153
15803 15071 17714 17618 18532 18907 17922 18325 18158 18761 19224 22881
17007 16042 19193 19097 20226 20254 19138 19920 18863 20576 20911 24127
18261 17087 19653 20518 21228 20737 20540 21018 19267 21528 21494 25104
19154 18758 20502 21186 22508 22242 22145 21778 21313 22605 21720 27719
;
proc x11 data=retail;
   monthly date=date charts=none tdregr=test printout=none;
   var sales;
   tables b1 c15 d8 d10 d11 d12;
   title 'Monthly Example Showing Tables';
run;
```

Output 20.1 Monthly Example

```
                                                                          1
                    Monthly Example Showing Tables

                           X11 Procedure


                  X-11 Seasonal Adjustment Program
                     U. S. Bureau of the Census
             Economic Research and Analysis Division
                        November 1, 1968

      The X-11 program is divided into seven major parts.
        Part          Description
         A.  Prior adjustments, if any
         B.  Preliminary estimates of irregular component weights
                and regression trading day factors
         C.  Final estimates of above
         D.  Final estimates of seasonal, trend-cycle and
                irregular components
         E.  Analytical tables
         F.  Summary measures
         G.  Charts


        Series - SALES
           Period covered - 1/1953 to 12/1964

           Type of run multiplicitive seasonal adjustment.
            No printout.   No charts.
      Sigma limits for graduating extreme values are 1.5 and 2.5
       Irregular values out side of 2.5-sigma limits are excluded
         from trading day regression
```

(continued on next page)

(continued from previous page)

B1 Original Series

Year	JAN	FEB	MAR	APR	MAY	JUN
1953	12903	12198	13711	14115	14520	14442
1954	12213	11948	13576	14025	14116	14533
1955	13147	12642	14609	15450	15333	15600
1956	13727	13551	15527	15074	16109	16579
1957	14741	14058	15945	16285	17205	17114
1958	15286	13783	15464	16362	17364	16603
1959	16225	14961	16967	17821	18600	18708
1960	16312	15829	17632	18973	18548	18918
1961	15803	15071	17714	17618	18532	18907
1962	17007	16042	19193	19097	20226	20254
1963	18261	17087	19653	20518	21228	20737
1964	19154	18758	20502	21186	22508	22242
Avg	15398	14661	16708	17210	17857	17886

Total - 2509376 Mean - 17426 S.D. - 2846.7

Monthly Example Showing Tables 2

X11 Procedure

B1 Original Series

Year	JUL	AUG	SEP	OCT	NOV	DEC	Total
1953	14250	14045	13952	14819	13828	16314	169097
1954	14259	13771	14012	14538	14401	17738	169130
1955	15261	15481	15765	15685	15751	19124	183848
1956	15382	16187	15582	16130	16493	19380	189721
1957	16864	17490	16373	16949	17133	19844	200001
1958	16596	17000	16326	17360	17039	21174	200357
1959	18332	18054	17570	19095	17635	21454	215422
1960	18066	18153	17848	18648	18385	22153	219465
1961	17922	18325	18158	18761	19224	22881	218916
1962	19138	19920	18863	20576	20911	24127	235354
1963	20540	21018	19267	21528	21494	25104	246435
1964	22145	21778	21313	22605	21720	27719	261530
Avg	17396	17602	17086	18058	17835	21418	

Total - 2509376 Mean - 17426 S.D. - 2846.7

C15 Final Trading Day Regression

	Combined Weight	Prior Weight	Reg. Coeff.	St.Err. Comb.Wt.	T (1)	T Pr.Wt.
Monday	0.961	1.000	-0.039	0.042	-0.938	-0.938
Tuesday	1.043	1.000	0.043	0.041	1.044	1.044
Wednesday	0.969	1.000	-0.031	0.042	-0.747	-0.747
Thursday	1.026	1.000	0.026	0.044	0.590	0.590
Friday	1.331	1.000	0.331	0.043	7.626*	7.626**
Saturday	1.268	1.000	0.268	0.042	6.349*	6.349**
Sunday	0.403	1.000	-0.597	0.043	-13.98*	-13.98**

* Comb. Wt. Differs from 1 at 1 Per Cent Level
** Comb. Wt. Differs from Prior Wt. at 1 Per Cent Level

Source of Variance	Sum of Squares	Dgrs.of Freedom	Mean Square	F
Regression	17.269	6	2.878	91.066
Error	4.045	128	0.032	
Total	21.314	134		

Probability of a Larger F is < 0.0001

Std. Errors of Trading Day Adjustment Factors

31-Day-Month	0.127
30-Day-Month	0.130
29-Day-Month	0.145
28-Day-Month	0.000

Monthly Example Showing Tables 3

X11 Procedure

D8 Final Unmodified SI Ratios

Year	JAN	FEB	MAR	APR	MAY	JUN
1953	88.7688	86.4631	98.3420	99.5052	102.5377	102.1540
1954	87.8490	86.7757	97.7376	99.5276	102.3404	103.7885
1955	90.3261	85.6847	97.1639	100.1853	102.8626	102.2040
1956	89.9748	84.5319	97.6940	98.6034	102.6732	103.3635
1957	90.1966	86.4006	96.6257	98.1665	102.0832	103.2025
1958	91.3465	84.3145	95.1217	99.4759	103.4167	102.7834
1959	90.4957	85.1156	96.8518	99.2753	103.1823	103.5006
1960	90.1633	85.1292	96.8479	102.1133	103.7221	103.7966
1961	89.7770	84.9035	97.9009	99.3017	103.0294	103.2612
1962	89.5348	84.5231	97.6003	100.6221	103.6538	101.4317
1963	90.2514	85.1140	96.7979	100.7673	102.8296	102.2385
1964	89.6812	85.2051	97.8002	98.4839	103.8232	101.8231
Avg	89.8638	85.3801	97.2070	99.6689	103.0129	102.7956

Total - 14401

D8 Final Unmodified SI Ratios

Year	JUL	AUG	SEP	OCT	NOV	DEC	Avg
1953	99.8702	100.7742	99.0441	103.4592	100.9897	116.9030	99.9009
1954	99.5877	99.6703	98.9459	101.8943	99.9981	120.5580	99.8894
1955	99.4830	100.5238	100.6563	102.2334	101.2241	120.4918	100.2532
1956	99.3560	101.0914	98.9758	100.8580	101.1709	120.9196	99.9677
1957	100.2715	101.6258	99.1730	100.5580	100.3767	121.5606	100.0284
1958	99.9995	101.9369	97.1048	101.1439	100.2464	121.8778	99.8973
1959	100.2552	100.9964	97.1743	103.6676	99.8300	118.6586	99.9169
1960	99.1778	99.8952	97.1900	104.2638	101.8041	120.6482	100.3960
1961	99.6094	99.7901	96.3447	102.7880	102.6323	121.2493	100.0490
1962	99.2392	99.8053	96.0443	103.1240	102.9487	121.1643	99.9743
1963	99.8310	99.6420	94.8487	103.1886	100.6884	121.7112	99.8257
1964	99.7333	99.9313	96.4499	100.3472	100.6175	125.7114	99.9673
Avg	99.7012	100.4736	97.6626	102.3022	101.0439	120.9545	

Total - 14401

Stable Seasonality Test

	Sum of Squares	Dgrs.of Freedom	Mean Square	F
Between Months	9510.538	11	864.594	699.137
Error	163.239	132	1.237	
Total	9673.777	143		

Probability of a Larger F is < 0.0001

Monthly Example Showing Tables 4

X11 Procedure

D10 Final Seasonal Factors

Year	JAN	FEB	MAR	APR	MAY	JUN
1953	89.3595	85.9827	97.7215	99.5574	102.5750	102.7935
1954	89.5032	85.9659	97.6809	99.4780	102.5751	102.8651
1955	89.7472	85.7611	97.4581	99.3731	102.6164	102.9712
1956	89.9844	85.4624	97.1142	99.2524	102.6662	103.0041
1957	90.2791	85.2259	96.9209	99.2401	102.8555	103.1410
1958	90.3703	85.1020	96.8649	99.2491	102.9865	103.2109
1959	90.2959	84.9766	96.9414	99.4187	103.1754	103.2043
1960	90.1874	84.9455	97.0794	99.6454	103.2603	103.0486
1961	90.0405	84.9204	97.2578	99.7741	103.3702	102.7935
1962	89.9600	85.0028	97.4354	99.7703	103.3633	102.5495
1963	89.8025	84.9290	97.4450	99.6759	103.3724	102.2633
1964	89.7784	84.9119	97.4534	99.6751	103.3649	102.0967
Avg	89.9424	85.2655	97.2811	99.5091	103.0151	102.8285

Total - 14401

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D10 Final Seasonal Factors

Year	JUL	AUG	SEP	OCT	NOV	DEC	Avg
1953	99.5846	100.4110	98.9182	101.6716	100.7703	120.4975	99.9869
1954	99.6117	100.5179	98.9413	101.5723	100.7710	120.5917	100.0062
1955	99.6613	100.7293	98.8677	101.4997	100.7833	120.8828	100.0293
1956	99.7594	100.9644	98.6228	101.3790	100.6976	120.9985	99.9921
1957	99.8027	101.0999	98.2651	101.3474	100.7101	121.1191	100.0006
1958	99.8455	101.0685	97.8648	101.4647	100.8635	121.1520	100.0036
1959	99.7751	100.8190	97.3653	101.7555	101.1608	121.1574	100.0038
1960	99.7069	10[illegible].4536	96.8756	102.1795	101.6090	121.1441	100.0113
1961	99.5865	10[illegible].0921	96.4925	102.[illegible]235	102.0998	121.0755	100.0022
1962	99.5742	9[illegible].8802	96.3097	102.8329	102.5928	121.2178	100.0407
1963	99.5715	99.8050	96.1798	102.9627	102.8501	121.2644	100.0101
1964	99.5971	99.7871	96.0744	102.9881	102.9036	121.2449	99.9896
Avg	99.6730	100.4690	97.5648	102.0148	101.4843	121.0288	

Total - 14401

Monthly Example Showing Tables 5

X11 Procedure

D11 Final Seasonally Adjusted Series

Year	JAN	FEB	MAR	APR	MAY	JUN
1953	14154	14313	14305	14180	14155	14048
1954	13645	14023	13911	13933	13927	14123
1955	14825	14873	14972	15243	15234	15153
1956	15553	15463	15672	15517	15672	15780
1957	16308	16642	16451	16408	16553	16777
1958	16739	16340	16157	16479	16527	16435
1959	17614	17763	17844	17928	18027	18125
1960	18086	18177	18140	18668	18313	18362
1961	17894	17906	18024	17854	17944	18177
1962	18922	19041	19309	19556	19544	19364
1963	20310	20299	20167	20582	20322	20503
1964	21113	21323	21448	21259	21774	21782
Avg	17097	17180	17200	17301	17333	17386

Total - 2507534 Mean - 17413 S.D. - 2347.7

D11 Final Seasonally Adjusted Series

Year	JUL	AUG	SEP	OCT	NOV	DEC	Total
1953	14161	14156	14099	14287	14020	13522	169400
1954	14032	13967	14164	14312	14289	14556	168882
1955	15312	15383	15758	15639	15622	15508	183521
1956	15720	15866	15975	15925	16186	16210	189538
1957	16912	16958	17023	16703	16679	16704	200119
1958	16601	16819	16680	16932	17081	17493	200284
1959	18182	18123	18038	18395	17811	17686	215536
1960	18118	18087	18207	18470	18087	17925	218640
1961	18213	18286	18450	18656	18832	18897	219132
1962	19595	19737	19803	20027	20143	20144	235184
1963	20647	20643	20467	20883	20489	21106	246418
1964	22003	22087	22175	21515	21565	22834	260880
Avg	17458	17509	17570	17645	17567	17715	

Total - 2507534 Mean - 17413 S.D. - 2347.7

6

Monthly Example Showing Tables

X11 Procedure

D12 Final Trend Cycle - Henderson Curve
13-term Moving Average Applied I/C Ratio is 1.230

Year	JAN	FEB	MAR	APR	MAY	JUN
1953	14256	14243	14224	14199	14171	14146
1954	13898	13895	13912	13938	13969	14000
1955	14735	14892	15023	15123	15196	15261
1956	15555	15553	15568	15606	15658	15717
1957	16326	16403	16476	16559	16659	16764
1958	16547	16473	16433	16427	16456	16512
1959	17567	17735	17869	17969	18046	18097
1960	18071	18137	18200	18242	18257	18248
1961	17940	17910	17913	17947	18007	18092
1962	19015	19149	19274	19384	19475	19554
1963	20234	20271	20308	20354	20412	20481
1964	21164	21270	21382	21514	21667	21822
Avg	17109	17161	17215	17272	17331	17391

Total - 2507618 Mean - 17414 S.D. - 2347.8

D12 Final Trend Cycle - Henderson Curve
13-term Moving Average Applied I/C Ratio is 1.230

Year	JUL	AUG	SEP	OCT	NOV	DEC	Total
1953	14126	14105	14075	14031	13979	13930	169486
1954	14031	14076	14152	14258	14396	14561	169086
1955	15334	15412	15481	15536	15565	15566	183122
1956	15781	15850	15930	16026	16131	16235	189510
1957	16846	16894	16895	16841	16746	16641	200051
1958	16588	16684	16808	16974	17171	17375	200449
1959	18117	18102	18068	18033	18016	18027	215647
1960	18224	18188	18139	18087	18037	17987	217816
1961	18204	18340	18484	18619	18745	18877	219077
1962	19632	19727	19848	19979	20097	20181	235316
1963	20562	20649	20739	20842	20951	21058	246861
1964	21952	22037	22079	22084	22072	22056	261097
Avg	17450	17505	17558	17609	17659	17708	

Total - 2507618 Mean - 17414 S.D. - 2347.8

Example 2: Quarterly Data

The data in this example are from CITIBASE, the CITIBANK Economic Database. The following statements produce **Output 20.2**.

```
data quarter;
   input date:yyq4. fy35rr 5.2;
   format date yyq4.;
   cards;
71Q1 6.59
71Q2 6.01
71Q3 6.51
71Q4 6.18
72Q1 5.52
72Q2 5.59
72Q3 5.84
72Q4 6.33
73Q1 6.52
73Q2 7.35
73Q3 9.24
73Q4 10.08
74Q1 9.91
74Q2 11.15
```

175

```
74Q3 12.40
74Q4 11.64
75Q1 9.94
75Q2 8.16
75Q3 8.22
75Q4 8.29
76Q1 7.54
76Q2 7.44
76Q3 7.80
76Q4 7.28
;
proc x11 data=quarter;
   var fy35rr;
   quarterly date=date printout=none;
   tables b1 d10 d11 d12;
   title 'Quarterly Example Showing Tables and Charts';
run;
```

Output 20.2 Printed Output of PROC X11 Quarterly Example

```
                    Quarterly Example Showing Tables and Charts                    1

                                X11 Procedure

                    Quarterly Seasonal Adjustment Program
                          U. S. Bureau of the Census
                    Economic Research and Analysis Division
                              November 1, 1968

              Series - FY35RR
                 Period covered - 1st Quarter 1971 to 4th Quarter 1976

                 Type of run multiplicitive seasonal adjustment.
                  No printout.   Standard charts.
              Sigma limits for graduating extreme values are 1.5 and 2.5
```

B1 Original Series

Year	1st	2nd	3rd	4th	Total
1971	6.5900	6.0100	6.5100	6.1800	25.2900
1972	5.5200	5.5900	5.8400	6.3300	23.2800
1973	6.5200	7.3500	9.2400	10.0800	33.1900
1974	9.9100	11.1500	12.4000	11.6400	45.1000
1975	9.9400	8.1600	8.2200	8.2900	34.6100
1976	7.5400	7.4400	7.8000	7.2800	30.0600
Avg	7.6700	7.6167	8.3350	8.3000	

Total - 191.53 Mean - 7.9804 S.D. - 1.9424

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D10 Final Seasonal Factors

Year	1st	2nd	3rd	4th	Avg
1971	95.8316	95.8298	104.6275	103.7607	100.0124
1972	95.7996	95.7836	104.5976	103.9539	100.0337
1973	95.5981	95.8463	104.5275	104.1253	100.0243
1974	95.5620	95.6668	104.5950	104.3041	100.0320
1975	95.4094	95.6224	104.6757	104.3164	100.0060
1976	95.4366	95.4758	104.7815	104.3185	100.0031
Avg	95.6062	95.7041	104.6341	104.1298	

Total - 2400.4

Quarterly Example Showing Tables and Charts 2

X11 Procedure

D11 Final Seasonally Adjusted Series

Year	1st	2nd	3rd	4th	Total
1971	6.8766	6.2715	6.2221	5.9560	25.3263
1972	5.7620	5.8361	5.5833	6.0892	23.2706
1973	6.8202	7.6685	8.8398	9.6806	33.0092
1974	10.3702	11.6550	11.8553	11.1597	45.0402
1975	10.4183	8.5336	7.8528	7.9470	34.7516
1976	7.9005	7.7925	7.4441	6.9786	30.1158
Avg	8.0247	7.9595	7.9662	7.9685	

Total - 191.51 Mean - 7.9797 S.D. - 1.9059

D12 Final Trend Cycle - Henderson Curve

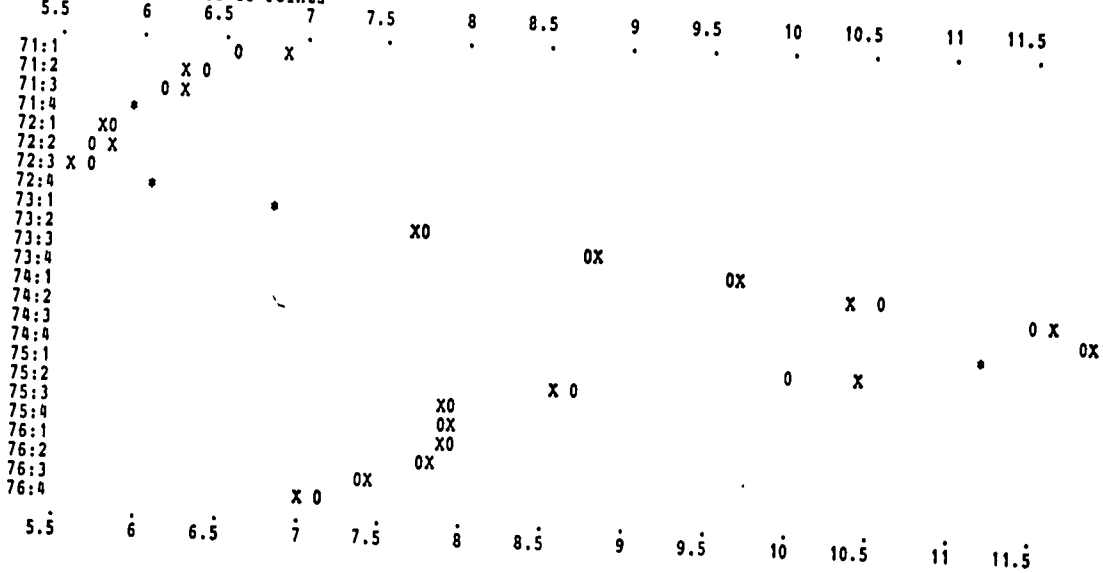
Year	1st	2nd	3rd	4th	Total
1971	6.5902	6.4009	6.1540	5.9650	25.1102
1972	5.8120	5.6970	5.6947	6.0606	23.2644
1973	6.7976	7.7319	8.7784	9.6389	32.9467
1974	10.5485	11.5165	11.8278	11.2076	45.1004
1975	10.0052	8.672	7.9256	7.8708	34.4743
1976	7.9192	7.7700	7.3936	7.1068	30.1896
Avg	7.9455	7.9648	7.9623	7.9750	

Total - 191.09 Mean - 7.9619 S.D. - 1.8881

Quarterly Example Showing Tables and Charts 3

X11 Procedure

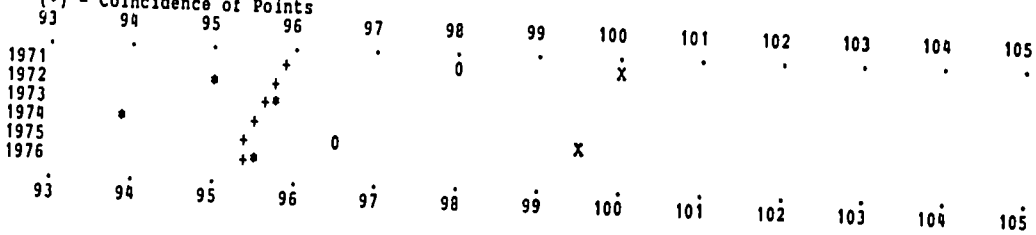
G1. Chart
(X) - D11. Final Seasonally Adjusted Series
(0) - D12. Final Trend Cycle
(*) - Coincidence of Points



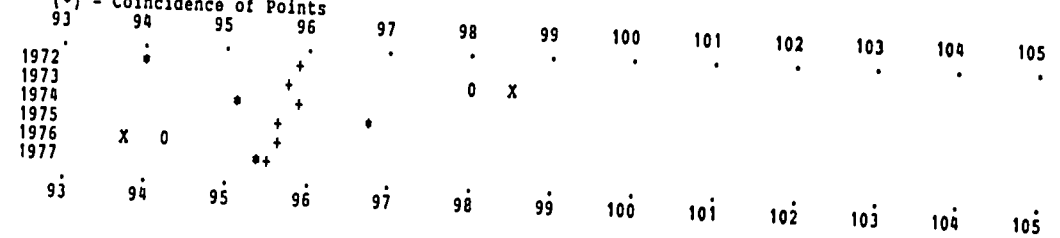
Quarterly Example Showing Tables and Charts 4

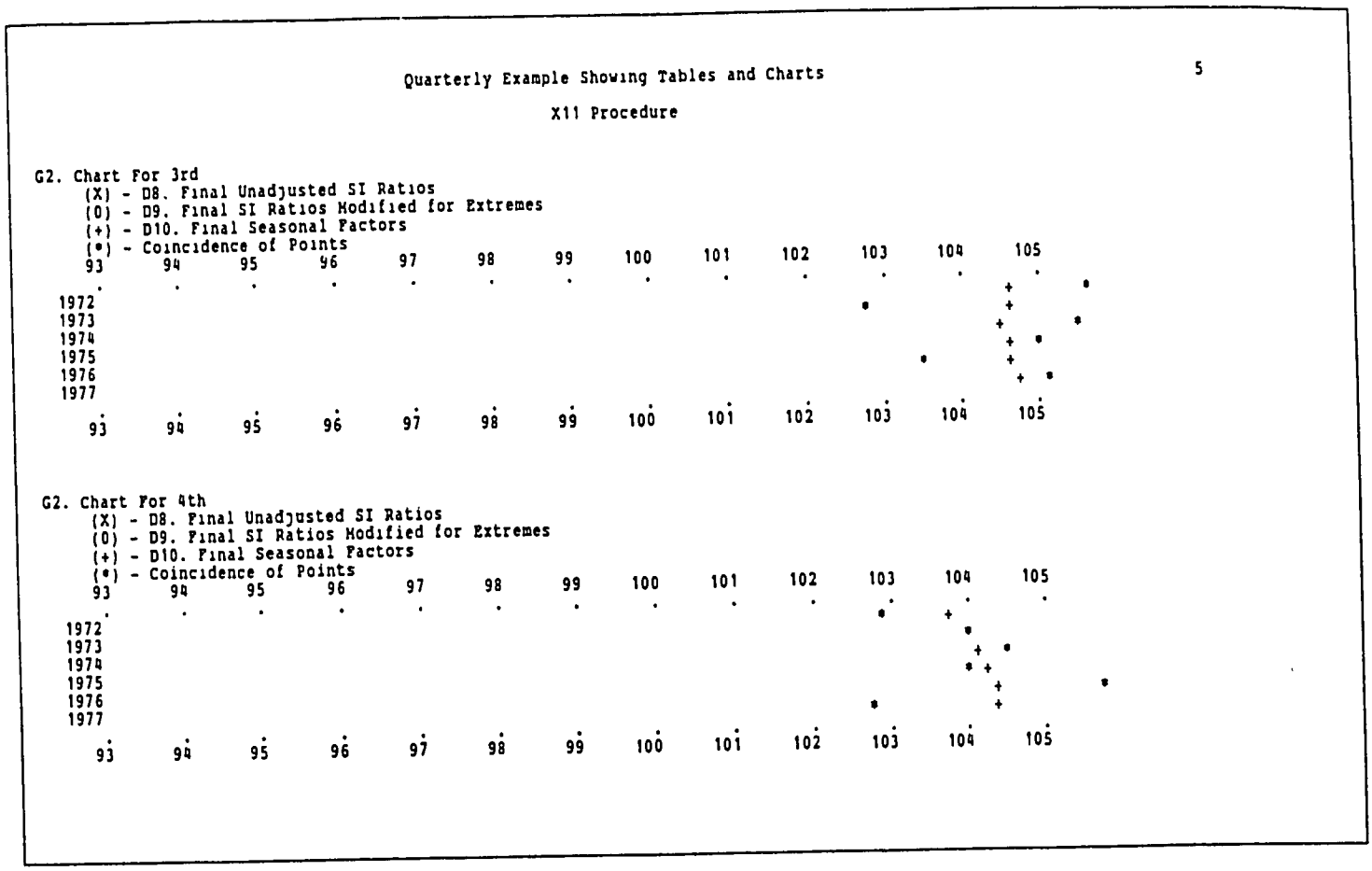
X11 Procedure

G2. Chart For 1st
(X) - D8. Final Unadjusted SI Ratios
(0) - D9. Final SI Ratios Modified for Extremes
(+) - D10. Final Seasonal Factors
(*) - Coincidence of Points



G2. Chart For 2nd
(X) - D8. Final Unadjusted SI Ratios
(0) - D9. Final SI Ratios Modified for Extremes
(+) - D10. Final Seasonal Factors
(*) - Coincidence of Points





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