

A SIMULATED FOODGRAIN SECURITY RESERVE PROGRAM
FOR CORN AND RICE IN CENTRAL AMERICA
AND PANAMA FROM 1960 TO 1980

by

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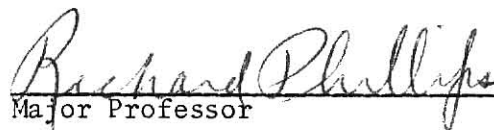
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CHAPTER I

THE PROBLEM SETTING AND SCOPE OF THE STUDY

The present study encompasses the developing countries of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama with a combined total area smaller than the state of Texas in the United States of America. These six countries with more than 23 million people share a common Spanish cultural heritage and somewhat similar socioeconomic conditions. The study does not include Belize, the former British Honduras, which was under British rule before gaining political independence on September of 1981, about 160 years later than most of the countries in the region.¹ Besides this, Belize is the smallest country in the isthmus with a population of 150 thousand, and does not contribute significantly to the production of foodgrains, with sugar being its main crop. The total lack of reliable data in the form required for the present analysis made the inclusion of Belize unwarranted.

The rapid population growth in Central America, with an average annual growth rate of about 3.1 percent observed over the period 1960 through 1980, has largely resulted from a steady decline in death rates caused by improvements in health, sanitation, housing and medical facilities, and to a lesser extent to slightly increasing birth rates. Although price and income are significant, the rapid increases in population has been the most important determinant of demand for foodgrains in the region.

¹Except the Republic of Panama which was part of Colombia before its independence at the turn of the century.

As in many other developing nations, there is a trend toward urbanization in the region. This is due to the more rapid rate of growth in the urban population with respect to total population and to migration from rural to urban areas. Among the reasons for this later phenomena are (1) lack of employment opportunities in rural areas, (2) better educational opportunities in urban areas, and (3) generally better living conditions in urban areas.

Agricultural output, on the other hand, has been falling behind population gains causing the inhabitants to lessen their intake of food as the countries of the region cannot greatly increase their importation of food commodities due to their overall precarious economic situation. This has been further aggravated by the present political uncertainty which has contributed to declining investments, capital flight, and growing foreign debts.

Another problem that has impeded agricultural growth in the region is low agricultural productivity resulting from inadequate systems for (1) farmer education, (2) agricultural credit, (3) assembly and storage of agricultural products, (4) marketing services, and (5) reform in the farmland structures.

The agricultural sector is by far the major industry, and source of occupation and export earnings for the region. The export earnings come from such agricultural commodities as coffee, sugar, bananas, and cotton with the United States being the major market outlet. The bulk of the foodgrain imports by the region will continue to be milling wheat from the United States, as Guatemala is the only significant, and perhaps by now self-sufficient, wheat producing country in the region.

The agriculture of the region is highly complex, varying from very modern and sophisticated production of export crops (cotton, bananas, coffee, and sugar) to primitive production of corn, beans, and grain sorghum, which are generally cultivated on small plots of relatively unproductive soil by subsistence farmers. Rice, on the other hand, is highly mechanized, partially as a result of the larger scale production.

The main staples in consumer diets of the region are beans (red or black), corn, rice and grain sorghum. Their relative importance varies from country to country. The most important producers of beans are Honduras, Guatemala, and Nicaragua. Per capita consumption of beans is fairly uniform and popular throughout the region and provides the main source of protein to the population. However, consumer tastes vary, with some countries preferring black to red beans, and some the reverse. This fact coupled with the lack of reliable data on beans in the form consistent with the data for corn and rice made it necessary to exclude edible beans from the present study.

Corn is the traditional basic food in the region. It is the most important food item in the diet of Guatemalans, where the per capita consumption is highest, and in the diet of both Hondurans and Salvadorans. It is also important for animal feed consumption. It is produced in larger quantities than any other crop in the region with Guatemala, Honduras and El Salvador being the three largest corn producers. Together they accounted for approximately four-fifths of the region's total corn production from 1960 to 1980.

Rice is very important as a foodgrain in Panama, where the consumption per capita is highest in the region. Panama is the major rice producer and together with Costa Rica traditionally produces almost

two-thirds of the rice grown in the region. Almost all the rice produced in the region is dryland cultivation, so there is a potential for increasing rice production through the adoption of paddy cultivation methods with higher yields.

Up to the present time, irrigation has not been used to a great extent in the region in the production of the basic foodgrain crops. Neither has cultivable land been used to its fullest extent in the region, with the probable exception of the Republic of El Salvador.

Grain sorghum is a low value crop used primarily to feed cattle. It is also used to feed hogs and chickens when in surplus. It is produced in El Salvador, Honduras, Guatemala, and Nicaragua, where it is often interplanted with corn. If the supply of corn becomes low, sorghum is utilized as a corn substitute as human food in the form of tortillas.

The implementation of a foodgrain security reserve program for corn and rice in Central America and Panama during the past two decades could well have worked under the auspices or general framework of the Central American Common Market (C.A.C.M.), created in the early sixties with member countries including five of the six countries under study. These five member countries are Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua.

The present study simulates ways of complementing past efforts and mechanisms created by the C.A.C.M. to stabilize prices of foodgrains through the regulation of the basic regional foodgrain supply.

Price stabilization programs in the region often have failed to exert much influence over production because of inadequate storage. Necessary, but not sufficient, for the success of these programs is the establishment of regional foodgrain reserves, which this study also addresses.

Regional reserves could serve as a means of back stopping the already existing buffer stock programs presently managed by the government marketing agencies of the region, including the Honduran Institute of Agricultural Marketing (I.H.M.A.), the Supply Regulatory Institute (I.R.A.) in El Salvador, the Economic Development Institute (I.F.E.) in Panama, the National Institute for Foreign and Domestic Trade (I.N.C.E.I.) in Nicaragua, the National Institute of Agricultural Marketing (I.N.D.E.C.A.) in Guatemala, and the National Council of Production (C.P.N.) in Costa Rica.

The objectives of the study are the following:

1. To make an overall historical review of the problems and issues related to a potential application of a foodgrain security reserve program in Central America and Panama.
2. To summarize conditions prevalent in each country with respect to population, production of foodgrains (corn and rice), and related issues.
3. To determine trend estimates and deviation patterns in per capita foodgrain supplies for each country.
4. To measure the requirements for annual in-country and regional foodgrain reserve transactions with and without stabilizing trade.
5. To determine storage capacity and inventory requirements for the simulated foodgrain security reserve program.
6. Finally, to aid in making a modest contribution to empirical application of the readily available guidelines and the methodology for the study of foodgrain reserve programs for developing countries around the world.

CHAPTER II

REVIEW OF LITERATURE ON FOODGRAIN SECURITY RESERVES

Most of the available literature on foodgrain security reserves and related issues listed in the bibliography is published by North Americans. Several attempts were made, although unsuccessful, to locate other work done in this area whether by nationals or foreigners through regional sources such as the Permanent Secretariat of the General Treaty for Central American Economic Integration (S.I.E.C.A.), the Coordinating Commission for Marketing and Price Stabilization in Central America and Panama (C.C.M.E.P.),¹ the Agency for International Development Regional Office for Central American Programs (A.I.D./R.O.C.A.P.), and the Interamerican Institute for Cooperation on Agriculture (I.I.C.A.).

To the best of this researcher's knowledge, the simulation study presently undertaken may very well be the first one for the region. Up to the present time, the regional grain reserve management programs have been based on the concept of buffer stocks. The purpose of these stocks has been to support seasonal price stabilization by means of (1) controlling the prices to be paid by consumers and (2) establishing support prices to be received by the producers.

As the national governments of the region are confronted with the problem of maintaining adequate year-to-year foodgrain supplies to meet domestic demand, the potential for a foodgrain security reserve program

¹Since its creation in 1964, its mission has been one of coordinating national price-stabilization plans and policies for the six countries.

to supplement the already existing buffer stock program may at last be recognized.

A. Types of Foodgrain Reserves

Unnecessary confusion has stemmed from the lack of general agreement among researchers concerning definitions of types of reserves.

David J. Eaton² proposes that grain reserves could be divided into four categories according to their social function, certainty of demand, and rate of reserve turnover. These four categories are (1) working stocks for intra-year stabilization, (2) buffer stocks for inter-year stabilization, (3) food aid reserves for political leverage and/or humanitarian use, and (4) emergency reserves for humanitarian use and/or political leverage.

James P. Houck and Mary E. Ryan³ recognized the need for a clear understanding of what constitutes grain stocks. They divided grain stocks into market and non-market stocks. Three stocks are distinguished among the market stocks, namely: (1) minimum working stocks (also called pipeline supplies), (2) additional working stocks held by consumers or merchandisers to meet future needs, and (3) speculative stocks held in anticipation of future profit. The non-market stocks are segregated from normal market channels to meet special needs. The non-market stock category includes those accumulated to stabilize or support prices, to fulfill food aid commitments, and to meet unanticipated emergency food needs in times of disaster.

²David J. Eaton, A System Analysis of Grain Reserves (Washington, D.C.: USDA, January 1980), p. 5.

³James P. Houck and Mary E. Ryan, Economic Research on International Grain Reserves: The State of Knowledge (St. Paul, Minnesota: University of Minnesota Agricultural Experiment Station, Bulletin No. 532, 1979), p. 26.

Harry Walters⁴ specified the amounts of grain reserves required for three different purposes, namely: (1) an insurance reserve of between 20 to 30 million metric tons to halt extreme effects of supply instability on price, (2) a stabilization reserve of about 60 million metric tons to provide a high degree of stability to prices of grain and offset deviations around the production or consumption trends, and (3) a combined food aid-emergency relief-contingency reserve ranging from 30 to 60 million metric tons to provide some measure of food security to developing countries and international grain stability within a wide price band.

According to a tripartite report by fourteen experts from North America, the European Community and Japan,⁵ there are three types of internationally supervised agricultural stocks, namely: (1) a commercial emergency reserve held by individual governments to provide price stability when world prices reach or exceed predetermined levels, (2) a buffer stock acquired by participating nations to minimize year-to-year fluctuations in prices of major grains, and (3) a strategic food reserve possibly placed in high risk developing countries to alleviate the threat of sudden crop failures.

Phillips, Kelley and Ryu⁶ classified grain reserves for Korea into: (1) national security reserves, (2) buffer stocks, and (3) food security

⁴Harry Walters, Food Reserves Policy and International Trade Policy, Mimeographed paper by the Assistant Executive Director of the World Food Council, p. 2.

⁵The Brookings Institution, Toward the Integration of World Agriculture: A Tripartite Report by Fourteen Experts from North America, The European Community and Japan (Washington, D.C.: The Brookings Institution, 1973), p. 24.

⁶Richard Phillips, Paul L. Kelley and Byung Seo Ryu, "Feasibility of Food Security Reserves for Korea," Journal of Rural Development, Vol. 5, No. 2 (1982), Seoul, Korea.

reserves. The reserve stocks for national security include (a) stocks needed to supply direct government demand by the armed forces and other government institutions, and (b) emergency stocks needed as safeguard against the uncertainties of wars or major disasters. Buffer stocks are kept to support seasonal price stabilization. Food security reserves are kept to support year-to-year stabilization of quantities and prices.

Corpus⁷ and Custodio⁸ suggest more comprehensive and yet different categorizations of grain reserves. The differences lie again on the definitions of the purpose or objective for which the particular reserves are held.

From all of the above, it seems that categorization of grain reserves will be influenced by personal judgment as to the purpose at hand. But once these purposes are clearly defined, unnecessary confusion could be avoided.

B. Review of Literature on Foodgrain Security Reserve Issues

The research on foodgrain reserves has dealt with two interrelated issues: price stability and food security or supply stability. Numerous analyses and debates about foodgrain reserves have centered on the concept of social welfare measurement derived from price stabilization policies. The question of how to measure social welfare has not been fully answered

⁷Marites S. Corpus, "Grain Reserves: A Review of Selected Literature" (Master's Report, Department of Agricultural Economics, Kansas State University, Manhattan, Kansas, 1982).

⁸Hipolito C. Custodio, Jr., "Measurement of Benefits from Phillipine Grain Stabilization Programs" (Ph.D. dissertation, Department of Agricultural Economics, Kansas State University, Manhattan, Kansas, 1982).

in the literature. Earlier studies by Waugh⁹ and Oi¹⁰ indicated that consumers and producers benefit more from unstable prices. Waugh, using the concept of consumers' surplus, showed that the consumer would benefit more from buying at varying prices rather than at prices stabilized at their simple arithmetic mean. Oi used exactly the same kind of analysis applied to producers' surplus to show that the producer would benefit more from selling at varying prices rather than at prices stabilized at their simple arithmetic mean.

Massell¹¹ integrating the Waugh and Oi results in a model containing both consumers and producers argued that there is a net economic gain to producers and consumers from price stability given that there is compensation between them.

Samuelson¹² showed that producers and consumers separately benefit from stabilized prices. The change in welfare depends upon the shapes of the demand and supply curves, and these results may differ from those derived by Waugh and Oi.

The welfare analysis based on consumer and producer surplus employs partial equilibrium analysis assuming (1) perfectly competitive markets, (2) perfect competition, (3) constant marginal utility of money, and (4) costless stabilization. The latter assumption renders this type of

⁹F. V. Waugh, "Does the Consumer Benefit from Price Instability?" Quarterly Journal of Economics 58 (1944), pp. 602-614.

¹⁰W. Y. Oi, "The Desirability of Price Instability Under Perfect Competition," Econometrica 29 (1961), pp. 494-498.

¹¹B. F. Massell, "Price Stabilization and Welfare," Quarterly Journal of Economics 83 (1969), pp. 285-298.

¹²P. Samuelson, "The Consumer Does Benefit from Feasible Price Stability," Quarterly Journal of Economics 86 (1972), pp. 476-493.

welfare analysis irrelevant since holding of reserves is not a costless operation.

Another source of debate has stemmed from the size and operating storage rules of foodgrain reserves. Walker and Sharples¹³ summarized five of the most common storage rules found in the literature, namely: (1) reserve stocks as being equal to a constant target stability, (2) reserve stocks as a function of production, (3) reserve stocks as a function of price, loan rate, and target stocks, (4) reserve stocks as a function of price, and (5) reserve stocks as a function of supply. The major general conclusion is that there is no best or optimal policy for reserve stocks. The best or optimal policy will depend upon the objective(s) being sought.

According to Gustafson,¹⁴ the conditions which are relevant to the determination of storage rules are four, namely: (1) the interest rate, (2) the cost of storage, (3) the probability distributions of output in future periods, and (4) the "total social value function."

A number of researchers have used economic analysis, simulation, and optimization techniques to study policy questions related to foodgrain reserves. Ryu¹⁵ provides a good summary of the research.

Houck and Ryan,¹⁶ in their survey of foodgrain reserve studies, classified the research in four groups, namely: (1) studies whose central

¹³Rodney L. Walker and J. Sharples, Reserve Stocks of Grain: A Review of Research, Economic Research Service, USDA, Agricultural Economics Report No. 304, Washington, D.C., August 1975.

¹⁴R. L. Gustafson, "Implications of Recent Research on Optimal Storage Rules," Journal of Farm Economics 40 (1958), pp. 290-300.

¹⁵B. S. Ryu, "Feasibility of Food Security Reserves for Korea" (Ph.D. dissertation, Department of Agricultural Economics, Kansas State University, Manhattan, Kansas, 1981), pp. 29-32.

¹⁶J. P. Houck and M. E. Ryan, op. cit., pp. 9-10.

objective is the examination of historical data to measure the extent and severity of fluctuations from trends in production, yields, prices, trade, and stocks, (2) studies that deal primarily with the evaluation of one or more programs for a foodgrain reserve system, (3) studies whose main objective is to design an optimal program of foodgrain reserves, and (4) studies whose primary goal is the testing or elaboration of research methods or statistical techniques.

In general, the results of these empirical studies on foodgrain reserves still leave much room for debate and controversy. Among the unresolved issues are: (1) the size of reserves, (2) what price or quantity rules should trigger acquisition or release of stocks, (3) who will gain or lose from a reserve, and (4) the role of government and private sectors for carrying reserves.

CHAPTER III

RESEARCH METHODOLOGY CONCEPT AND EMPIRICAL APPLICATION

The research methodology developed at Kansas State University by Phillips and colleagues involves three phases to determine the size and cost of foodgrain security reserve programs based upon the historical patterns of foodgrain production, international trade, and utilization as they have existed within a nation. Simulations are made using specialized subroutines of the Master Projection Computer Program (MPJ) in the KSU Food and Feed Grain Institute "User's Guide to Computerized System for Feasible Agribusiness Development," Volume 2, Computer Programs, Special Report No. 2 Revised August 1979.

Phase One measured the needs for foodgrain security reserve programs by country and region in eight sequential steps. Phase Two, with another eight sequential steps, simulates the performance of alternative foodgrain security programs had they been operational over the historical period. Phase Three measures the cost-effectiveness of alternative programs in eleven sequential steps.

Each step is done for all ijk of concern, i denoting crop year, j denoting each foodgrain, and k denoting the country.

The methodology for determining stabilization requirements applied in this study is portrayed by the over-all linkage model diagram indicating the data requirements, the supply triggering mechanism, and the determination of direction and magnitudes of trade adjustments and reserve transactions (Figure 3.1).

The flow is indicated by the direction of the arrow after each check point (diamond-shaped box). The open ended box explains computation of the observations for each grain, country and crop year. Circle one and two indicate when there is an overrun or shortfall in per capita food supply quantity compared to the linear trend target band. Circle three is the case where the observation falls within the specified target band of deviation from trend.

The upper limit (abbreviated UL) is defined as:

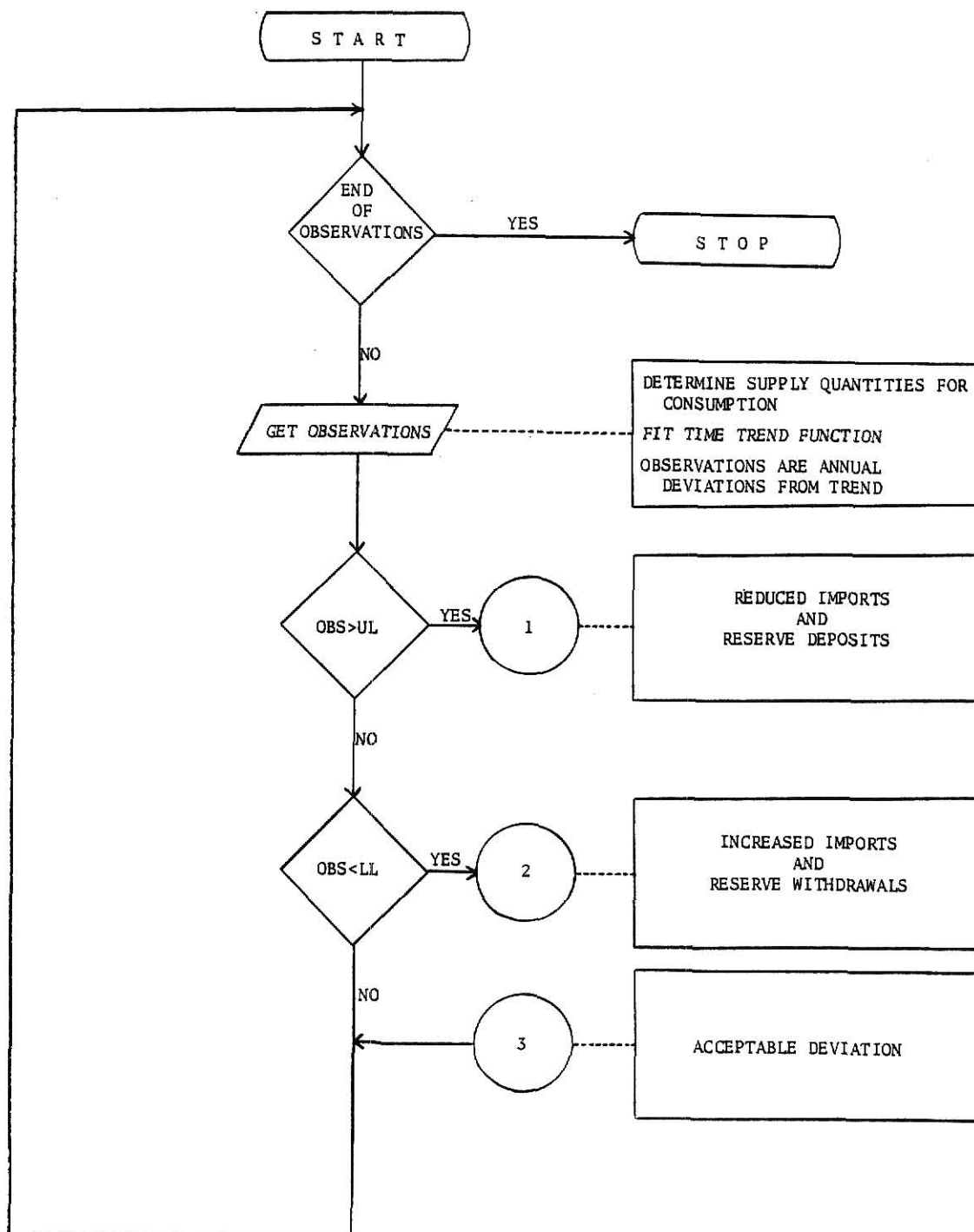
$$UL = \hat{Y} (1 + \text{target band}), \text{ where } \hat{Y} = \text{observed value}$$

The lower limit (abbreviated LL) is defined as:

$$LL = \hat{Y} (1 - \text{target band}), \text{ where } \hat{Y} = \text{observed value}$$

The magnitude of difference at circle one specifies the quantity of needed reduction in planned imports or deposits to food security reserves to meet stabilization requirements. That of circle two specifies the quantity of needed increase in planned imports or withdrawals from reserves to achieve targeted stability in foodgrain supply quantities. No stabilizing import adjustments nor transactions with food security reserves are needed for those grain-country-year cases represented by circle three.

Figure 3.1 Determining Stabilization Requirements



A. Research Methodology Developed at Kansas State University

The 16 sequential steps of the methodology's first two phases applied in this study are outlined in a simplified non-computer terminology from Phillips and Jeon,¹ as follows:

Phase One: Determining the Need for Reserves by Country and Region

Step 1 A. Develop supply-utilization balance sheets by crop year for major grain in each country such that the total supply quantity, Q , equals the total quantity utilized, U :

$$(1A) \quad Q_{ijk} = U_{ijk}$$

for crop year (i), specific grain (j), and country (k).

For each ijk , total quantity, Q , is the sum of the quantities available from each source:

$$(1B) \quad Q = Q1 + Q2 + Q3, \text{ where}$$

$Q1$ = beginning inventory at the start of the crop year

$Q2$ = domestic production during the crop year

$Q3$ = net imports during the crop year (if exports of the grain of concern exceed imports, $Q3$ is negative).

Likewise, for each ijk , total quantity utilized, U , is the sum of quantities absorbed by each use:

$$(1C) \quad U = U1 + U2 + U3 + U4, \text{ where}$$

$U1$ = on-farm disappearance (seed loss, animal feed)

$U2$ = total consumption of food

$U3$ = total industrial utilization

$U4$ = ending inventory at the close of the crop year

¹Richard Phillips and Doyle Jeon, "Simulating the Impact of Alternative Food Reserve Programs: The Asean Case," Journal of Rural Development 3 (April 1980), Korea Rural Economics Institute, Seoul, Korea, pp. 86-97.

The quantities available from each specific source and those utilized in each specific use from Equations 1B and 1C are substituted into Equation 1A to form the basic supply-utilization equation. Thus for each ijk :

$$(1) Q_1 + Q_2 + Q_3 = U_1 + U_2 + U_3 + U_4$$

Step 1B. Convert the balance sheets from Step 1A to a common denominator g (for example, milled rice equivalent), by applying appropriate conversion factors for each ijk . Thus, Equation 1A becomes $Q_{igk} = U_{igk}$, and a comparable summation is made for Equation 1.

Step 1C. For cases where the concern is for reserves of total foodgrains, sum across the g 's for each ik combination from Step 1B to obtain the equivalent quantities of the total foodgrains, f , in terms of the common denominator, such as milled rice. Thus, Equation 1A becomes $Q_{ifk} = U_{ifk}$ and comparable summation is made from Equation 1. For cases where other types of grain reserves may be of interest (total feed grain reserves, etc.), corresponding summations are made for such uses other than solely for human food.

Step 2. For the specific type of utilization of concern reorder Equation 1 to focus on the historical quantities available. For example, where the concern is food supply quantities Equation 1 is reordered for each ijk , igk , or ifk as follows:

$$(2) U_2 = Q_1 + Q_2 + Q_3 - U_1 - U_3 - U_4$$

Step 3. Convert the total quantities for U_2 (or other utilization of concern) to the equivalent quantities available per capita over the historical period in each country. The corresponding

per capita quantities in Equations 1 and 2 can be designated by the lower case q and u , respectively, and obtained by dividing these total equations through by the appropriate total human population figures, H_{ijk} . Thus, for each ijk , igk , and ifk , the corresponding per capita quantities are defined by:

$$(3) \quad q_1 + q_2 + q_3 = u_1 + u_2 + u_3 + u_4, \text{ and}$$

$$(4) \quad u_2 = q_1 + q_2 + q_3 - u_1 - u_3 - u_4$$

Note: Accurate annual mid year population figures are required for the conversion; source population data should be checked carefully.

- Step 4. Fit statistical time trends to the historical per capita quantities of the u_{igk} (or q_{igk}) of concern, using suitable regression equations. Thus, over the relevant historical period, a set of trend estimates, \hat{q} and \hat{u} , is developed for each quantity in Equations 3 and 4 which is of interest. Linear trend estimates often are suitable for the per capita quantities, but in individual cases logarithmic or exponential equations may be needed. The trend estimates are fitted by the method of least squares to the historical quantities, estimating the per capita quantity as a function of time, i . The linear estimating equation is simply:

$$(5) \quad \hat{q}_i = a + b_1$$

Other common time trend equations include the natural logarithmic functions.

$$(6A) \quad \log_e \hat{q}_i = \log_e a + \log_e b_i,$$

and exponential functions,

$$(6B) \quad \hat{q}_i = a = b(i)^x, \text{ where } x \text{ is some power greater or less than } 1.0.$$

In lieu of time trends, more complex multi-variable estimating equations may be used to reflect such factors as anticipated changes in relative real prices of alternative foodgrains, and changes in the anticipated rate of growth in real per capita incomes. Even though the concern in this analysis is not with estimates, per se, but rather in the pattern of deviations from the estimates, still more complex estimators may yield more accurate results in some cases. If more complex estimators have been developed for other kinds of economic planning, then their use also for this purpose is recommended.

- Step 5. Determine for each crop year the deviations from trends in available per capita quantities. Thus,

$$(7) \dot{q}_{ijk} = \hat{q}_{ijk} - q_{ijk}, \text{ and } \dot{u}_{ijk} = \hat{u}_{ijk} - u_{ijk}$$

where:

q and u = observed quantities

\hat{q} and \hat{u} = estimated quantities

\dot{q} and \dot{u} = deviations from trend, plus or minus; ijk subscript identifies the crop year, the grain, and the country, as before.

- Step 6. Convert the per capita deviations from the above step to the corresponding total tonnages for each country by applying the appropriate total population figures. Thus,

$$(8) \dot{Q}_{ijk} = \dot{q}_{ijk} * H_{ik}, \text{ and } \dot{U}_{ijk} = \dot{u}_{ijk} * H_{ik}$$

- Step 7. Compute the corresponding deviations which are in excess of that acceptable where a security reserve program is in operation. Thus,

$$(9) \ddot{Q}_{ijk} = \dot{Q}_{ijk} - \acute{Q}_{ijk}, \text{ and } \ddot{U}_{ijk} = \dot{U}_{ijk} - \acute{U}_{ijk},$$

where

\ddot{Q} and \ddot{U} = excess deviations = needed annual transactions

with reserves

\dot{Q} and \dot{U} = observed deviations (from Step 6)

\acute{Q} and \acute{U} = acceptable deviation levels, as determined

exogenously.

Note: Given the trend and deviation patterns, the wider the range of acceptable deviation from trend, the lower the security reserve requirement, and vice versa.

Step 8. Define the need for annual transactions with security reserves as the tonnages, \ddot{Q} and \ddot{U} , for each basic grain in each country each year. If such potential transactions are designated as RT, then Equation 2 (above) can be restated as:

$$(10) U_2 = Q_1 + Q_2 + Q_3 - U_1 - U_3 - U_4 - RT, \text{ where } RT = \ddot{Q},$$

$$\text{or } RT = \ddot{U}.$$

In years when additional supplies are needed for consumption, withdrawals are made from the reserves (RT is negative), so that the sign for the last term in Equation 10 becomes + ; in years when current supplies are greater than needed for consumption, additions are made to the reserves (RT is positive); in years when total supply quantities are in balance with total utilization requirements no transactions are made with the reserve (RT is zero).

Phase Two: Testing Performance of Alternative Security Reserve Programs

Step 9. Determine reserve stock levels and net reserve transactions for economic and acceptable levels of security reserves for foodgrains

within each country over the historical test-period. For each ijk , establish realistic bounds on in-country reserve levels, and compute the possible reserve transaction subject to these bounds, as follows:

$$(11) \quad RT1 = RT, \text{ provided } L1 \leq RB1 \leq M1,$$

where

RT_{ijk} = total reserve transaction, as above

$RT1_{ijk}$ = transactions with in-country reserves

$RB1_{ijk}$ = balance in in-country reserves

$L1_{ijk}$ = lower limit for in-country reserve levels

$M1_{ijk}$ = maximum limit for in-country reserves

Furthermore,

$$(12) \quad RB1_i = RB1_{i-1} + RT1_i$$

This is a simultaneous computation, with $RB1$ as a function of $RT1$, and $RT1$ subject to constraints on $RB1$.

Step 10. Determine the indicated residual transactions with regional reserves by each country in order to meet the targeted stability level in that country. Following Equation 11, this is done for each ijk subject to bounds on the regional reserves as follows:

$$(13) \quad RT2 = RT - RT1, \text{ provided } \sum_k L2 \leq RB2 \leq \sum_k M2,$$

where

RT and $RT1$ are identified as above

$RT2_{ijk}$ = transactions with regional reserves

$RB2_{ijk}$ = balance in regional reserves

$L2$ and $M2$ = represent the limit on stock levels in regional reserves.

Likewise, following Equation 12

$$(14) \text{RB2}_i = \text{RB2}_{i-1} + \text{RT2}_i$$

- Step 11. If residual needs for further reserve transactions to meet targeted stability levels still remain from the above step, the analysis can be extended to a still higher level of world-wide reserves, RT3 and RB3, following the procedures outlined above. Thus, corresponding to Equations 13 and 14
- (13') $\text{RT3} = \text{RT} - (\text{RT1} + \text{RT2})$, provided $\sum_k \text{L3} \leq \text{RB3} \leq \sum_k \text{M3}$,
and

$$(14') \text{RB3}_i = \text{RB3}_{i-1} + \text{RT3}_i$$

These steps can be repeated for as many alternative configurations, targeted stability levels and constraint levels for reserve stocks as may be needed to support planning decisions by officials in each country and region.

- Step 12. Determine the potential adjustments in international trade to stabilize supply quantities in each country, using the relevant historical data from the above steps as base. This requires realistic determination of (1) the date within the crop year by which accurate estimates of domestic production, Q_i , can be known, and (2) the time lag required for completing delivery of adjusted transactions in international trade. These two factors determine the fraction of the indicated adjustments which can be achieved during the same crop year, F1, and the fraction that will not be effective until the following crop year, F2. Given this information, the potential adjustments in international trade are computed from the excess deviations in the

historical quantities of grain in each country, \ddot{Q}_{ijk} from Equation 10. For each ijk , the net quantity adjustments in international trade, A , has two components, (1) effective adjustments for the current crop year, $A1_i = F1 \cdot \ddot{Q}_i$ plus the carryover adjustment for the previous crop year, $A2_i = F2 \cdot \ddot{Q}_{i-1}$. This time lag gives rise to the possibility of additional trade adjustments to offset last year's adjustment equation:

$$(15A) \ A_i = F1 \cdot \ddot{Q}_i + F2 \cdot \ddot{Q}_{i-1}, \text{ becomes}$$

$$(15B) \ A_i = F1 \cdot \ddot{Q}_i + F2 \cdot \ddot{Q}_{i-1} + F2A_{i-1}, \text{ or}$$

$$(15C) \ A_i = F1 \cdot \ddot{Q}_i + F2(\ddot{Q}_{i-1} + A_{i-1})$$

It will be noted that as $F1$ approaches 1.0 ($F2 \rightarrow 0.0$), trade adjustments approach excess deviations, except with opposite sign. As $F2$ approaches 0.0 ($F1 \rightarrow 1.0$), trade adjustments may exhibit far greater frequency and amplitude than the excess deviations they are designed to overcome.

Step 13. Define the need for transactions with security reserves after adjustments in international trade by each country. Thus, Equation 10 from Step 8 becomes:

$$(16) \ U_2 = Q_1 + Q_2 + Q_3 + A - U_1 - U_3 - U_4 - AT$$

$$AT = \ddot{Q} - A,$$

where

A = net adjustment in international trade as specified in Equation 15.

AT = annual transactions with security reserves after trade adjustments.

Note that if $AT \rightarrow 0$ through time, then there is no need for food security reserves if full advantage is taken of potential

adjustments in international trade by each country.

Step 14. Determine the required stock levels and net reserve transactions for each country after trade adjustments. This step parallels Step 9 so that for each ijk Equations 11 and 12 become:

$$(17) \quad AT1 = AT, \text{ provided } L1 \leq AB1 \leq M1, \text{ given}$$

$$(18) \quad AB1_i = AB1_{i-1} + AT1_i, \text{ and where}$$

AT = as identified in Step 13

$AT1$ = transactions with in-country reserves after trade adjustments

$AB1$ = balance in-country reserves after trade adjustments

$L1$ and $M1$ = limits on stock levels for in-country reserves, as in Step 9.

Step 15. Determine the indicated residual transactions with regional reserves after trade adjustments by each country in order to meet the targeted stability levels in that country. Following Equation 13 this is done for each ijk subject to bounds on the regional reserves as follows:

$$(19) \quad AT2 = AT - AT1, \text{ provided } \sum_k L2 \leq AB2 \leq \sum_k M2, \text{ given}$$

$$(20) \quad AB2_i = AB2_{i-1} + AT2_i, \text{ and where}$$

AT and $AT1$ are identified as in Step 14

$AT2_{ijk}$ = transactions with regional reserves after trade adjustments

$AB2_{ijk}$ = balance in regional reserves after trade adjustments

$L2$ and $M2$ = represent the limits on stock levels in regional reserves, as in Step 10.

Step 16. As in the case of Step 11, if residual needs for further reserve transactions to meet targeted levels of stability still remain from Step 15, comparable analysis can be extended to a still higher level of world-wide reserves (after international trade adjustments), AT3 and AB3, following the procedures outlined in Step 15. Corresponding to Equations 19 and 20 are:

$$(19') \text{ AT3} = \text{AT} - (\text{AT1} + \text{AT2}), \text{ provided } \sum_k \text{L3} \leq \text{AB3} \geq \sum_k \text{M3}, \text{ and given}$$

$$(20') \text{ AB3}_i = \text{AB3}_{i-1} + \text{AT3}_i$$

B. Empirical Application of a Foodgrain Security Reserve Program for Corn and Rice in Central America and Panama

The present study applies these first two phases of the outlined research methodology developed at Kansas State University. Each of the sequential steps was used to test separately the security reserves of corn and rice using historical trade and with stabilizing adjustments in international trade.

The historical data provided in the next chapter served as the basis for carrying out the sequential steps of both phases of the methodology. The first three steps of Phase One are involved in the development of supply-utilization balance sheets to obtain actual domestic per capita consumption figures. These are then plotted with historical time estimates of the trend in per capita food use within a 5-percent targeted supply stability range to determine the reserve transactions from deviations in Steps 4 through 8. The targeted supply stability range of 5-percent was arbitrarily defined. It is felt that given the conditions prevalent in the region over the historical period consumers could tolerate variations in total available quantities of corn and rice within 5-percent of trend.

Assuming average price elasticity of demand for these grains in the countries studied of -0.2, this corresponds to ranges of \pm 25 percent in real prices of corn and rice.

Phase Two is applied to determine the annual additions to and withdrawals from the in-country and regional reserves of corn and rice subject to stock bounds using historical trade and with stabilizing (import or export) adjustments in international trade to meet the targeted levels of supply stability of 5-percent in Steps 9 through 16.

All of the above leads to Chapter VIII of this study in determining the storage capacity and inventories required for the separate simulated foodgrain security reserve programs of corn and rice (1) using historical trade and (2) with stabilizing adjustments in international trade to meet the targeted level of supply stability of 5-percent for each of the countries in the region.

CHAPTER IV

HISTORICAL DATA FOR THE STUDY

Historical data from sources published outside the region were utilized, including the United Nations Demographic Yearbook for Latin America mid-year aggregate human population estimates (Appendix A), and annual foodgrain (corn and rice) supply and utilization information for each country over the period 1960 through 1980 from the U.S. Department of Agriculture Foreign Agriculture Circular (Appendix B).

Population

The region as a whole is experiencing rapid population growth. At an annual average of about 3.1 percent, this growth rate will have the effect of doubling the region's population by 1983 from the base period of 1960. The average annual growth rates for the individual countries are: Costa Rica 2.81 percent, El Salvador 3.27 percent, Guatemala 3.03 percent, Honduras 3.39 percent, Nicaragua 3.10 percent, and Panama 2.87 percent.

Most populous Guatemala, with almost 1/3 of the region's population, experienced an increasing annual population growth rate during the sixties which reached a peak in 1969 and then declined for the rest of the period. However, the annual growth rate remained higher in later years than was true in the early 1960's. The next two populous countries, El Salvador and Honduras, have experienced differing annual population growth rates from each other. El Salvador has experienced declining rates, as opposed to Honduras where the rates are higher than they were in the sixties and early seventies. Nicaragua has had increasing annual population growth from about

2.9 percent during most of the sixties to approximately 3.3 percent during the seventies. The less populous countries of Costa Rica and Panama both have had dramatic declines in annual rates of population growth. Costa Rica, for instance, went from a high rate of about 3.7 in 1960 down to a rate of approximately 2.4 in 1979, a drop of 1.3 percent.

In spite of the different population growth patterns among the countries of the region, their shares have changed very little over the period 1960 through 1980. Guatemala and El Salvador have continued to account for more than 53 percent of the total regional population. Honduras has increased its percentage share from 15.3 in 1960 to 16.3 in 1980, while the shares by Costa Rica, Nicaragua, and Panama have remained fairly constant at about 10, 12, and 9 percent, respectively.

Annual Supply and Utilization of Corn and Rice

The reported figures in Tables 1 (Appendix B) contain annual data regarding gross domestic production, net imports, change in ending stocks, and consumption for each country by grain. The latter includes on-farm seed and loss figures assumed at 10 percent of gross domestic corn production, and food use computed as total consumption (or utilization) minus the seed and loss figures. For purposes of discussion, data on areas harvested and yields were gathered from the same source but not included in the present study as they are not needed for the analysis.

Costa Rica

Costa Rica's domestic corn production has been declining at an average annual rate of 160 metric tons. The country has resorted to imports as human consumption has been increasing at an average of 1,210 metric tons

per year. Imports have been increasing in the order of 1,440 metric tons per year on average.

Even though yields in Costa Rica have increased from 1.11 in 1960 to 1.78 metric tons per hectare in 1980, these gains have not had any major impacts on corn production as areas harvested have been declining over the years.

Costa Rica continues to be an important rice producer, second only to Panama. Domestic production has increased an average of 4,470 metric tons per year resulting in an increment of 275 percent between 1960 and 1979. Rice production has more than kept pace with human consumption during the 1970's. This is reflected by declines in rice imports averaging 2,390 metric tons per year over the entire historical period.

The large increment in domestic rice production can be attributed to both higher yields and larger areas harvested. Yields have more than doubled and areas harvested in the late 1970's were larger than in the sixties. Costa Rica's total food need for rice is increasing at an average rate of 2,090 metric tons per year, converting the country into a net exporter of rice to the rest of the region.

El Salvador

In the seventies, the smallest country of El Salvador overtook Honduras as the second major corn producer of the region. Its annual production gains have been exceeded only by those of Guatemala, averaging 17,660 metric tons per year, the net result being a tripling of domestic corn production from 1960 to 1980. A plausible explanation for this is that El Salvador has the highest yields of the region and continued to harvest larger areas in the 1970's than in the sixties.

Imports of corn have declined at an average rate of 380 metric tons per year as a direct result of increases in domestic production. However, as human consumption continues to increase at an average annual rate of 14,980 metric tons, El Salvador could be faced with the need to import larger quantities of corn as cultivable land becomes more scarce and as the pace of production gains experienced in the past becomes less pronounced.

El Salvador's domestic rice production has increased only at an annual average of 710 metric tons. Nevertheless, this has resulted in a doubling of rice production which was due mostly to the high yields. For instance, in 1960 rice yields were at 2.08 metric tons per hectare, but increased to 3.35 in 1980.

Human consumption in El Salvador has increased at an average annual rate of 1,060 metric tons. This is more than the average increase in domestic production of rice. These imbalances had to be met partially by the importation of rice which on the average increased by 330 metric tons per year over the historical period.

Guatemala

Guatemala continues to be the major producer and consumer of corn in the region. It produces over 40 percent of the region's corn, and production has more than doubled between 1960 and 1980, with an average increase of 24,780 metric tons per year (the largest for the region). This increase can be largely attributed to higher yields with an increase of about 120 percent between 1960 and 1980; areas harvested have fluctuated between a low of 591,000 and a high of 874,000 hectares. Nevertheless, Guatemala's share in area harvested is the highest comprising more than 40 percent of the region.

Since 1960, Guatemala's net imports of corn have increased by an average of 5,050 metric tons per year, representing about 5.5 percent of total domestic needs. Guatemala's total food need for corn is increasing at an average rate of 27,270 metric tons per year, a clear indication of its rapidly growing population.

Guatemala has been a relatively unimportant rice producer. It is next to last in share of the region's total rice production over the period 1960 to 1980, even though production increased from 9,000 metric tons in 1960 to 39,000 metric tons by 1980 for an annual average rate of 1,300 metric tons. Higher yields account for much of the increase in rice production. Yields of 1.36 metric tons per hectare in 1960 increased to 3.94 in 1980 (approximately 190 percent).

Except in isolated years, Guatemala's net imports of rice have not been significant, increasing at an average rate of only 380 metric tons annually. Human consumption has increased at an average annual rate of 1,660 metric tons per year.

Honduras

Honduras has been an important corn producer in the region. Currently, it occupies third place as its production gains were overrun by the more impressive gains of El Salvador in the 1970's. Honduran production has increased at an annual average rate of 4,660 metric tons, less rapidly than the average increase in human consumption of 7,000 metric tons per year, resulting in the second largest average increase in importation of 3,550 metric tons per year in the region from 1960 to 1980.

This relative poor showing can be partially attributed to the almost insignificant and unsustained gains in corn yields. Moreover, Honduras is

growing at the highest average annual population growth rate in the region, worsening the domestic supply-demand imbalances of recent years.

Honduras has been a relatively unimportant rice producer. Its share is last in the total rice production of the region. Nevertheless, rice production has doubled at an annual average rate of 1,120 metric tons between 1960 and 1980. Higher yields account for most of the increase in rice production, as the area harvested declined for most of the sixties and recovered to a gradual slight increase in the seventies.

Honduras' long term trend in human consumption of rice has been increasing more rapidly than domestic production. Human consumption has increased at an annual rate of 1,390 metric tons while domestic production has increased at the average rate of 1,120 metric tons per year. Almost invariably, domestic production has lagged behind human consumption creating a need for a small average increase in importation of 200 metric tons per year.

Nicaragua

Nicaragua's corn production has more than doubled in the period 1960 to 1980, increasing at an average rate of 4,910 metric tons per year. Areas harvested and yields have both had an impact on this increase. For instance, in 1980 the area harvested was 114,000 hectares higher than in 1960. On the average, yields have been higher in the 1970's than in the sixties.

Nicaragua's net imports of corn are growing at an average of 1,180 metric tons per year. Human consumption of corn is increasing at an average of 4,710 metric tons per year which is a little lower than domestic production resulting in a favorable supply-demand balance for most of the period.

Rice has sustained a larger increase in production than corn from the base period of 1960. Since then, rice production has more than doubled at an average annual rate of increase of 1,630 metric tons. Nicaragua has one of the highest yields in the region together with the countries of El Salvador and Guatemala. In terms of area harvested, Nicaragua occupies third place in its share to the region's total.

Nicaraguan domestic human consumption of rice has been increasing less rapidly than production. Human consumption has increased at an annual average rate of 1,430 metric tons, and net imports show almost no long term trend as they are declining at an annual average rate of just 50 metric tons.

Panama

Even though Panama's corn production has almost doubled during the historical period, the average rate of increase of 50 metric tons per year is the smallest in the region, accounting for the fact that it has one of the lowest average yields and that its area harvested is next to last.

Production increases have not kept pace with those of human consumption. Since 1960, human consumption has been increasing at an annual average rate of 860 metric tons. As a result, imports have been significant and increasing at an average rate of 630 metric tons per year over the period 1960 to 1980.

Panama is the major rice producer and consumer of the region. It contributed with over 1/3 of the rice grown in the region over the 21-year historical period. Surprisingly, its yields are the lowest for the region but its area harvested accounted for 40 to 50 percent of the total with the single exception of 1980. In spite of having the lowest yields in the region, the production of rice has been increasing more rapidly than

consumption. Gross domestic production has increased at an annual average rate of 2,690 metric tons, while human consumption has increased at an average rate of 2,150 metric tons per year. Imports, on the other hand, have declined as a result of this at an average of 530 metric tons annually between 1960 and 1980.

CHAPTER V

TREND ESTIMATES AND DEVIATION PATTERNS IN FOODGRAIN SUPPLIES

The analysis of trend estimates and deviation patterns in per capita foodgrain supplies is made separately for rice and for corn in each country. The building blocks for this and later chapters is the data presented previously in Table 3 for the mid-year total human population estimates in Appendix A and the supplies of corn and rice for food use taken from column (6) of Tables 1 in Appendix B.

Total Foodgrain Consumption

As depicted in Table 2 in Appendix C, Guatemala is the dominant consumer of corn in the region, representing well over 40 percent of the total annual consumption. El Salvador surpassed Honduras as the second most important corn consumer in the 1970's. Nicaragua's consumption share has varied between 8 and 13 percent over the historical period. The countries of Costa Rica and Panama combined have accounted for 7 to 11 percent of the corn consumed in the region.

In the case of rice, Panama is the dominant consumer, followed by Costa Rica and Nicaragua. The combined annual rice consumption of El Salvador, Guatemala and Honduras has not come even close to what is consumed in the country of Panama alone, with the exception of the crop years 1975 and 1979, where consumption was the same.

Trends in Per Capita Consumption

The trend and deviation patterns in annual supply quantities of corn and rice for human consumption within each individual country provide the

basis for determining the size of in-country and regional reserves needed to achieve the targeted stability range of five percent.

In this study, linear time-trend regression equations were fitted to the historical quantities by the least squares method to obtain the trend estimates in per capita quantities as functions of time. Due to the gradual change in taste patterns and to the unpredictability of per capita quantities available for human consumption, linear trend estimates are appropriate for the purpose at hand. No evidence was found to warrant application of multi-variable logarithmic or exponential trend regression equations to historical per capita consumption for the six countries.

Tables 4 in Appendix C depict the domestic per capita food consumption of corn and rice per country as they have existed over the historical period. There has been significant variation in annual per capita quantities of corn and rice available for food consumption within each nation as well as from one country to another.

In the case of corn, the 21-year mean consumption quantities range from 44.1 kilograms in Costa Rica to 126.3 kilograms in Guatemala. The long term trend in per capita corn consumption is upward in El Salvador and Guatemala, increasing at an annual average of about 1.5 kilograms in El Salvador and over 1 kilogram in Guatemala. By contrast, the long term trend in per capita quantities is decreasing in the other countries. This decrease is greatest in the country of Honduras where per capita consumption of corn has decreased more than 1 kilogram per year on average.

The relatively large year-to-year variations around trends in per capita supplies of corn, are indicated by the smallness of the variation explained by the trend lines in each country. For instance, Nicaragua's low r-square value of .0034 indicates that almost 100 percent of the year-to-year

variations was left unexplained by the long-term trend. By contrast, El Salvador's trend line explained about 58 percent of the year-to-year variations in per capita food supplies of corn for that country.

The 21-year mean rice consumption quantities range from 4.1 kilograms in Guatemala to 66.5 kilograms in Panama. The long-term trend in per capita rice consumption is upward in all countries except in Panama. Consumption is increasing at an annual average rate of about 230 grams for Costa Rica and Honduras, 194 grams for Guatemala, 63 grams for El Salvador, and 52 grams for Nicaragua. Panama, on the other hand, shows an annual average decrease of about 372 grams.

The r-square values for rice indicate that the individual trend lines explain only a small fraction of the year-to-year variation that has existed in each country. These r-square values are: .5 percent for Nicaragua, 5.5 percent for El Salvador, 6.5 percent for Costa Rica, 14.5 percent for Panama, 30.3 percent for Honduras, and 39 percent for Guatemala.

Annual Deviation Patterns in Per Capita Consumption

The Table 4 charts that follow depict the trend and deviation patterns in per capita (corn and rice) food supplies available to each country based upon the historical data presented in Table 4 and the statistical regression estimates of the trend in per capita food use shown in Tables 5 (Appendix C).

The hand-drawn targeted stability range band, assumed at ± 5 percent from the long term trend in per capita quantities of corn and rice, signal needed deposits to reserves in years of excess above the band and needed withdrawals from reserves in years of shortfall or deficit below the band.

The numerical deviations between the historical data presented in Table 4 and the statistical regression estimates of the trend in per capita

food use in Table 5, also are presented in Tables 7 and 8 (Appendix C).

Costa Rica

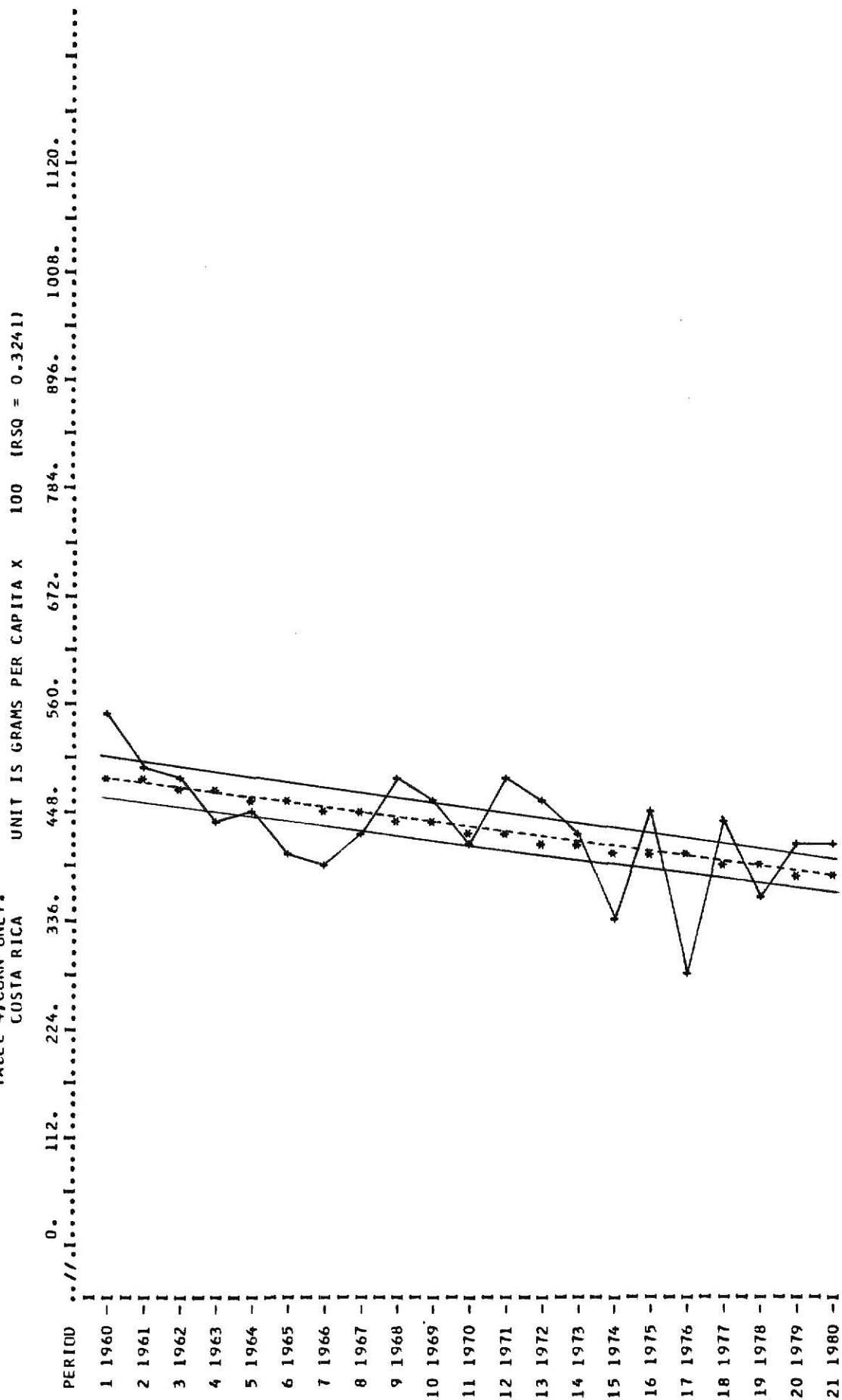
Costa Rica's per capita supplies of corn for human consumption show a downward trend. They have been in excess of the trend in twelve of the twenty one years recorded and seven times in the last ten years. By contrast, Costa Rica's rice consumption trend is upward, as indicated by the chart and by the positive b-value in Table 4 of Appendix C. In the case of rice only, Costa Rica's food supplies per capita have exceeded trend eleven years and fallen short of trend in nine out of the other ten years. The shortfalls have been more frequent in the period 1971 to 1980.

For the corn case, Costa Rica has simulated deposits to the reserves in 1960, 1968, 1969, 1971, 1972, 1975, 1977, 1979 and 1980, and withdrawals in 1963, 1965, 1966, 1974, 1976, and 1978. The largest deposit and withdrawal occurring in the year 1960 and 1976 respectively.

The simulated deposits to the rice reserves of Costa Rica are in the years 1960, 1962, 1965, 1969, 1970, 1972, 1976, and 1977, and the simulated withdrawals in the years 1963, 1964, 1968, 1971, 1973 and 1979. The largest deposit and withdrawal occurring in the years 1976 and 1973 respectively.

Figure 5.1. PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 4, CORN ONLY.



El Salvador

Both corn and rice consumption show upward trends in El Salvador. However, corn shows a steeper upward trend as the average annual increase in corn is about 23 times higher than rice.

The high r-square of .58 reflects five observations on the trend line, while half of the other sixteen years exceed or fall short of trend. The greatest deficit in 1972 was followed by the greatest excess in 1973.

In the case of rice only, El Salvador food supplies per capita have exceeded trend eight years with the greatest excess encountered in the year 1968. It has fallen short of trend in eleven of the remaining years.

El Salvador has relatively small simulated deposits to the corn reserves in 1962, 1964, 1965, and 1966, and a large one in 1973. Simulated withdrawals from the reserves have been more frequent and have happened in the years 1960, 1961, 1967, 1969, 1970, 1972, and 1976.

The simulated deposits to the rice reserves of El Salvador are quite large in the years 1967, 1968, 1969, 1971, and 1973. The simulated withdrawals were indicated during 1961 through 1963, in 1972, and again during 1974 through 1977. The largest deposit and withdrawal occurring in 1968 and 1963, respectively.

Figure 5.3 PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 4. CORN ONLY.
EL SALVADOR

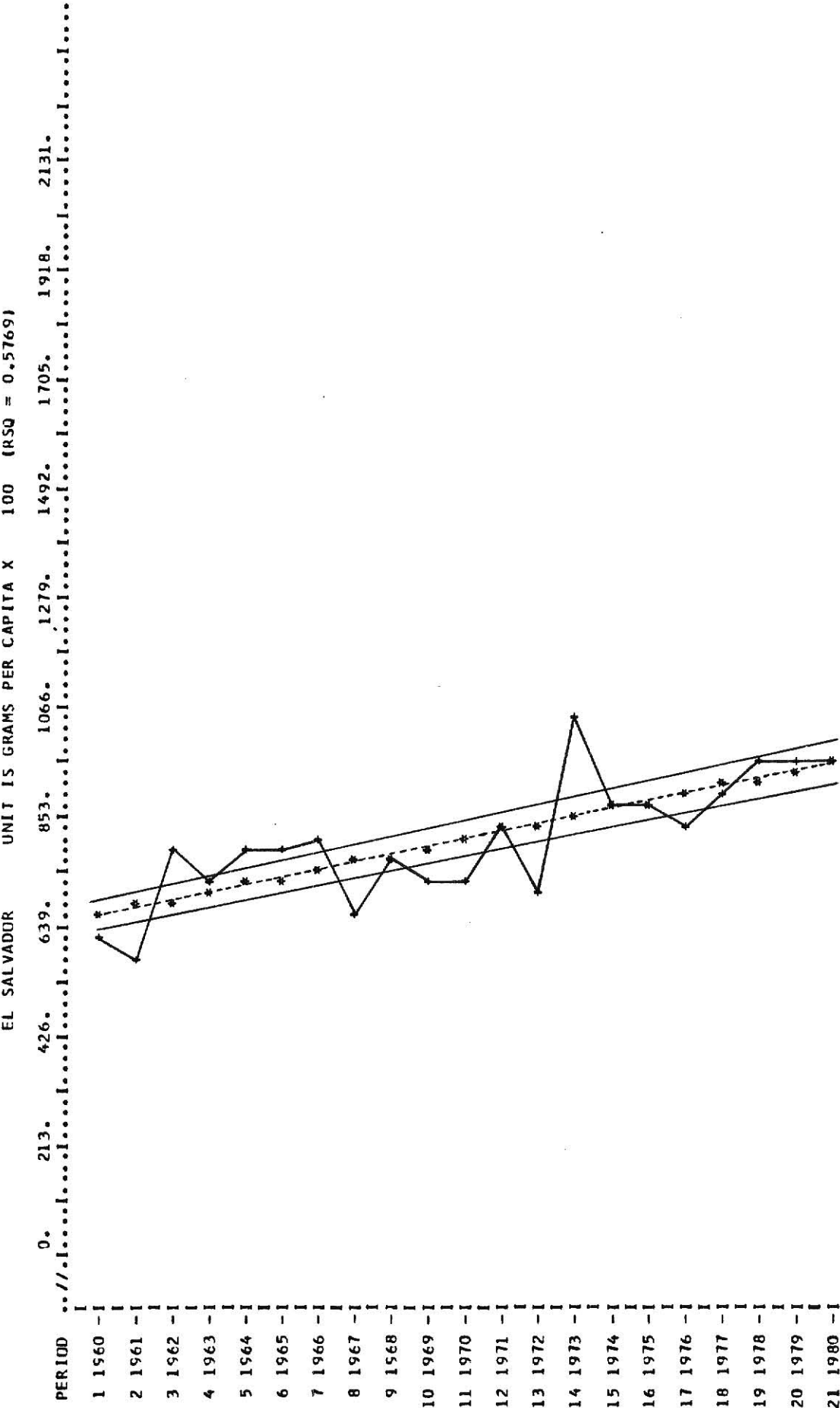
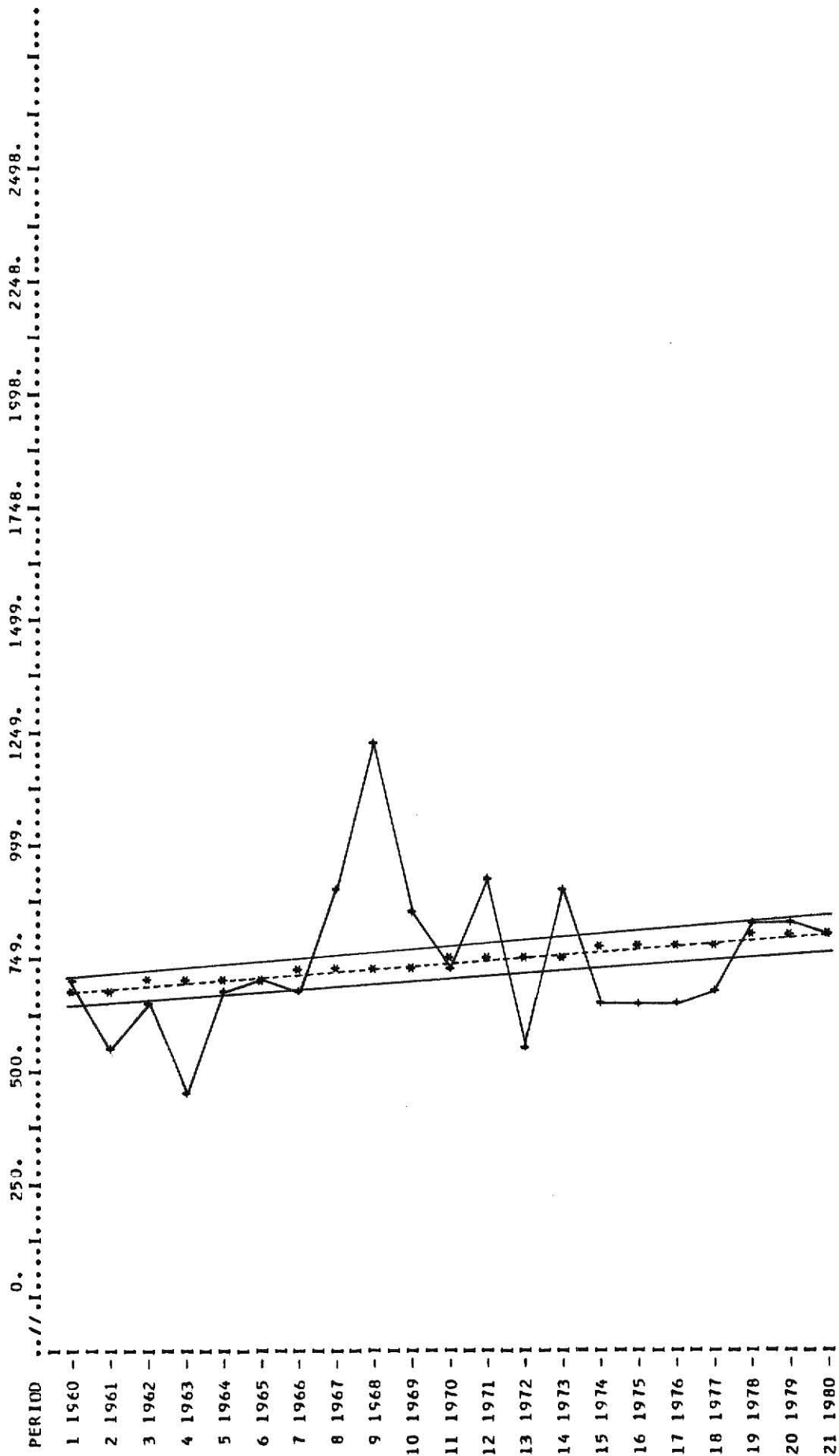


Figure 5.4 PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 4, RICE ONLY.
EL SALVADOR

UNIT IS GRAMS PER CAPITA X 10 (RSQ = 0.0550)



Guatemala

The positive b-values in Tables 4 of Appendix C show an upward trend in per capita food supplies of corn and rice in the country of Guatemala. In contrast to El Salvador, however, rice shows a steeper upward trend than corn.

In the case of corn only, Guatemala's food supplies per capita have exceeded or fallen short of trend each in nine out of eighteen years. Shortfalls have been frequent in the last ten years, but the greatest surpluses have been in the last three of these same years.

Rice, on the other hand, exhibits deficits from trend for most of the sixties. Very large surpluses were encountered in five consecutive years, 1971-1975, followed by deficits for the next five consecutive years. The greatest deficit was encountered in 1978 and the greatest excess in 1973.

Guatemala has relatively small simulated deposits to the corn reserves in 1964 and 1969, and large ones during 1978 through 1980. The largest deposit occurs in 1980 and the largest withdrawal in 1966 with smaller ones occurring during 1973 through 1975, and in 1977.

Simulated transactions of rice were required in all but two years of the historical period, 1960 and 1962. Thus, for the rice case, Guatemala has simulated deposits to the reserves in 1963, and during 1971 through 1975, and withdrawals in 1961, 1964, 1965, 1966, 1967, 1968, 1969, 1970, and again during 1976 through 1980. The largest deposit and withdrawal occurred in 1973 and 1978, respectively.

Figure 5.5 PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 4, CORN ONLY.

GUATEMALA

UNIT IS GRAMS PER CAPITA X 100 (RSQ = 0.2605)

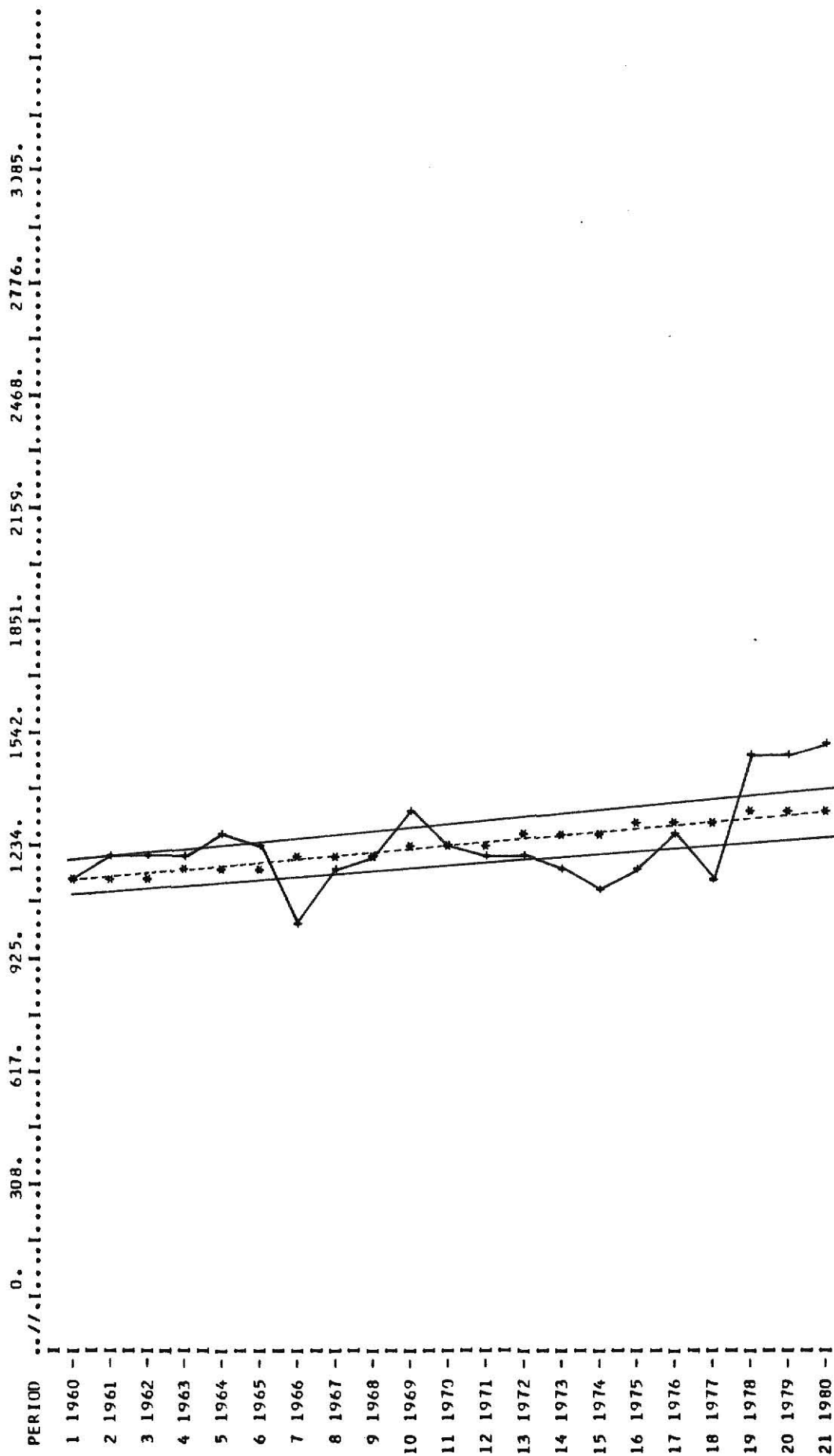
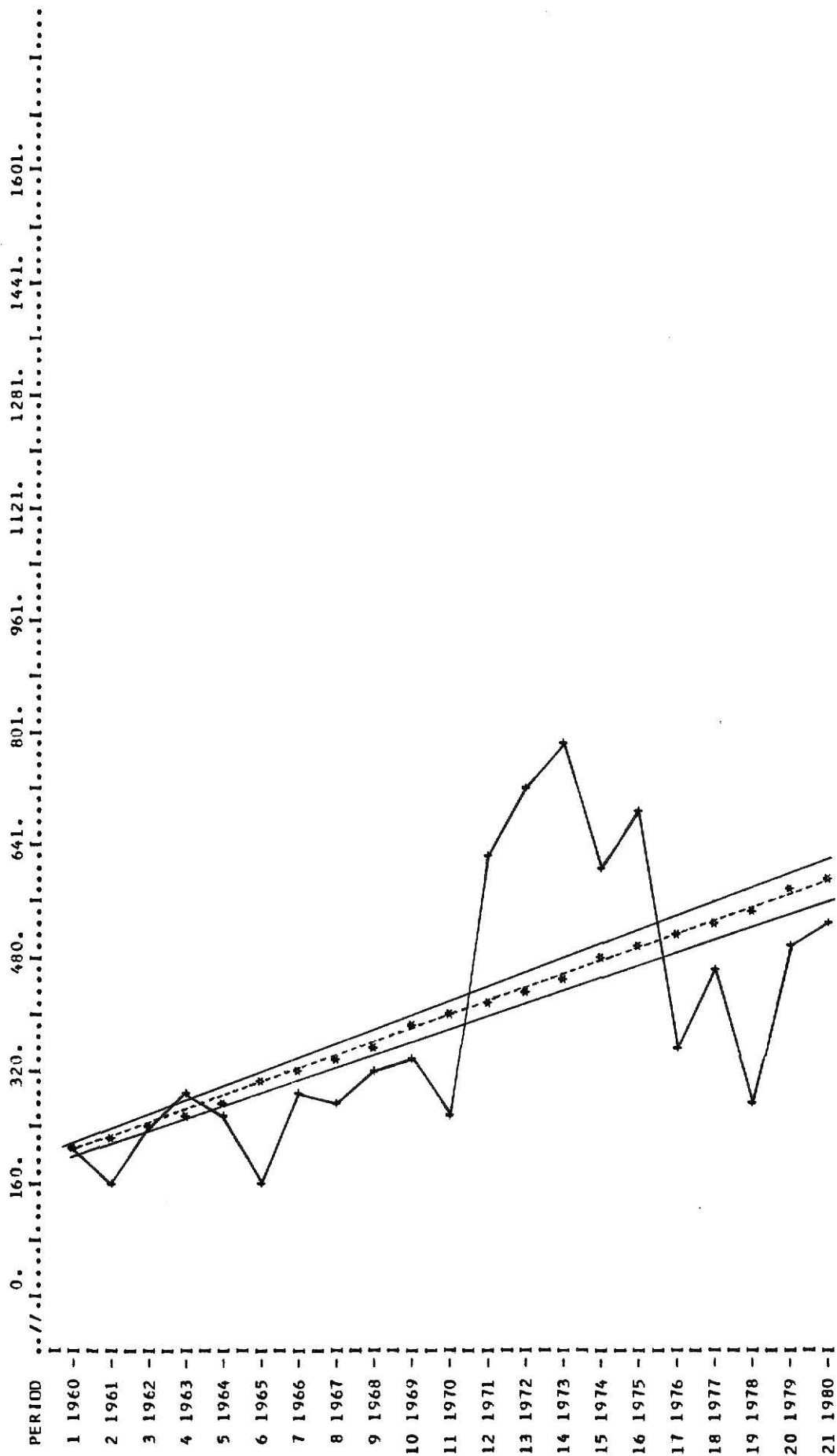


Figure 5.6 PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 4. RICE ONLY.
GUATEMALA

UNIT IS GRAMS PER CAPITA X 10 (RSQ = 0.3677)



Honduras

Honduras is experiencing opposite trends in per capita food supplies of corn and rice. As indicated by the charts and by the sign of the b-values in Table 4 of Appendix C, corn is showing a downward trend and rice a steep upward trend.

Corn food supplies per capita have exceeded trend in nine years and fallen short of trend in nine years also. Surpluses were encountered in three successive years, 1967-1969, as well as in the period 1978-1980. Deficits were encountered in three successive years, 1964-1966, as well as in four successive later years, 1974-1977. The greatest deficit was encountered in 1964 and the greatest excess in 1968.

Rice, on the other hand, shows large surpluses from trend in five successive years, 1960-1964, as well as the period 1975 to 1980. Deficits have occurred over a period of ten successive years from 1965 to 1974. The largest deficit was encountered in 1965 and the largest surplus in 1975.

Honduras has simulated deposits to the corn reserves in the years 1960, 1962, 1968, 1969, and 1980. The largest deposit occurs in 1968. The largest withdrawal occurs in 1964 with smaller ones in 1965, 1966, 1972, 1975, 1976 and 1977.

Simulated transactions of rice reserves were required over the 21-year historical period. Thus, for the rice case, Honduras has simulated deposits to the reserves during 1960 through 1964, withdrawals from the reserves during 1965 through 1974, and deposits again during 1975 through 1980.

Figure 5.7 PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 4. CORN ONLY.

HONDURAS

UNIT IS GRAMS PER CAPITA X 100 (RSQ = 0.1296)

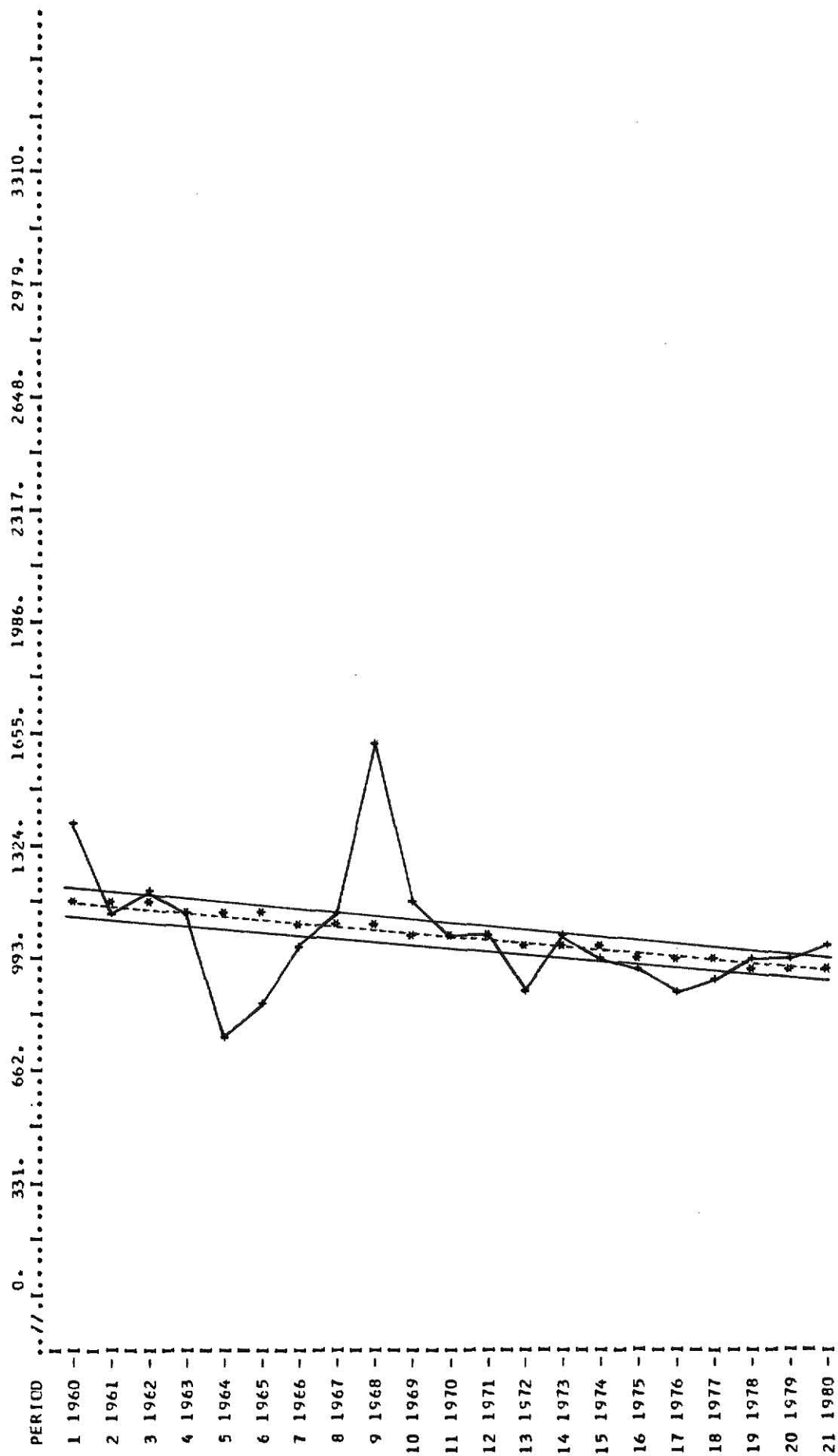
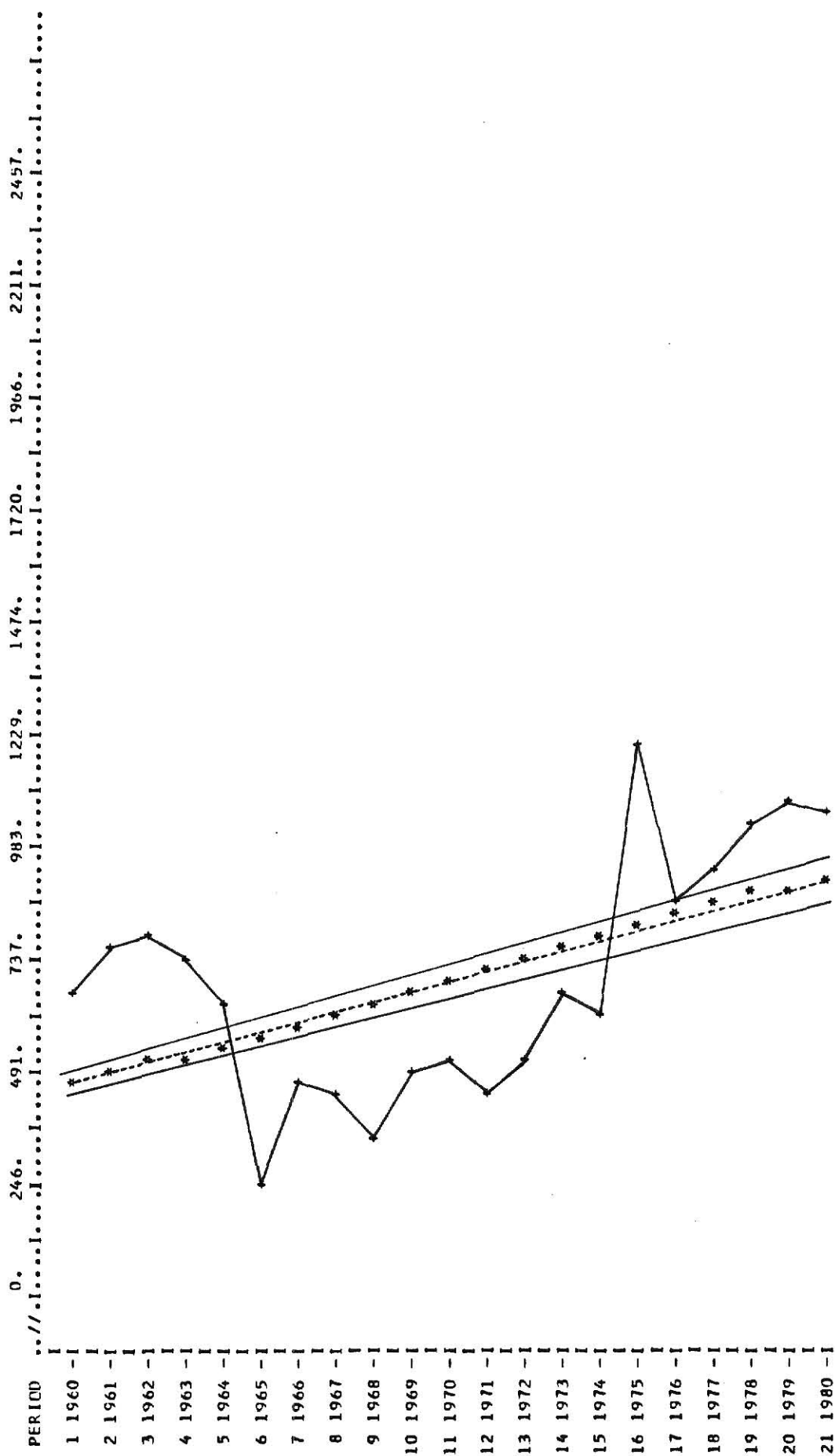


Figure 5.8 PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 4, RICE ONLY.
HONDURAS

UNIT IS GRAMS PER CAPITA X 10 (RSQ = 0.3026)



Nicaragua

Nicaragua portrays trends which are almost horizontal for per capita food supplies both of corn and rice. As indicated by the respective charts and b-value signs in Table 4 of Appendix C, corn shows a slight downward trend while rice shows a slight upward trend.

Corn food supplies per capita have exceeded trend in nine years and fallen short of trend in eleven years. Surpluses were encountered in six successive years, 1964-1969, where the greatest excess occurred in 1969. Deficits were encountered in four successive years, 1960-1963, as well as in five successive later years, 1976-1980. The greatest deficit happened in the year 1979.

Rice, on the other hand, shows large surpluses in the period 1963 through 1968, preceded by three successive years of deficit from 1960 to 1962. The greatest excess was encountered in 1967 and the greatest deficit in 1969.

Nicaragua has simulated deposits to the corn reserves during 1964 through 1969, and in the years 1971, 1973, and 1974. The largest deposit occurred in 1969. The largest withdrawal occurred in 1979 with smaller ones during 1960 through 1963, in 1970, and again in the period from 1976 through 1980.

Simulated transactions of rice reserves were required in 17 of the 21-year historical period. Nicaragua has simulated deposits to the reserves in 1963, 1964, 1965, 1966, 1967, 1968, 1975, and 1980. The largest one occurs in the year of 1967. Withdrawals from the reserves occur in the years 1960, 1961, 1962, 1969, 1970, 1972, 1973, 1977, and 1979. The largest withdrawal occurs in the year of 1969.

Panama

Per capita food supplies of both corn and rice show a downward trend in the Republic of Panama. However, the average annual decrease in corn is higher than in rice.

In the case of corn only, Panama's food supplies per capita have exceeded the trend in nine years and fallen short of the trend in ten years. Surpluses were encountered in the last two years of the historical period, 1979 and 1980, as well as in six successive previous years, 1964-1969. As can be seen, surpluses were more frequent in the sixties. The largest of these occurred in the year 1965. By contrast, deficits were most frequent in the seventies, the largest one occurring in 1971.

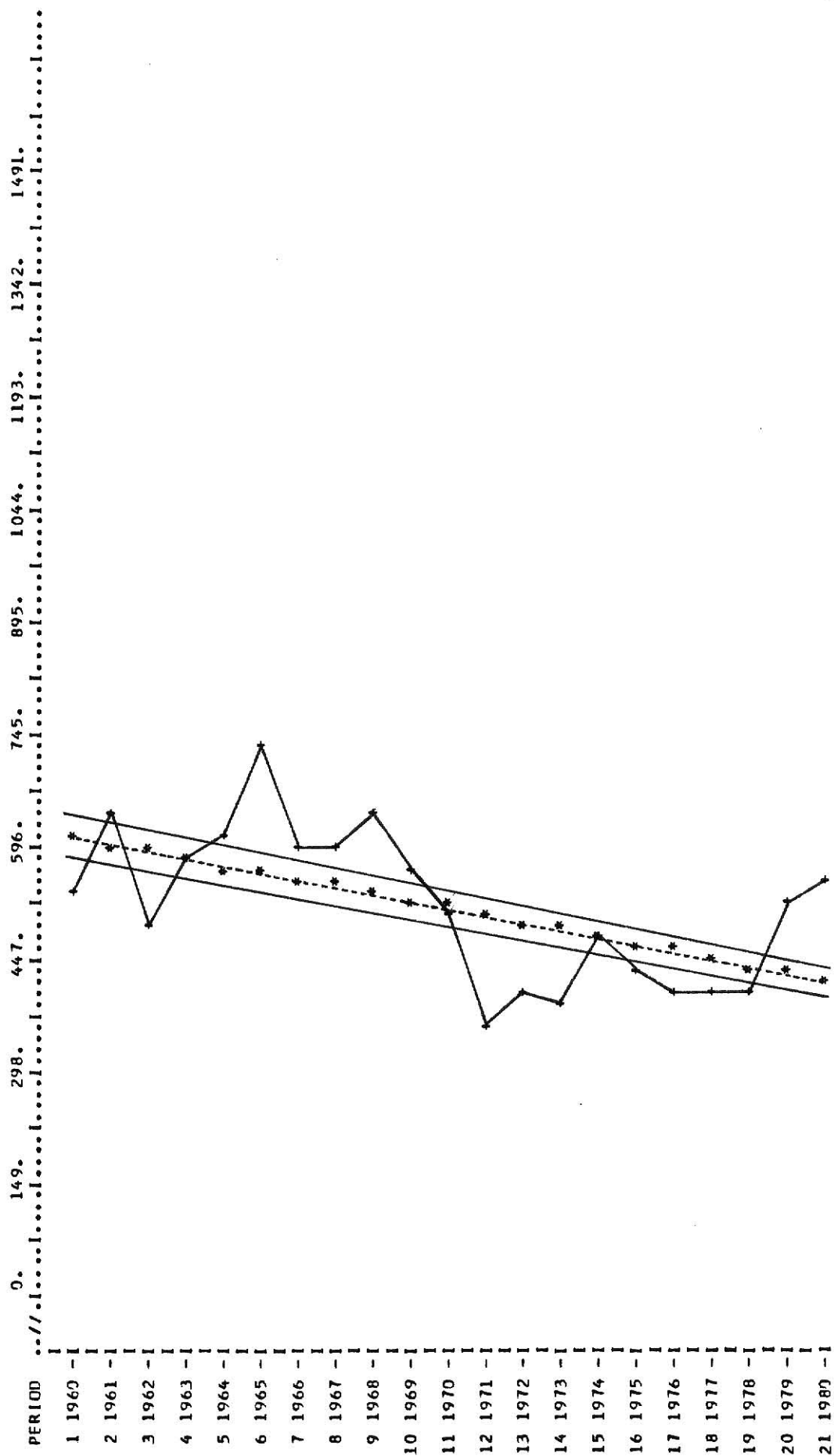
Rice shows surpluses in the period 1965 through 1970 and in the years 1974, 1975 and 1980. Deficits were encountered in five successive years, 1960-1964, as well as three later successive years, 1971-1973, and four last successive years, 1976-1979. The greatest deficit was encountered in 1972 and the greatest surplus in 1968.

Simulated transactions of corn reserves were required in 19 of the 21 historical years. Panama has simulated deposits to the reserves in 1961, 1964, 1965, 1966, 1967, 1968, 1969, 1979, and 1980. The largest one occurred in 1965. Withdrawals from the reserves occur in the years 1960, 1962, 1971, 1972, 1973, 1975, 1976, 1977, and 1978. The largest withdrawal occurs in the year 1971.

Simulated transactions of rice reserves were less frequent than in the case of corn. Panama's largest deposit occurs in 1967 with smaller ones occurring in the years 1965, 1968, 1969, 1970, and 1974. The largest withdrawal occurs in 1971 with smaller ones occurring in the years 1960, 1963, 1977 and 1978.

Figure 5.11 PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 4. CORN ONLY.

PANAMA
UNIT IS GRAMS PER CAPITA X 100 IRSQ = 0.3344

Annual Deviation Patterns in Total Consumption Supplies

Annual deviations between reported and trend estimates of total consumption supplies of corn and rice for the six countries of the region are shown in Tables 8, Appendix C. These deviations were obtained by multiplying the corresponding per capita deviations (Table 7) by the mid-year population estimates for each country from Table 3 (Appendix A).

The pattern of large and unpredictable year-to-year deviations between the observed supply quantities and estimated trend quantities available for consumption shown in Tables 8 provide the basis for assessing the need for food security reserves in each of the countries under study.

The magnitude of the difference in extreme deviations is higher in corn than in rice for all countries. As a total for the region, deviations in corn supplies have ranged from -150,000 metric tons in 1977 to 168,000 metric tons in 1968, and rice from -22,000 metric tons in 1977 to 23,000 metric tons in 1967. Note also from Tables 8 (Appendix C) that shortfalls of corn were common to all countries in 1976 whereas in 1977 only Costa Rica showed an overrun. These years accounted for two of the three largest shortfalls, the other one occurring in the year 1972. In the case of rice, the three largest shortfalls were experienced in the years 1977, 1978, and 1979.

CHAPTER VI

SIMULATED REQUIREMENTS FOR FOODGRAIN RESERVE TRANSACTIONS WITH AND WITHOUT STABILIZING TRADE

The simulated requirements for annual deposits to and withdrawals from the foodgrain reserve program for corn and rice, needed by each country to achieve the stability goal of 5-percent deviation from the long-term trend in supply quantities available for per capita food consumption, are shown for two major situations by the tables included in Appendix D, (a) using historical trade patterns, and (b) assuming stabilizing trade adjustments.

The targeted range of 5-percent of variability in available quantities for food consumption is somewhat arbitrary. As this range is made wider, the needed reserve transactions and the corresponding reserve stock levels would be correspondingly lower, and vice versa. It is usually the case that complete stability of 0-percent deviation is not a feasible goal because of the size and cost associated with the reserve required to reach it.

Stabilizing Trade

Over the period 1960-1980 all of the countries of the region have been actively engaged in international trade of corn and rice.¹ Costa Rica's annual net imports of corn have averaged about 15,500 metric tons, while its annual exports of rice have averaged about 6,500 metric tons.

¹The volume of this trade is shown in the set of Tables 1 included in Appendix B.

Annual net importation of corn by El Salvador has averaged about 22,800 metric tons, while exporting about 1,300 metric tons of rice annually on the average. Guatemala is the largest importer of corn averaging about 38,500 metric tons per year. Guatemala also imports rice, but in smaller quantities at an annual average of 2,400 metric tons. In contrast with the rest of the region, Honduras is the only net exporter of corn with an annual average of about 7,300 metric tons; her imports of rice are the largest with an annual average of about 4,200 metric tons. Annual net imports by Nicaragua have averaged about 9,500 metric tons of corn, and 1,800 metric tons of rice. Panama imports substantial quantities of corn; net imports have averaged about 11,200 metric tons, plus very small quantities of rice.

Table 15 in Appendix D simulates stabilizing trade adjustments in international trade by each of the countries over the 1960-1980 period based on the relevant data provided in Table 10. The assumption that one-half of the needed trade adjustments can be made available in the domestic consumer market by the end of the current crop year is based on the hypothesized time lag from the time that accurate estimates of domestic production are made to the date when delivery takes place in the domestic market of grain obtained through international trade. Contributing to this hypothetical time lag are factors such as late final crop estimates, the time required to execute import/export orders, the institutional constraints, the physical logistics at existing port facilities, the long distances between ports and major consumer centers, and the delays in getting the grain into the retail markets. The effect of reducing the time lag in achieving trade adjustment would be to further reduce needed reserve transactions, capacities, and inventories.

Simulated annual net import adjustments in corn under the 5-percent targeted maximum deviation band range from -4,000 MT in 1980 to 7,000 MT in 1976 for Costa Rica, from -21,000 MT in 1973 to 15,000 MT in 1972 for El Salvador, from -59,000 MT in 1979 to 36,000 MT in 1974 for Guatemala, from -59,000 MT in 1968 to 37,000 MT in 1965 for Honduras, from -17,000 MT in 1969 to 18,000 MT in 1979 for Nicaragua, and from -14,000 MT in 1980 to 10,000 MT in 1972 for Panama. Simulated net import adjustments for paddy rice range from -16,000 MT in 1976 to 14,000 MT in 1971 for Costa Rica, from -13,000 MT in 1968 to 5,000 MT in 1975 for El Salvador, from -17,000 MT in 1973 to 11,000 MT in 1978 for Guatemala, from -7,000 MT in 1975 to 7,000 MT in 1968 for Honduras, from -16,000 MT in 1967 to 14,000 MT in 1969 for Nicaragua, and from -8,000 MT in 1968 and 1969 to 8,000 MT in 1972 for Panama.

Transactions with Security Reserves

The simulated total need for reserve transactions of corn and rice by each country is presented graphically in Figure 6-1 and 6-2 at the end of the chapter. In general, compared to the cases of no stabilizing import adjustments for corn or rice, the indicated reserve transactions with stabilizing trade adjustments are smaller in absolute value in all the countries.

For both rice and corn, the indicated reserve transactions by Costa Rica are more significant over the second half of the 21-year historical period. However, the indicated transactions for corn and rice with no stabilizing import adjustment were somewhat less frequent than with stabilizing trade adjustments.

Compared to Costa Rica, simulated transactions for corn in El Salvador are relatively larger in absolute terms, although they occur less

frequently. Under no stabilizing import adjustment the indicated transactions range from about +20,000 metric tons in 1962 to about -33,000 metric tons in 1972. They stand at zero over the period 1974 through 1980, except in 1976 with a reserve transaction of -5,000 metric tons. With and without stabilizing trade, corn reserve transactions are less significant through the period 1976 to 1980.

In the case of rice, El Salvador needed reserve transactions are less significant during the periods 1960 to 1966 and 1974 to 1980. With and without stabilizing trade, needed transactions stand at zero in 1978, 1979 and 1980.

In general for Guatemala, reserve transactions of corn and rice are considerably more significant over the second half of the 21-year historical period than is true for the first half of the period. With no stabilizing import adjustment, corn needed transactions have ranged from about -69,000 metric tons in 1977 to about +79,000 metric tons in 1980.

In the case of rice, Guatemala indicates needed transactions that range from +27,000 metric tons in 1973 to about -26,000 metric tons in 1978 under no stabilizing import adjustments. By contrast, with stabilizing trade adjustments the needed transactions range from +10,000 metric tons in 1973 to about -15,000 metric tons in 1978.

Most of the needed transactions for corn in Honduras fall in the first half of the 21-year historical period. Under no stabilizing import adjustment, they range from -65,000 metric tons in 1964 to +117,000 metric tons in 1968, and from -22,000 metric tons in 1972 to +7,000 metric tons in 1980. These same figures were reduced by over one-half with stabilizing trade adjustments.

Under no stabilizing import adjustment, needed rice reserve transactions by Honduras range from about +6,000 metric tons in 1960 to about -10,000 metric tons in 1971. By contrast, with stabilizing trade adjustments the needed transactions range from +3,000 metric tons in 1960 to about -4,000 metric tons in 1971.

Under no stabilizing import adjustment, corn needed reserve transactions by Nicaragua range from about -17,000 metric tons in 1960 to about +31,000 metric tons in 1969, and from about +23,000 metric tons in 1971 to about -29,000 metric tons in 1979.

In the case of rice with or without stabilizing trade, needed reserve transactions are more significant over the first half of the period. Without stabilizing trade, there were no transactions in the years 1971, 1974, 1975, 1976, and 1978; as opposed to the years 1972 and 1976 of no transactions under stabilizing trade.

Without stabilizing trade, the needed reserve transactions of rice by Nicaragua range from -11,000 metric tons in 1960 to +22,000 metric tons in 1967. With stabilizing trade, they range from about -5,000 metric tons in 1961, to +10,000 metric tons in 1966.

Transactions with corn reserves by Panama are needed in more years than is true for rice. No transactions of rice are indicated in 10 years of the 21-year period in the case of no stabilizing import adjustment.

The increase in amplitude in the latter half of the period for corn without stabilizing trade can be seen in the range of needed reserve transactions from -19,000 metric tons in 1971 to +21,000 metric tons in 1980. With stabilizing trade, the range was reduced to -10,000 metric tons in 1971 and to +7,000 metric tons in 1980 respectively.

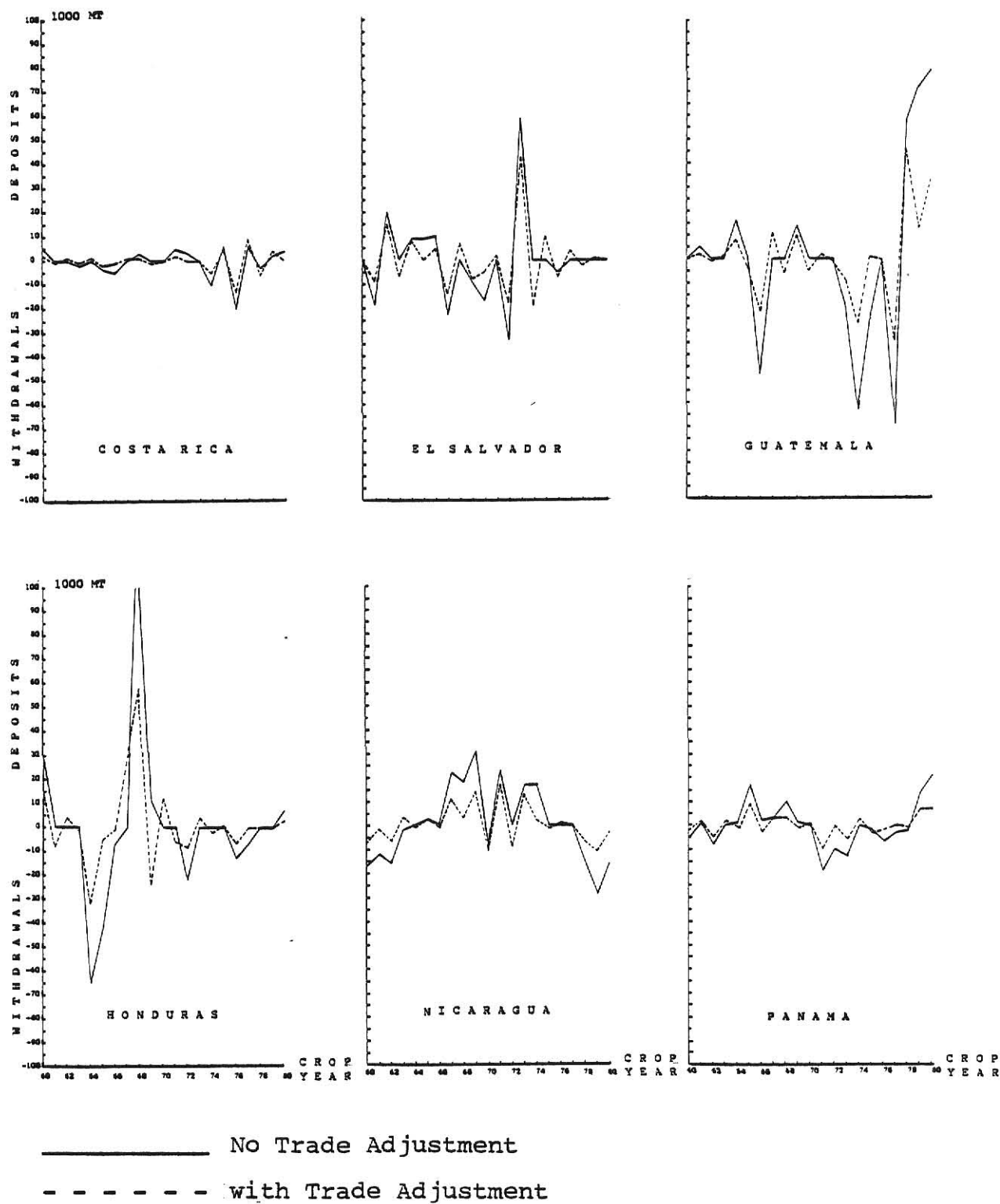
Panama's needed reserve transactions of rice without trade adjustments have ranged from about -8,000 metric tons in 1960 to about +12,000 metric tons in 1967; none were needed in 10 of the years.

ILLEGIBLE DOCUMENT

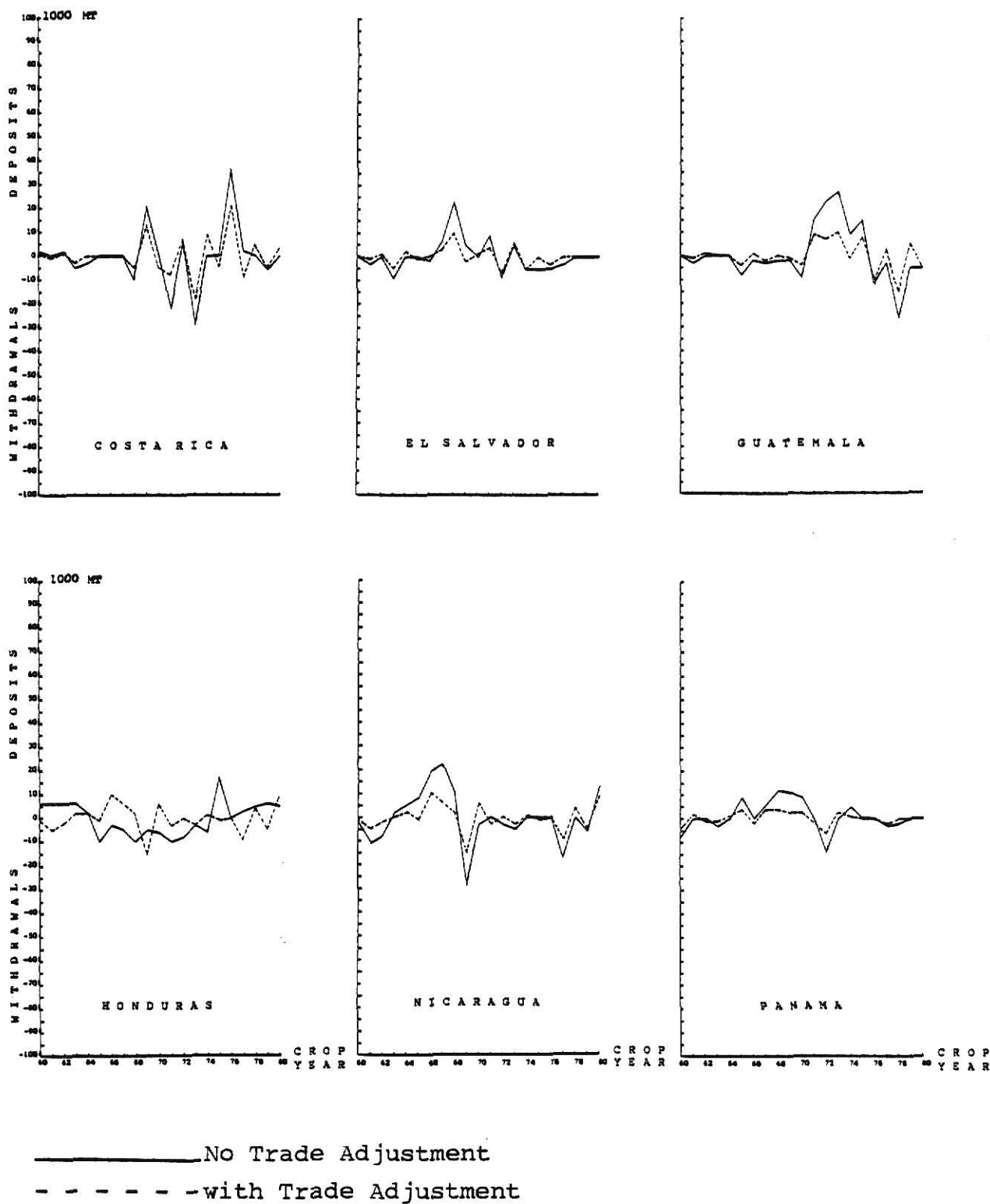
**THE FOLLOWING
DOCUMENT(S) IS OF
POOR LEGIBILITY IN
THE ORIGINAL**

**THIS IS THE BEST
COPY AVAILABLE**

6.1 Needed Corn Reserve Transactions for 5-percent Stability



6.2 Needed Rice Reserve Transactions for 5-percent Stability



CHAPTER VII

SIMULATED ANNUAL TRANSACTIONS WITH IN-COUNTRY AND REGIONAL FOODGRAIN RESERVES

The simulated annual transactions with in-country and regional foodgrain reserves for corn and rice, are analyzed separately for (a) historical trade patterns and (b) assuming stabilizing trade adjustments. Tables 10 and 16 in Appendix D provide the basic data for the analysis under the restriction that the year-end storage balances for in-country reserves be kept at reasonable levels to allow for future needs to withdraw from them. When the needs are greater than can be met by the in-country reserves, transactions with regional reserves are used to supplement those with the in-country reserves.

Corn Reserve Transactions

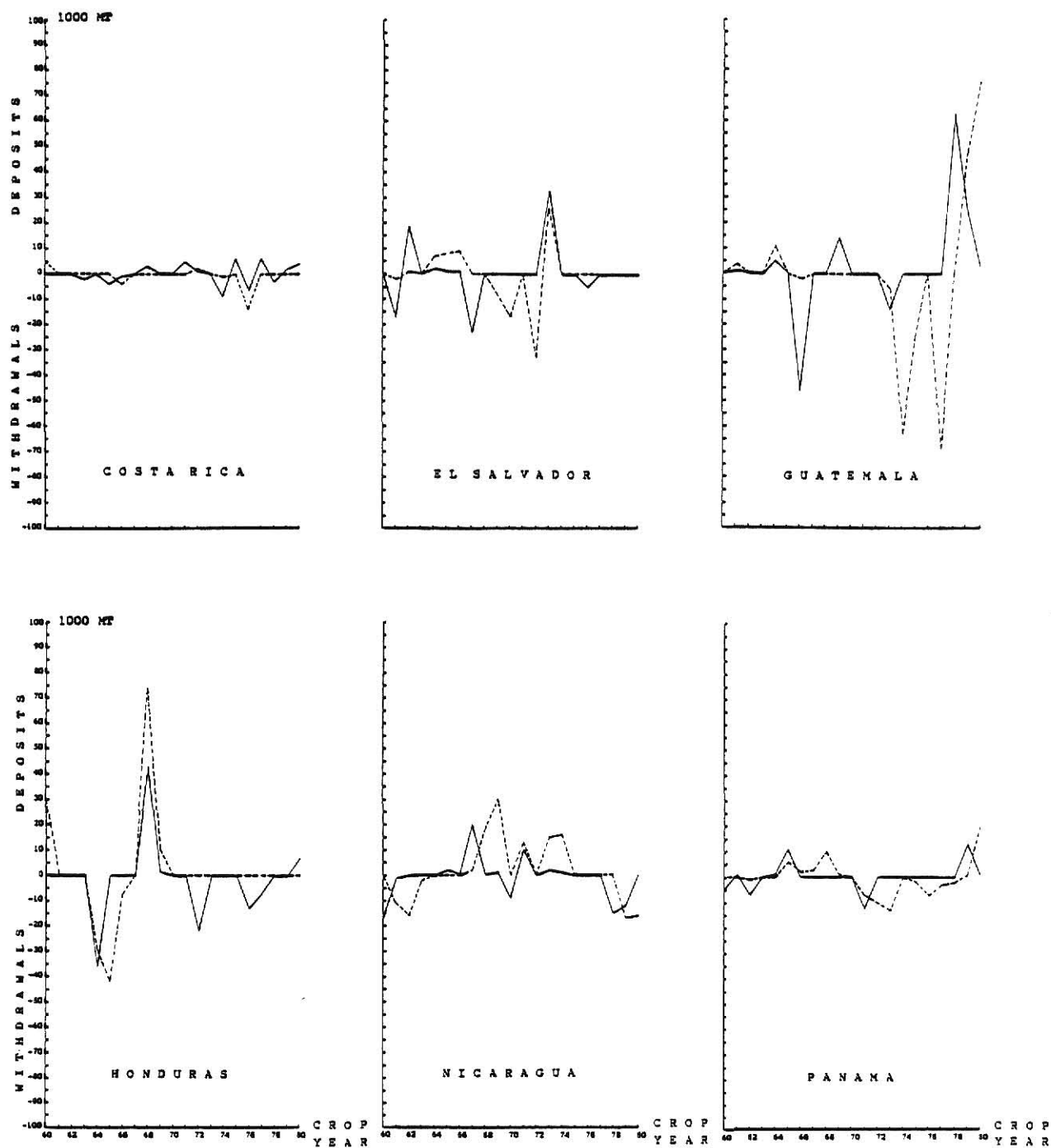
The computed annual transactions with corn reserves using historical trade patterns are plotted in Figure 7.1A. These are tabulated separately in Tables 11 and 13 (Appendix E) for in-country and regional reserves, respectively.

Indicated annual transactions with the in-country corn reserves using historical trade patterns, in units of 1,000 metric tons, range from +6 to -9 for Costa Rica, +33 to -23 for El Salvador, +58 to -46 for Guatemala, +43 to -36 for Honduras, +20 to -17 for Nicaragua, and +13 to -12 for Panama. Over the 21-year period, simulated transactions with in-country reserves were most frequent in Costa Rica, with zero transactions in only 8 of the years.

Simulated regional reserve transactions of corn using historical trade patterns over the 21-year period were needed the same number of times as with in-country reserves. However, there were more withdrawals and less deposits at the regional reserve level than was true for in-country reserves.

As a total for the region, simulated withdrawals from and deposits to corn regional reserves were greater than with in-country corn reserves using historical trade patterns. In both cases, total deposits exceed total withdrawals.

7.1A Computed Transactions with Corn Security Reserves (with Historical Trade)



————— In-Country Reserve
 - - - - - Regional Reserve

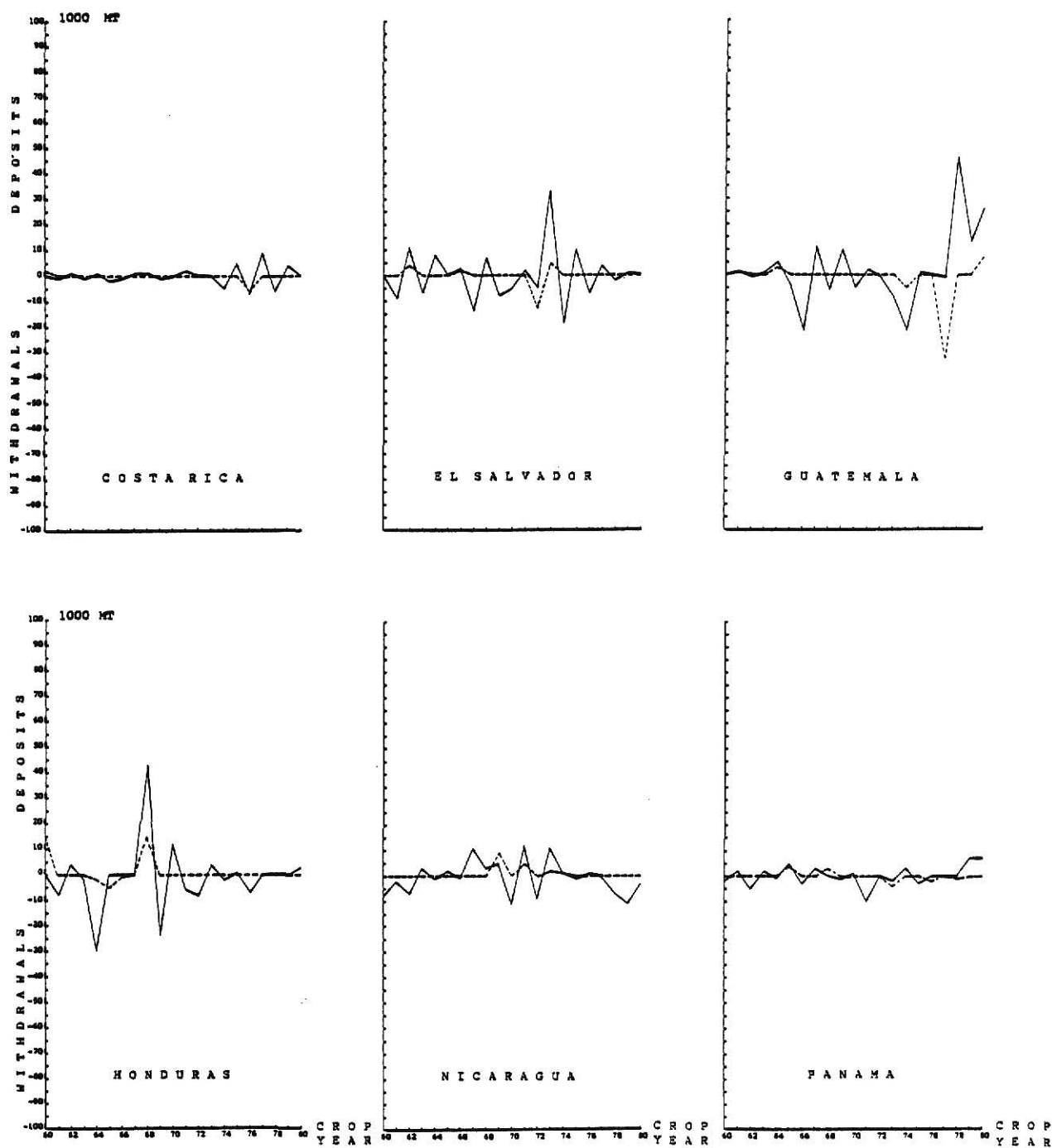
Under the assumption of stabilizing trade adjustments, the simulated annual transactions with corn reserves are shown in Figure 7.1B, and in numerical form in Tables 17 and 19 (Appendix E) for in-country and regional reserves, respectively.

The indicated annual transactions with in-country corn reserves assuming stabilizing trade adjustments, in units of 1,000 metric tons, range from +9 to -7 for Costa Rica, +33 to -19 for El Salvador, +46 to -22 for Guatemala, +43 to -30 for Honduras, +11 to -11 for Nicaragua, and +7 to -10 for Panama. Over the 21-year period, simulated transactions were most frequent in Nicaragua, with no transactions indicated only in the 1977 crop year.

The indicated annual transactions with regional corn reserves assuming stabilizing trade adjustments are considerably less frequent and smaller than with in-country reserves for the region as a whole. Simulated transactions total 25, with 15 deposits and 10 withdrawals. The largest of these simulated deposits took place in the country of Honduras, while the largest withdrawal occurred in Guatemala.

As a total for the region, simulated deposits to both in-country and regional corn reserves exceeded corresponding withdrawals.

7.1B Computed Transactions with Corn Security Reserves (with Stabilizing Trade)



————— In-Country Reserve
 ----- Regional Reserve

Rice Reserve Transactions

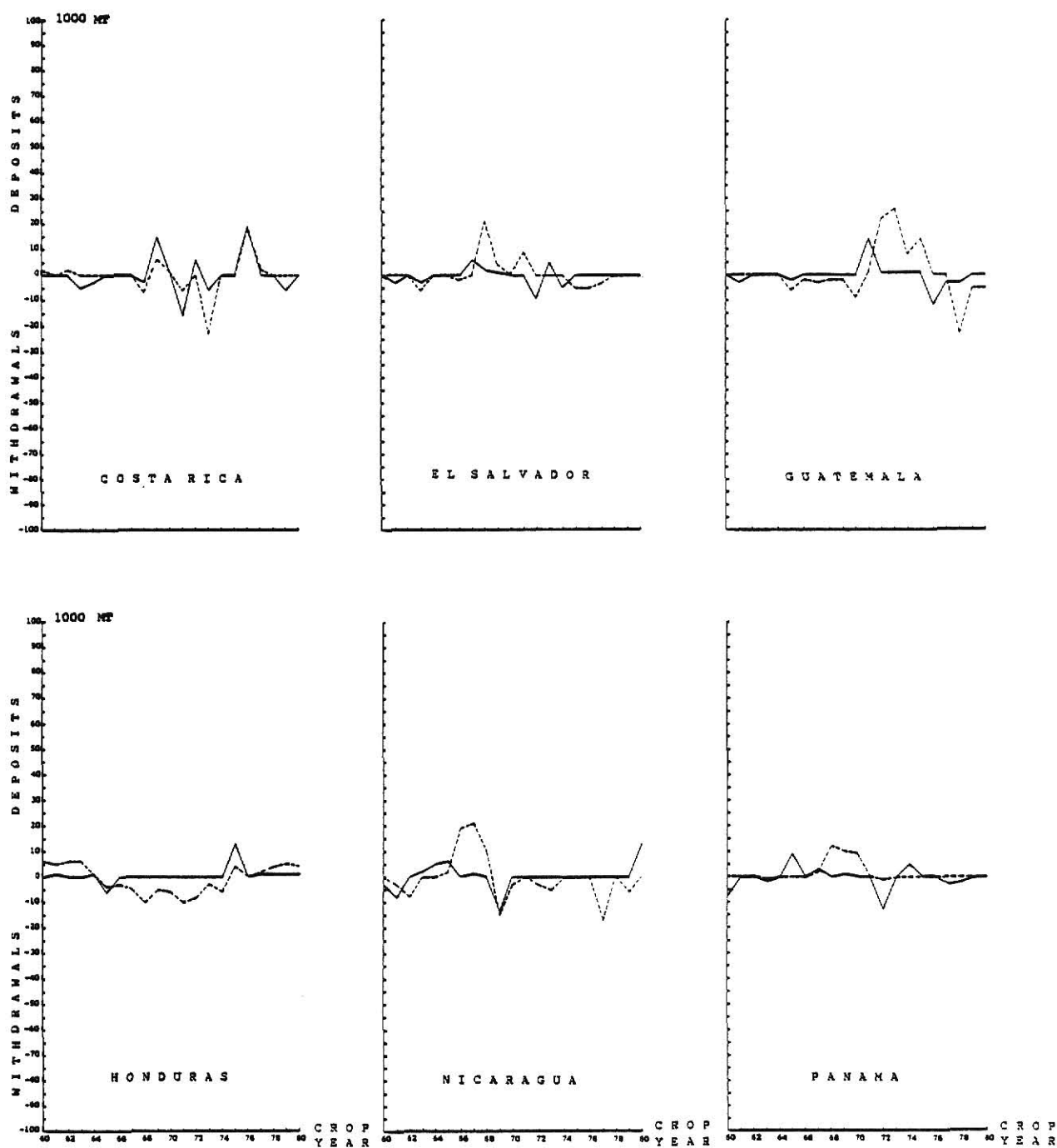
The computed annual transactions with rice reserves using historical trade patterns in Figure 7.2A are shown numerically in Tables 11 and 13 (Appendix E) for in-country and regional reserves, respectively.

Using historical trade patterns, the indicated annual transactions of rice with in-country reserves, in units of 1,000 metric tons, range from +19 to -16 for Costa Rica, +6 to -9 for El Salvador, +14 to -12 for Guatemala, +13 to -6 for Honduras, +13 to -14 for Nicaragua, and +9 to -13 for Panama. Over the 21-year historical period, Costa Rica and Guatemala had more simulated transactions than other nations in the region; Costa Rica's simulated total in-country transactions with rice reserves were greater than those of Guatemala.

Indicated rice regional reserve transactions using historical trade patterns were needed more frequently and were larger than the total deposits to and withdrawals from in-country reserves.

As was the case in corn, total simulated deposits of rice to both in-country and regional reserves exceeded simulated withdrawals.

7.2A Computed Transactions with Rice Security Reserves (with Historical Trade)



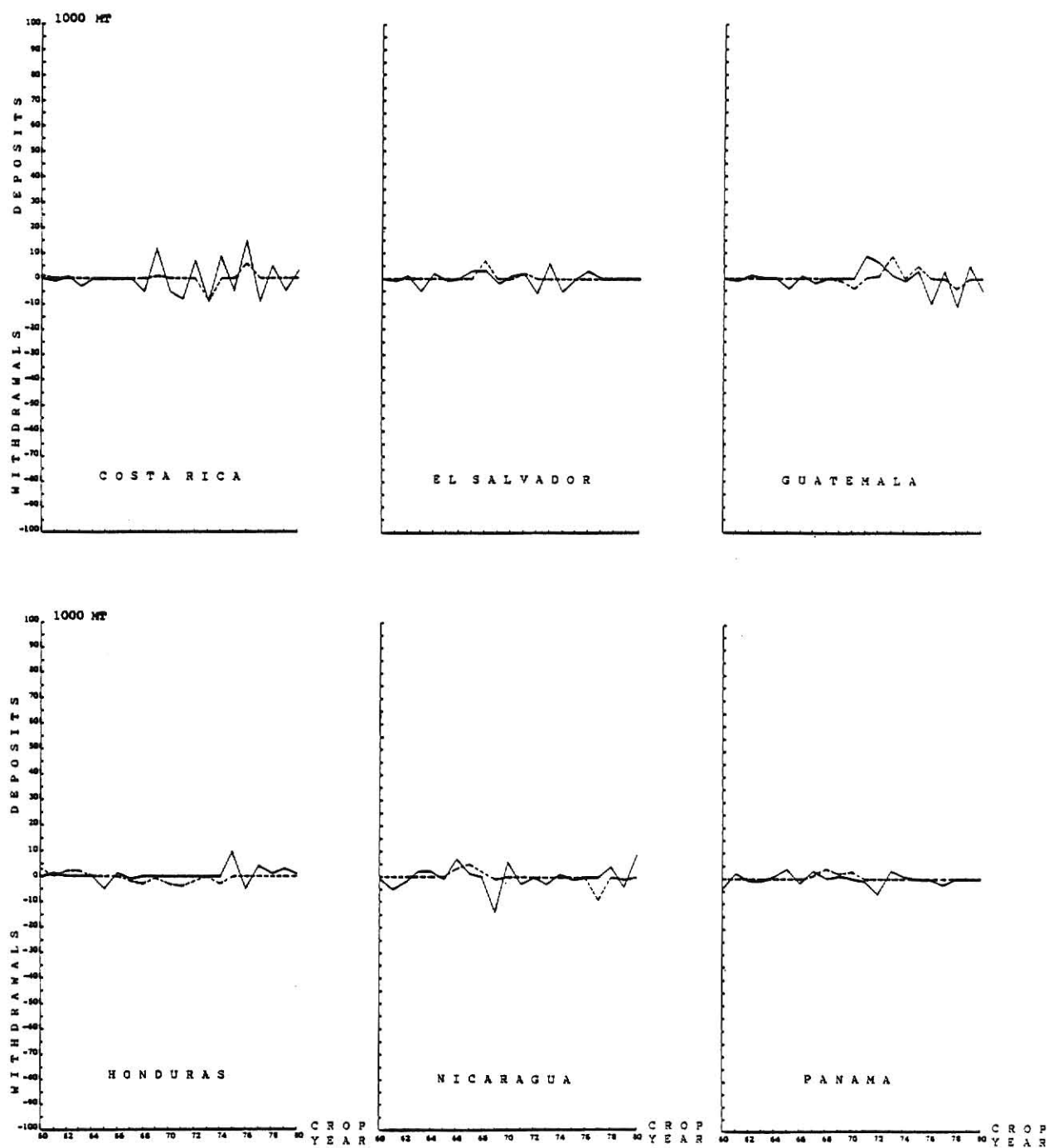
————— In-Country Reserve
 - - - - - Regional Reserve

With the assumption of stabilizing trade adjustments, the simulated annual transactions with rice reserves are shown in Figure 7.2B, and in numerical form in Tables 17 and 19 (Appendix E) for in-country and regional reserves, respectively.

Indicated annual transactions with in-country rice reserves assuming stabilizing trade adjustments, in units of 1,000 metric tons, range from +15 to -9 for Costa Rica, +6 to -6 for El Salvador, +9 to -11 for Guatemala, +10 to -5 for Honduras, +9 to -14 for Nicaragua, and +3 to -6 for Panama. As was the case for transactions with in-country corn reserves, Nicaragua needed more frequent transactions with in-country rice reserves assuming stabilizing trade adjustments than the other countries. There were no rice transactions in only 4 of the 21 years.

With regional rice reserves, the indicated annual transactions assuming stabilizing trade adjustments were considerably less frequent and smaller than was true for in-country reserves for the region as a whole. Simulated total regional rice reserves deposits were greater than corresponding withdrawals. The two largest deposits took place in Costa Rica, while the largest withdrawal occurred in Nicaragua.

7.2B Computed Transactions with Rice Security Reserves (with Stabilizing Trade)



————— In-Country Reserve

----- Regional Reserve

CHAPTER VIII

STORAGE CAPACITY AND INVENTORIES REQUIRED FOR SIMULATED FOODGRAIN SECURITY RESERVE PROGRAM

The storage inventories for both in-country and regional reserves of corn and rice were assessed separately for (a) historical trade patterns and (b) assuming stabilizing trade adjustments. Tables 12 and 14 (Appendix F) correspond to alternative (a), and Tables 18 and 20 (Appendix G) correspond to alternative (b).

The required grain storage capacities increase through time as defined by the maximum year-end balances in inventory. The presentation of the data on storage capacities follows the same format as is the case for inventories. Tables 12' and 14' (Appendix F) summarize the required total storage capacities for both in-country and regional reserves of corn and rice assuming historical trade patterns. Tables 18' and 20' (Appendix G) present the required total storage capacities for both in-country and regional reserves of corn and rice assuming stabilizing trade adjustments.

Capacities and Inventory Levels for Corn Reserves with Historical Trade

The simulated grain storage capacity and inventory levels for corn reserves for the six countries are shown graphically in Figure 8.1. The charts depict both in-country (lower section) and regional (upper section) levels. The corresponding capacities are reflected by the height of the bar for each crop year. Inventories are depicted by the height of the shaded area within each bar.

Simulated in-country reserve balances of corn are substantial for Guatemala and Honduras. As a share of the total over the 21-year historical period, they account for over 53 percent of corn reserve balances. The reserve balances of Guatemala account for 29.5 percent and of Honduras for 23.7 percent of the total. The total shares for the remaining countries are 5.3 percent in Costa Rica, 19.8 percent in El Salvador, 15.4 percent in Nicaragua, and 6.2 percent in Panama.

The required in-country storage capacity for corn reserves is large for Guatemala over the total period. That for Costa Rica holds at 7,000 MT through 1970, then increases to 8,000 MT in 1971 and 9,000 MT in 1972. That for El Salvador holds at 17,000 MT for 1960 and 1961, at 19,000 MT for 1962 and 1963, at 21,000 MT for 1964, at 22,000 MT for 1965, at 23,000 MT for 1966 through 1972, and at 33,000 MT for 1973 through 1980. That for Honduras remains at 36,000 MT through 1967, then increases to 43,000 MT in 1968 and 44,000 MT in 1969. That for Nicaragua remains at 1,000 MT through 1964, at 2,000 MT for 1965 and 1966, at 22,000 MT for 1967 and 1968, at 23,000 MT for 1969 and 1970, at 24,000 MT for 1971 and 1972, at 26,000 MT for 1973, and at 27,000 MT for 1974 through 1980. That for Panama starts at 6,000 MT for 1960, remains at 7,000 MT for 1961 through 1964, at 12,000 MT for 1965 through 1978, at 13,000 MT for 1979, and at 14,000 MT for 1980.

On a percentage basis, the total required in-country storage capacity for corn reserves increased by over 98 percent from the base period 1960. Nicaragua's storage capacity increased 27-fold, while El Salvador, Guatemala, and Panama more than doubled their respective capacities. Costa Rica and Honduras experienced much smaller increases.

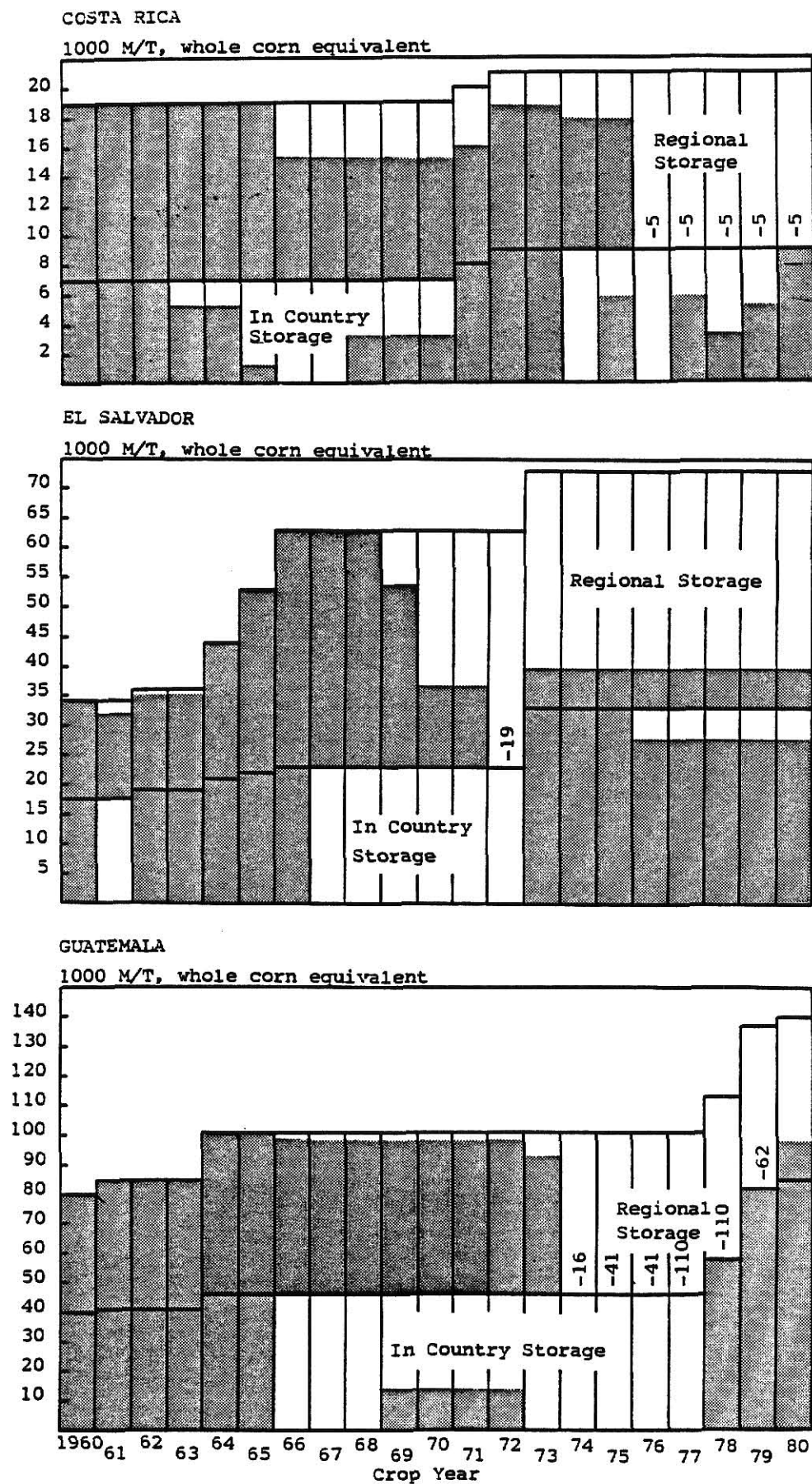
All six countries encounter negative regional corn reserve balances--Costa Rica from 1976-1980, El Salvador only in 1972, Guatemala from 1974-1979,

Honduras from 1965-1967, Nicaragua from 1962-1967, and Panama from 1976-1979.

The required regional storage capacity for corn reserves remains constant for Costa Rica at 12,000 MT. That for El Salvador holds at 17,000 MT through 1963, then increases to 23,000 MT for 1964 and 31,000 MT for 1965, and remains at 40,000 MT for 1966 through 1980. That for Guatemala starts at 40,000 MT for 1960, remains at 44,000 MT for 1961 through 1963, and increases to 55,000 MT for 1964 through 1980. That for Honduras remains at 66,000 MT until 1969 when it reaches 72,000 MT. That for Nicaragua holds at 18,000 MT through 1968, at 39,000 MT for 1969 and 1970, at 52,000 MT for 1971 and 1972, at 67,000 MT for 1973, and at 83,000 MT for 1974 through 1980. That for Panama holds at 11,000 MT through 1964, at 16,000 MT for 1965, at 18,000 MT for 1966, at 21,000 MT for 1967, at 31,000 MT for 1968, and at 32,000 MT for 1969 through 1980.

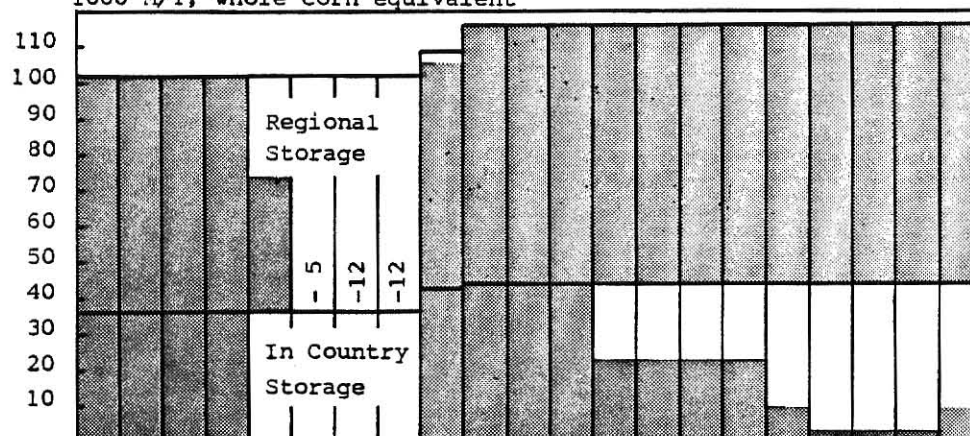
The total required regional storage capacity for corn reserves increased by over 79 percent over the 21-year period. Costa Rica experienced no increase, in contrast to Nicaragua's increase of 461 percent from the base period 1960. El Salvador's capacity more than doubled and Panama's tripled. Guatemala and Honduras experienced much smaller increases.

Fig 8.1 Computed Storage Capacity and Inventory for Corn
Security Reserves (with Historical Trade)



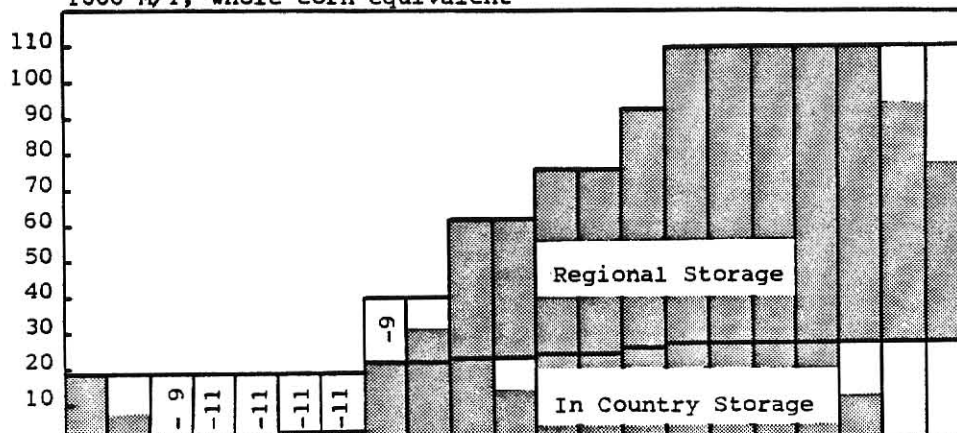
HONDURAS

1000 M/T, whole corn equivalent



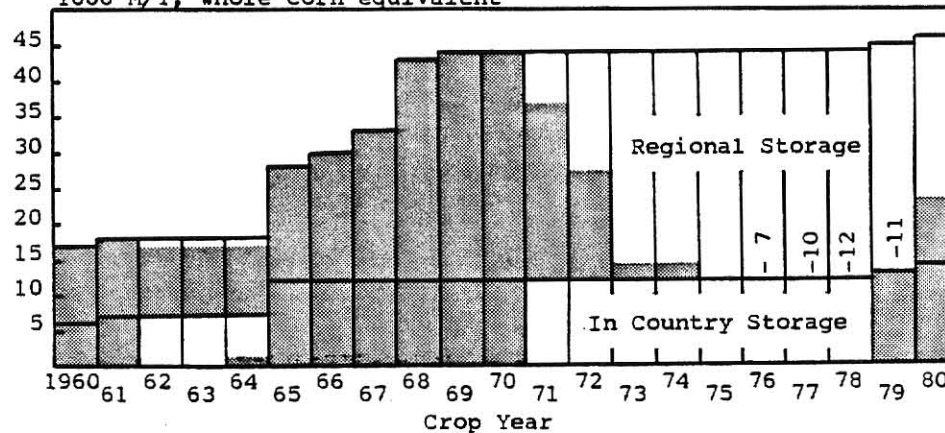
NICARAGUA

1000 M/T, whole corn equivalent



PANAMA

1000 M/T, whole corn equivalent



Capacities and Inventory Levels for Rice Reserves with
Historical Trade

The simulated grain storage capacity and inventory requirement levels for rice reserves are shown graphically in Figure 8.2

The in-country reserve balances of rice were substantial for Costa Rica. As shares of the total in-country rice reserve balances over the 21-year historical period, the individual country components are 27 percent for Costa Rica, 9.2 percent for El Salvador, 16.1 percent for Guatemala, 17.9 percent for Honduras, 13.3 percent for Nicaragua, and 16.4 for Panama.

The required in-country storage capacity for rice reserves is large for Costa Rica over the total period. That for El Salvador remains at 6,000 MT through 1967, at 8,000 MT for 1968, and then increases to 9,000 MT. That for Guatemala holds at 5,000 MT through 1970, at 14,000 MT for 1971, at 15,000 MT for 1972, at 16,000 MT for 1973, at 17,000 MT for 1974, and at 18,000 MT for 1975 through 1980. That for Honduras starts at 4,000 MT for 1960, remains at 5,000 MT for 1961 through 1963, at 6,000 MT for 1964 through 1974, at 13,000 MT for 1975 and 1976, at 14,000 MT for 1977, at 15,000 MT for 1978, at 16,000 MT for 1979, and at 17,000 MT for 1980. That for Nicaragua holds at 8,000 MT through 1964, at 13,000 MT for 1965 and 1966, and at 14,000 MT for 1967 through 1980. That for Panama remains at 2,000 MT through 1964, at 9,000 MT for 1965 and 1966, at 12,000 MT for 1967 and 1968, and at 13,000 MT for 1969 through 1980.

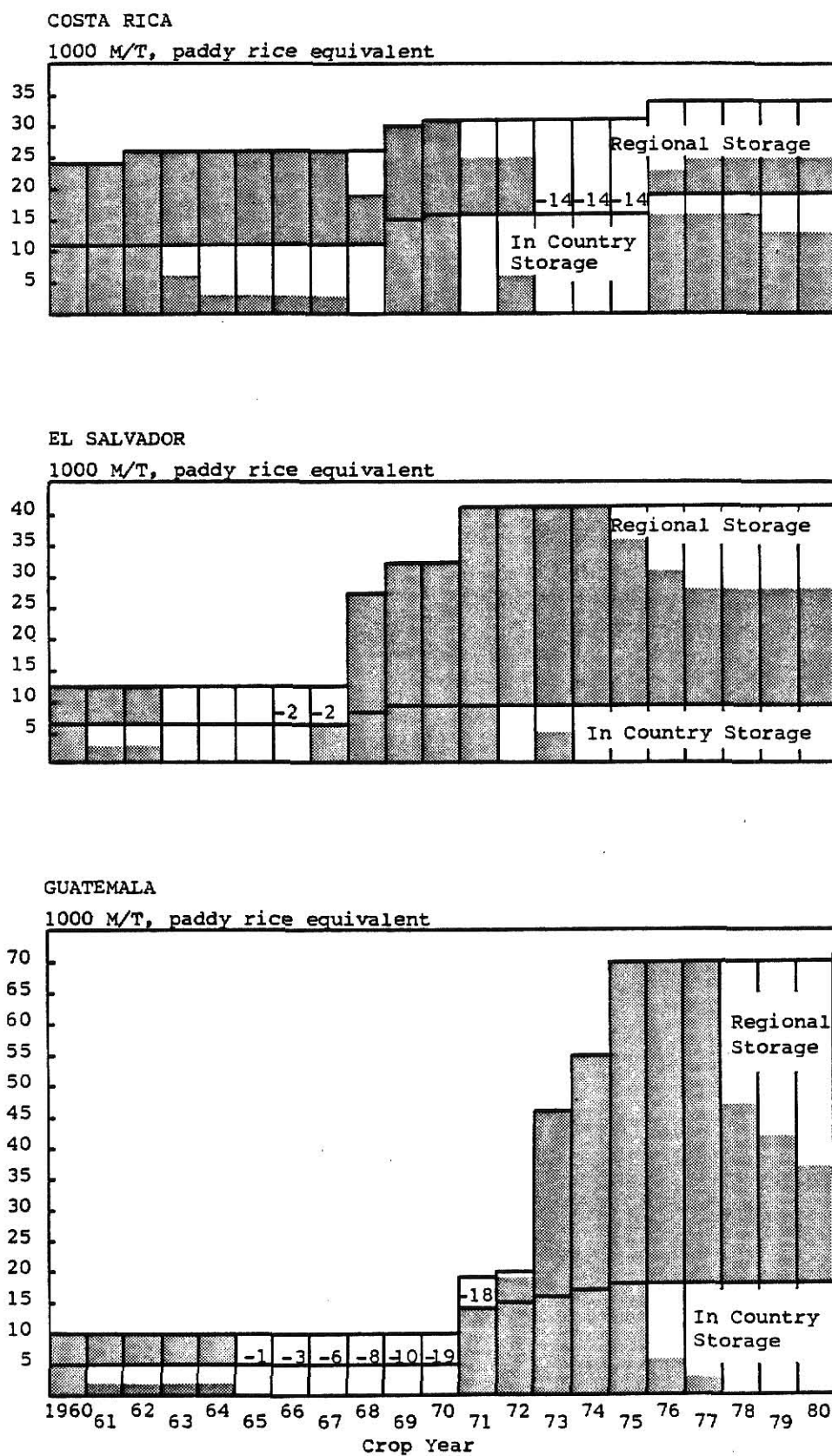
The total required in-country storage capacity for rice reserves increased by 250 percent over the 1960 base period. The increases experienced in the six countries were 72.7 percent for Costa Rica, 50.0 percent for El Salvador, 360.0 percent for Guatemala, 425.0 percent for Honduras, 75.0 percent for Nicaragua, and 650.0 percent for Panama.

With the exception of Nicaragua and Panama, the individual countries encounter negative regional rice reserve balances--Costa Rica from 1973-1975, El Salvador from 1966-1967, Guatemala from 1965-1971, and Honduras from 1970-1980.

The required regional storage capacity for rice reserves for Costa Rica holds at 13,000 MT for 1960 and 1961, and then increases to 15,000 MT for 1962 through 1980. That for El Salvador remains at 6,000 MT through 1967, at 19,000 MT for 1968, at 23,000 MT for 1969 and 1970, and increases to 32,000 MT for 1971 through 1980. That for Guatemala remains at 5,000 MT through 1972, at 30,000 MT for 1973, at 38,000 MT for 1974, and increases to 52,000 MT for 1975 through 1980. That for Honduras starts at 10,000 MT for 1960, increases to 15,000 MT for 1961, to 21,000 MT for 1962, to 27,000 MT for 1963, and then remains at 28,000 MT for 1964 through 1980. That for Nicaragua holds at 11,000 MT through 1965, increases to 21,000 MT for 1966, to 42,000 MT for 1967, and then remains at 52,000 MT for 1968 through 1980. That for Panama remains at 10,000 MT through 1966, increases to 11,000 MT for 1967, to 23,000 MT for 1968, to 33,000 MT for 1969, and then remains at 42,000 MT for 1970 through 1980.

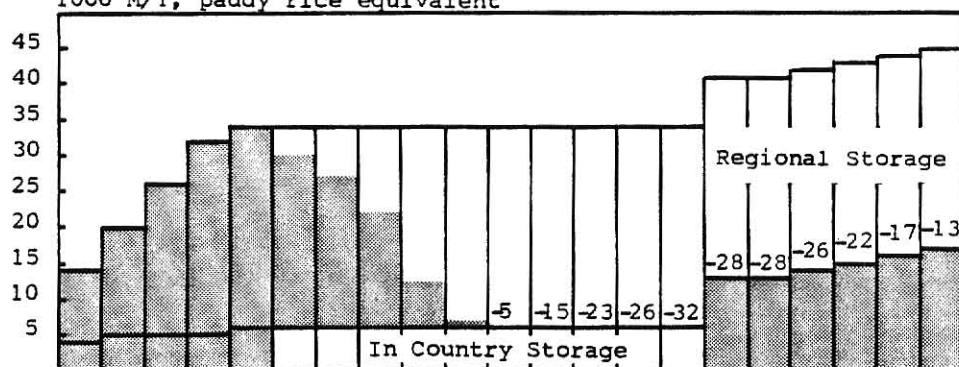
The total required regional storage capacity for rice reserves increased by 402 percent over the 1960 base period. The increases experienced by the six countries were 15.4 percent for Costa Rica, 533.3 percent for El Salvador, 1040.0 percent for Guatemala, 230.0 percent for Honduras, 473.0 percent for Nicaragua, and 420.0 percent for Panama.

Fig 8.2 Computed Storage Capacity and Inventory for Rice
Security Reserves (with Historical Trade)



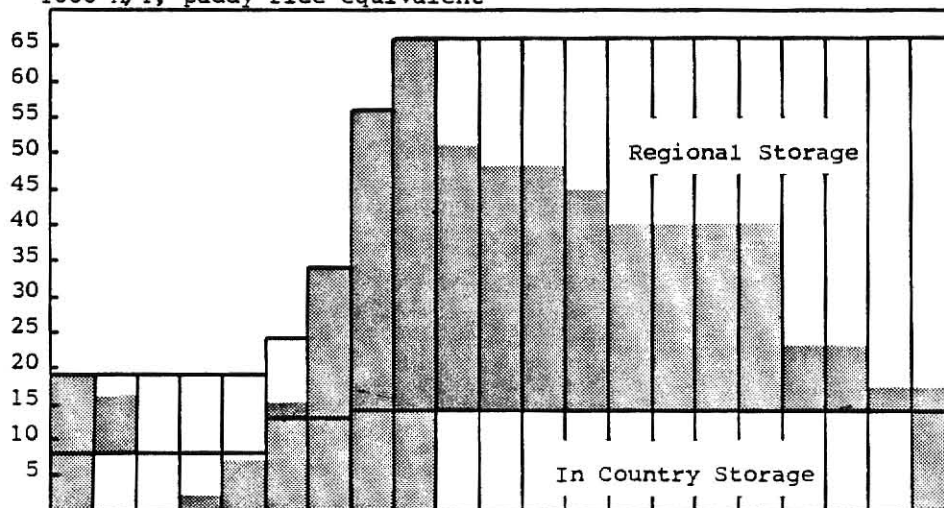
HONDURAS

1000 M/T, paddy rice equivalent



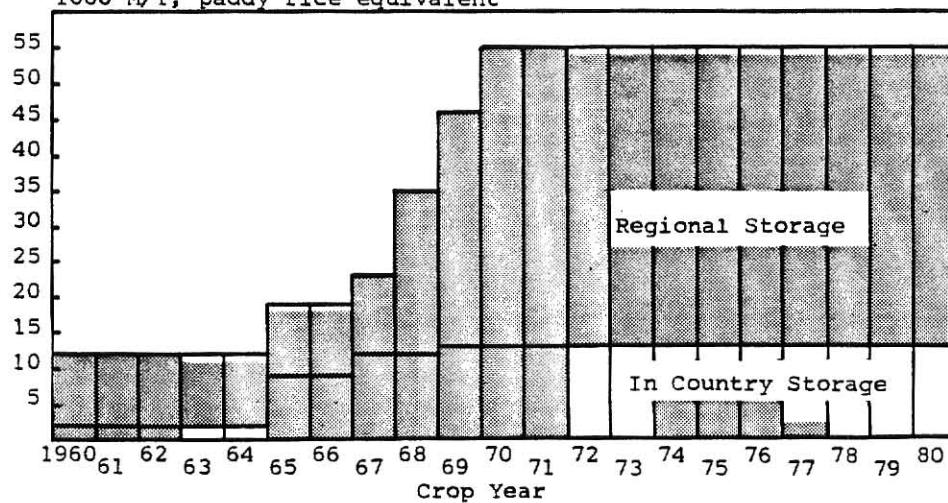
NICARAGUA

1000 M/T, paddy rice equivalent



PANAMA

1000 M/T, paddy rice equivalent



Capacities and Inventory Levels for Corn Reserves with Stabilizing Trade

The simulated grain storage capacity and inventory levels for corn reserves with stabilizing trade for the six countries are shown graphically in Figure 8.3.

Simulated in-country reserve balances of corn are substantial for Guatemala and Honduras. Together they account for over 54 percent of the total corn reserve balances. Guatemala accounts for 34.2 percent and Honduras for 19.9 percent. The total shares of the remaining countries are 6.1 percent for Costa Rica, 16.8 percent for El Salvador, 15.9 percent for Nicaragua, and 7.0 percent for Panama.

The required in-country storage capacity for corn reserves with stabilizing trade is large for Guatemala over the total period. That for Costa Rica holds at 7,000 MT through 1976, then increases to 9,000 MT for 1977 through 1980. That for El Salvador holds at 17,000 MT for 1960 and 1961, at 19,000 MT for 1962 and 1963, at 20,000 MT for 1964 and 1965, at 23,000 MT for 1966 through 1972, and at 33,000 MT for 1973 through 1980. That for Honduras holds at 36,000 MT through 1967, then increases to 43,000 MT in 1968. That for Nicaragua remains at 10,000 MT through 1966, at 15,000 MT for 1965, at 18,000 MT for 1968, at 23,000 MT for 1969 and 1970, at 24,000 MT for 1971 and 1972, at 26,000 MT for 1973, and at 27,000 MT for 1974 through 1980. That for Panama starts at 9,000 MT for 1960, it remains at 11,000 MT for 1961 through 1964, at 12,000 MT for 1965 through 1979, and at 14,000 MT for 1980.

The simulated total required in-country storage capacity for corn reserves increases by over 77 percent over the 1960 base period. The increases experienced in the six countries are 28.6 percent for Costa Rica,

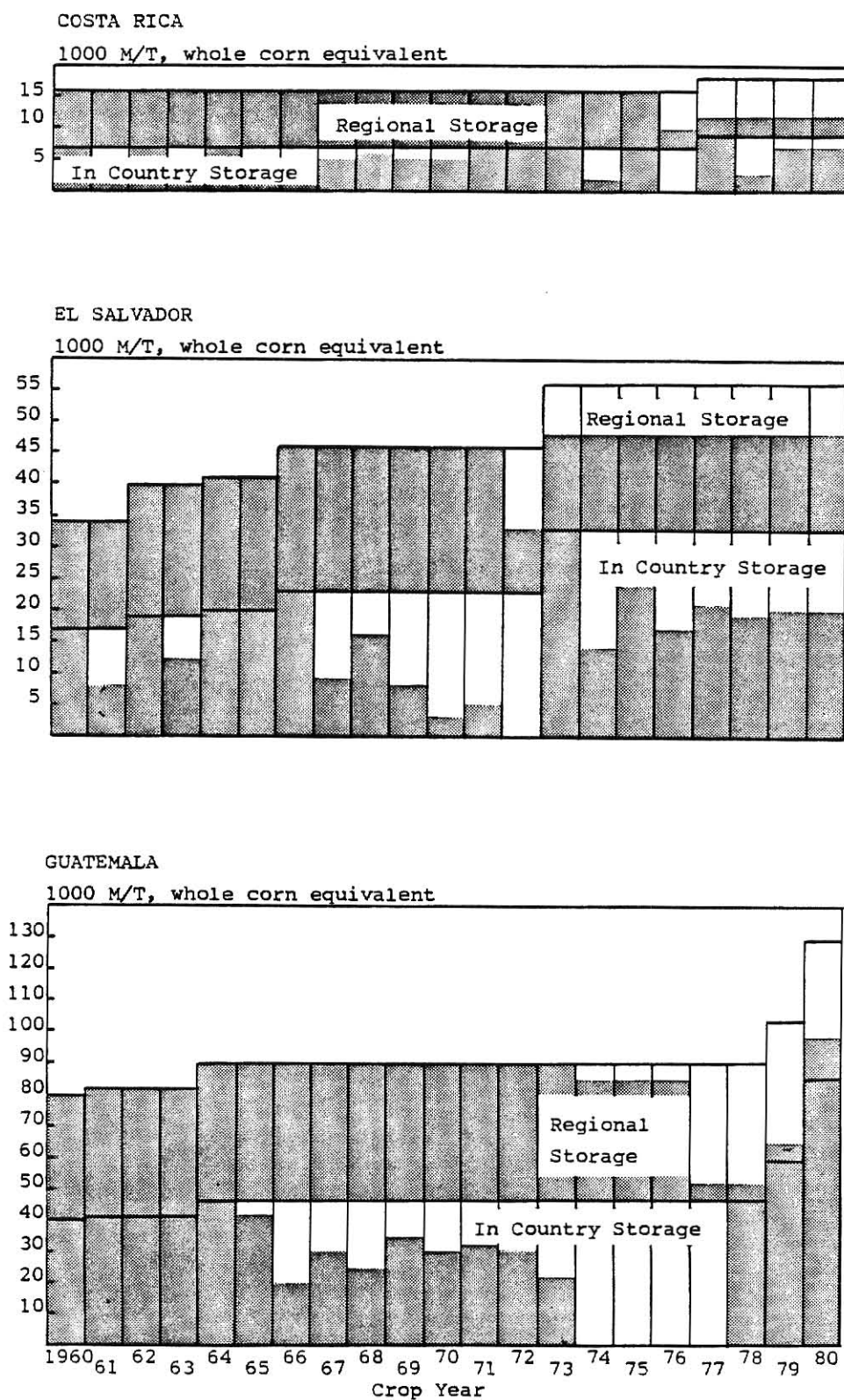
94.1 percent for El Salvador, 212.5 percent for Guatemala, 19.4 percent for Honduras, 270.0 percent for Nicaragua, and 55.5 percent for Panama.

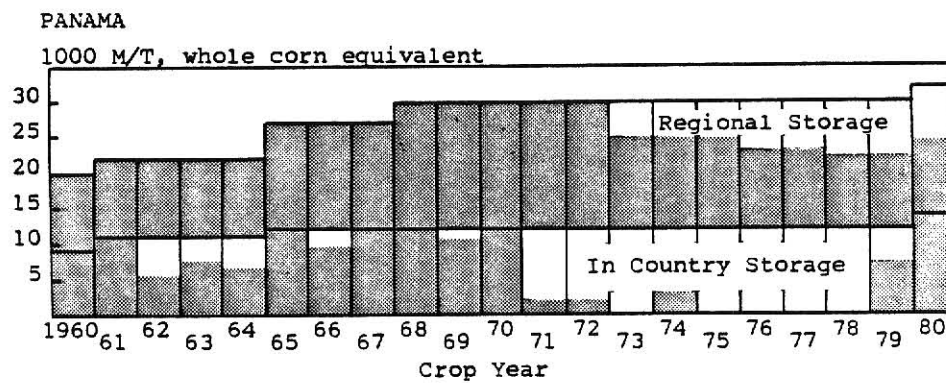
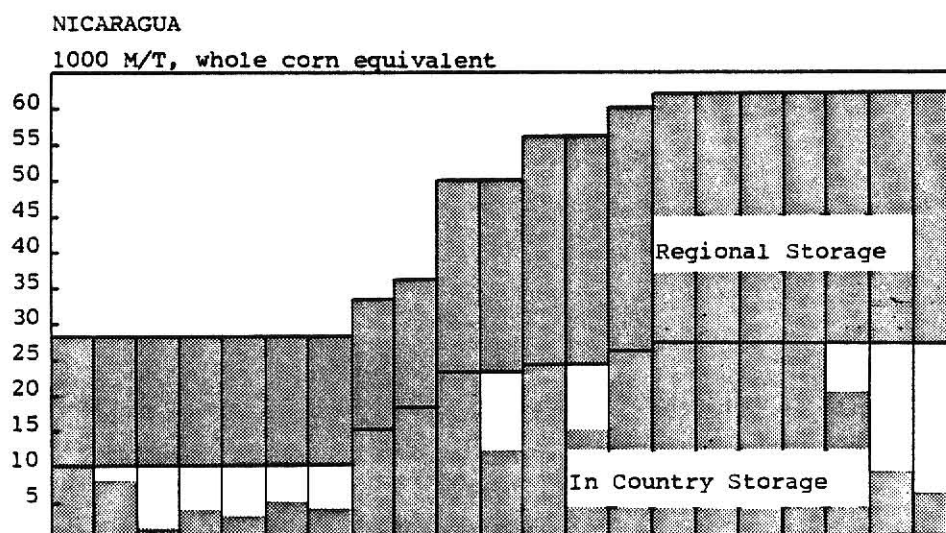
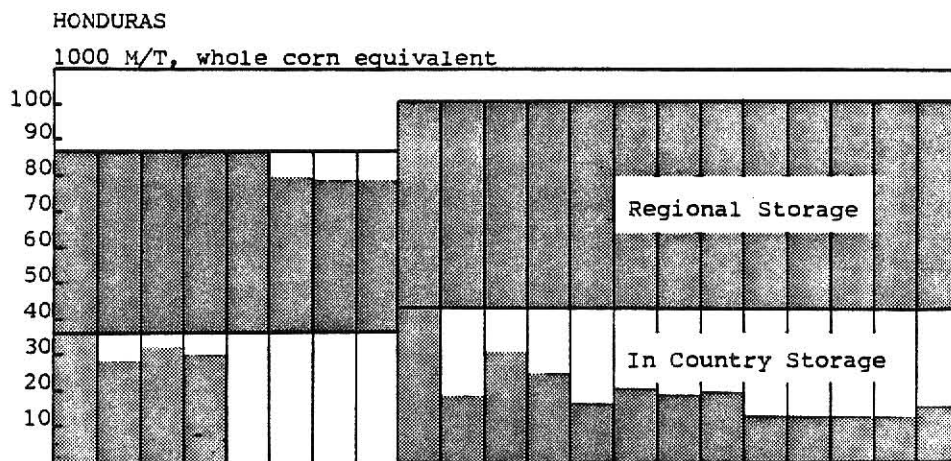
Simulated regional reserve balances of corn with stabilizing trade are substantial for Honduras and Guatemala. Together they account for 57.5 percent of the total corn reserve balances. Honduras accounts for 34.6 percent and Guatemala for 22.9 percent. The total shares of the remaining countries are 4.8 percent for Costa Rica, 11.8 percent for El Salvador, 17.0 percent for Nicaragua, and 8.8 percent for Panama.

The required regional storage capacity for corn reserves with stabilizing trade is large for Honduras over the total period. That for Costa Rica remains constant at 9,000 MT. That for El Salvador holds at 17,000 MT for 1960 and 1961, at 21,000 MT for 1962 and 1963, and at 23,000 MT for 1964 through 1980. That for Guatemala starts at 40,000 MT for 1960, increases to 41,000 MT for 1961 through 1963, and remains at 44,000 MT for 1964 through 1980. That for Nicaragua holds at 18,000 MT through 1968, at 27,000 MT for 1969 and 1970, at 32,000 MT for 1971 and 1972, at 34,000 MT for 1973, and at 35,000 MT for 1974 through 1980. That for Panama remains at 11,000 MT through 1964, at 15,000 MT for 1965 through 1967, and at 18,000 MT for 1968 through 1980.

The total required storage capacity for corn reserves with stabilizing trade increases by 28 percent over the 21-year period. The increases experienced in the six countries are 0 percent for Costa Rica, 35.3 percent for El Salvador, 10.0 percent for Guatemala, 13.7 percent for Honduras, 94.4 percent for Nicaragua, and 63.6 percent for Panama.

Fig 8.3 Computed Storage Capacity and Inventory for Corn
Security Reserves (with Stabilizing Trade)





Capacities and Inventory Levels for Rice Reserves with Stabilizing Trade

The simulated grain storage capacity and inventory levels for rice reserves with stabilizing trade for the six countries are shown graphically in Figure 8.4.

The in-country reserve balances of rice with stabilizing trade are substantial for Panama and Costa Rica, the two countries together accounting for almost half of total rice reserves balances. The total shares of the six countries are 24.4 percent for Costa Rica, 10.9 percent for El Salvador, 15.8 percent for Guatemala, 11.0 percent for Honduras, 13.2 percent for Nicaragua, and 24.7 percent for Panama.

The required in-country storage capacity for rice reserves with stabilizing trade is large for Costa Rica over the total period. That for El Salvador holds at 6,000 MT through 1967, at 8,000 MT for 1968 through 1970, and at 9,000 MT for 1971 through 1980. That for Guatemala remains at 5,000 MT through 1970, then increases to 9,000 MT and 15,000 MT for 1971 and 1972, to 16,000 MT for 1973 and 1974, and holds at 18,000 MT for 1975 through 1980. That for Honduras starts at 4,000 MT for 1960, then increases to 5,000 MT for 1961 through 1974, to 10,000 MT for 1975 through 1978, and to 13,000 MT and 14,000 MT for 1979 and 1980. That for Nicaragua holds at 10,000 MT through 1965, then increases to 13,000 MT for 1966, and remains at 14,000 MT for 1967 through 1980. That for Panama starts at 6,000 MT for 1960, then increases to 8,000 MT for 1961 through 1964, to 11,000 MT for 1965 and 1966, to 12,000 MT for 1967 and 1968, and to 13,000 MT for 1969 through 1980.

The simulated total required in-country storage capacity for rice reserves increases by 207.1 percent over the 21-year period. The increases

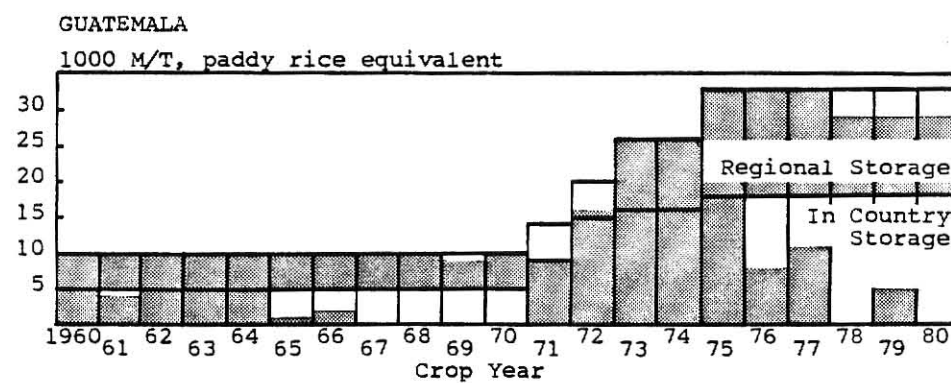
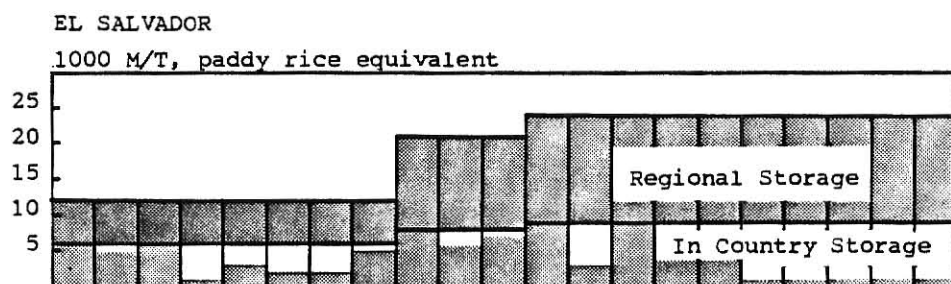
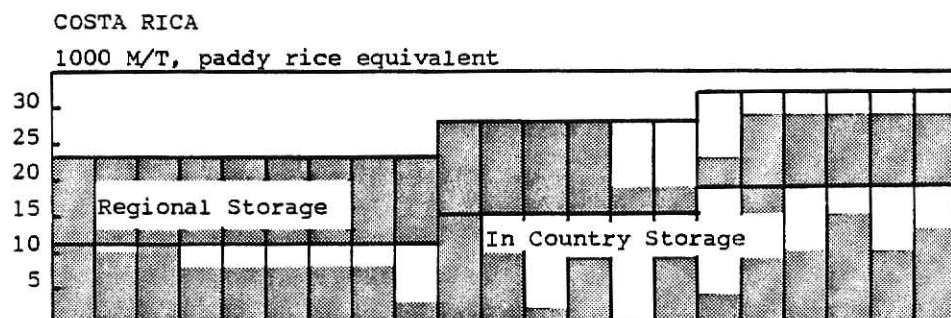
experienced in the six countries are 72.7 percent for Costa Rica, 50.0 percent for El Salvador, 360.0 percent for Guatemala, 350.0 percent for Honduras, 40.0 percent for Nicaragua, and 216.7 percent for Panama.

The only country that encountered negative regional rice reserve balances with stabilizing trade was Honduras. They extended over the period 1971-1980.

The required regional storage capacity for rice reserves with stabilizing trade is large for Nicaragua and Panama over the total period. That for Costa Rica holds at 12,000 MT through 1968, and at 13,000 MT for 1969 through 1980. That for El Salvador remains at 6,000 MT through 1967, at 13,000 MT for 1968 through 1970, and at 15,000 MT for 1971 through 1980. That for Guatemala remains at 5,000 MT through 1972, at 10,000 MT for 1973 and 1974, and at 15,000 MT for 1975 through 1980. That for Honduras starts at 7,000 MT for 1960 and 1961, then increases to 9,000 MT for 1962, and to 11,000 MT for 1963 through 1980.

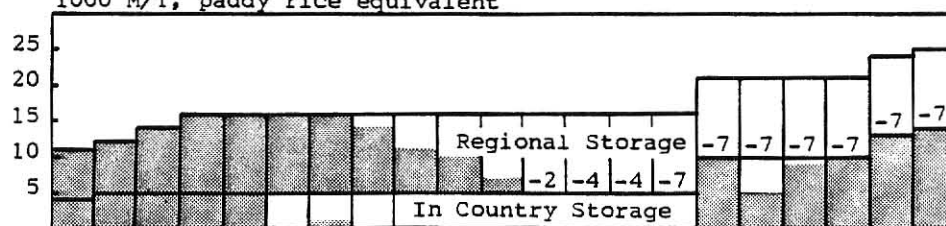
The total required regional storage capacity for rice reserves with stabilizing trade increased by over 86 percent over the 21-year period. The increases experienced in the six countries are 8.3 percent for Costa Rica, 250.0 percent for El Salvador, 300.0 percent for Guatemala, 57.1 percent for Honduras, 90.9 percent for Nicaragua, and 200.0 percent for Panama.

Fig 8.4 Computed Storage Capacity and Inventory for Rice
Security Reserves (with Stabilizing Trade)



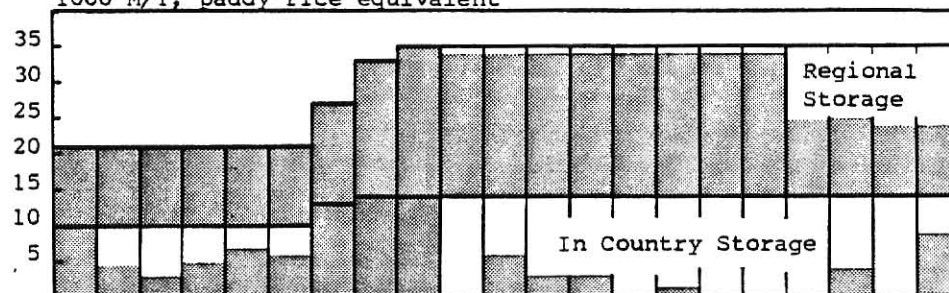
HONDURAS

1000 M/T, paddy rice equivalent



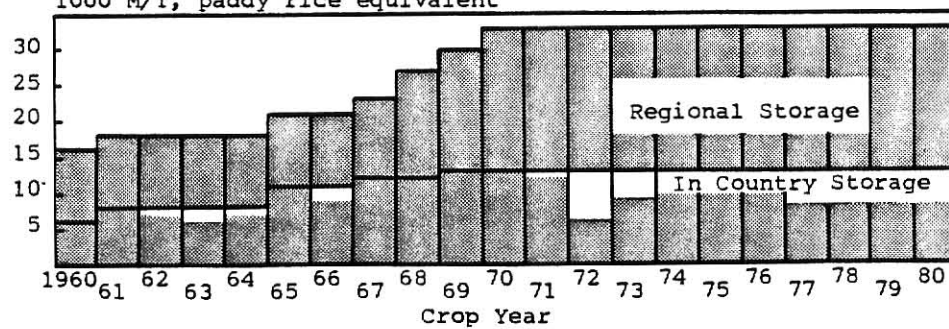
NICARAGUA

1000 M/T, paddy rice equivalent



PANAMA

1000 M/T, paddy rice equivalent



Average Utilization of Corn and Rice Reserve Capacities

Tables 8.1 and 8.2, at the end of the chapter, provide the basis for the utilization analysis summarized here. The purpose is to indicate the variation in average annual utilization of storage capacity for the security reserves with historical trade compared to stabilizing trade.

Under the stabilizing trade assumption, in-country reserve average storage capacity requirements for corn and rice are reduced except in Nicaragua and Panama. The average storage capacities of corn and rice at the regional level are reduced for all six countries. In the combined reserve, reduction in total storage capacity amounted to 68,000 MT for corn and 73,700 MT for rice. Both can be attributed largely to the reduction in requirements at the regional reserve level.

With the exception of Costa Rica and Panama, the average storage capacities of in-country and regional reserves with historical trade are larger for corn than for rice. This also is true with stabilizing trade, except in Costa Rica.

Over the 21-year period, the total average utilization of in-country and regional combined capacities of corn and rice increased from 65 percent to 77 percent for corn, and from 59 percent to 73 percent for rice when trade adjustments are reflected. This is attributed to increases in both in-country and regional total average capacity utilization patterns for corn and rice reserves. The total average utilization of in-country storage increases from 57 percent to 61 percent for corn, and from 47 percent to 59 percent for rice. In the case of regional storage capacities, the total average utilization rises from 69 percent to 91 percent for corn, and from 64 percent to 84 percent for rice.

TABLE 8.1. Average Annual Capacity Utilization Patterns for Corn Reserves, 1960-1980.

| (Capacity Unit = 1000 MT Whole Corn Equivalent) | | | | | | | | |
|---|----------------|---------------------|----------|------------------|----------------------|----------|------------------|--|
| Country | Variable | Historical Trade 1/ | | | Stabilizing Trade 2/ | | | |
| | | In-Country | Regional | Combined Reserve | In-Country | Regional | Combined Reserve | |
| Costa Rica | Capacity | 7.9 | 12.0 | 19.9 | 7.4 | 9.0 | 16.4 | |
| | Utilization(%) | 57.8 | 62.7 | 60.8 | 76.8 | 84.1 | 80.8 | |
| El Salvador | Capacity | 25.7 | 34.4 | 60.1 | 25.6 | 22.0 | 47.6 | |
| | Utilization(%) | 66.7 | 48.9 | 56.5 | 61.1 | 83.4 | 71.4 | |
| Guatemala | Capacity | 49.1 | 52.7 | 101.8 | 47.5 | 43.4 | 90.9 | |
| | Utilization(%) | 51.9 | 63.6 | 58.0 | 67.0 | 82.4 | 74.4 | |
| Honduras | Capacity | 40.9 | 69.4 | 110.3 | 40.3 | 55.3 | 95.6 | |
| | Utilization(%) | 50.2 | 84.1 | 71.5 | 45.9 | 97.8 | 75.9 | |
| Nicaragua | Capacity | 17.2 | 47.2 | 64.4 | 19.6 | 26.6 | 46.2 | |
| | Utilization(%) | 77.3 | 82.0 | 80.8 | 75.2 | 100.0 | 89.5 | |
| Panama | Capacity | 10.9 | 25.0 | 35.9 | 11.8 | 15.9 | 27.7 | |
| | Utilization(%) | 49.3 | 48.6 | 48.8 | 55.5 | 86.5 | 73.3 | |

Sources: 1/ Tables 12, 12', 14, 14' in Appendix F.

2/ Tables 18, 18', 20, 20' in Appendix G.

TABLE 8.2. Average Annual Capacity Utilization Patterns for Rice Reserves, 1960-1980.

| (Capacity Unit = 1000 MT Paddy Rice Equivalent) | | | | | | | | | |
|---|-----------------|----------------------------|-----------------|-------------------------|-----------------------------|-----------------|-------------------------|-------------------------|-------------------------|
| <u>Country</u> | <u>Variable</u> | <u>Historical Trade 1/</u> | | | <u>Stabilizing Trade 2/</u> | | | <u>Combined Reserve</u> | <u>Combined Reserve</u> |
| | | <u>In-Country</u> | <u>Regional</u> | <u>Combined Reserve</u> | <u>In-Country</u> | <u>Regional</u> | <u>Combined Reserve</u> | | |
| Costa Rica | Capacity | 14.5 | 14.8 | 29.3 | 14.2 | 12.6 | 26.8 | | |
| | Utilization(%) | 56.1 | 64.0 | 60.1 | 63.9 | 84.1 | 73.3 | | |
| El Salvador | Capacity | 7.8 | 20.6 | 28.4 | 7.7 | 11.3 | 19.0 | | |
| | Utilization(%) | 35.4 | 77.6 | 66.0 | 52.5 | 100.0 | 80.7 | | |
| Guatemala | Capacity | 10.7 | 21.2 | 31.9 | 10.4 | 8.3 | 18.7 | | |
| | Utilization(%) | 45.3 | 73.0 | 63.7 | 56.6 | 84.6 | 69.0 | | |
| Honduras | Capacity | 8.2 | 26.1 | 34.3 | 6.7 | 10.5 | 17.2 | | |
| | Utilization(%) | 65.3 | 30.8 | 39.0 | 61.0 | 40.3 | 48.3 | | |
| Nicaragua | Capacity | 12.5 | 38.3 | 50.8 | 12.8 | 17.7 | 30.5 | | |
| | Utilization(%) | 32.1 | 49.7 | 45.4 | 38.3 | 86.5 | 66.3 | | |
| Panama | Capacity | 9.9 | 28.5 | 38.4 | 11.4 | 15.8 | 27.2 | | |
| | Utilization(%) | 50.0 | 97.8 | 85.5 | 80.4 | 100.0 | 91.8 | | |

Sources: 1/ Tables 12, 12', 14, 14' in Appendix F.

2/ Tables 18, 18', 20, 20' in Appendix G.

CHAPTER IX

SUMMARY, CONCLUSION AND RECOMMENDATION

A. Summary and Conclusion

The basic foodgrains (beans, corn, rice, and sorghum) constitute the main staples in consumer diets of over 80 percent of the Central American population. They also represent a major source of work and income for the rural poor. It is for these reasons that the stabilization of basic foodgrain supplies and prices continues to be of major concern to the governments of the region. Even with inter and intraregional imports and exports, total annual basic foodgrain supplies have deviated widely from food requirements in all six countries. This degree of instability could have been avoided by a foodgrain security reserve program in the region.

Based on data for a 21-year observation period (1960 to 1980), the analysis was directed to simulate a foodgrain security reserve program for corn and rice in Central America and Panama using the methodology developed by Phillips and colleagues at Kansas State University.

The study calculated the storage capacities and levels of foodgrain security reserves required to dampen the deviations to within ± 5.0 percent of long-term trends of food supply quantities of corn and rice.

The required corn and rice storage capacities for reserve programs to achieve the targeted ± 5.0 percent stability under each alternative (with and without import adjustments) are shown in units of 1000 MT whole corn equivalent and 1000 MT paddy rice equivalent in Summary Table 9.1.

In-country storage capacities for corn and rice remained the same under each of the alternatives with the exception of Honduras where

in-country storage capacities were reduced under stabilizing trade.

SUMMARY TABLE 9.1. Computed Reserve Storage Capacity
(1000 Metric Tons of Whole Grain)

| Grain Location | C O R N | O N L Y | R I C E | O N L Y |
|--------------------|------------------|----------------|------------------|----------------|
| | Historical Trade | Adjusted Trade | Historical Trade | Adjusted Trade |
| <u>In-Country:</u> | <u>212</u> | <u>211</u> | <u>90</u> | <u>87</u> |
| Costa Rica | 9 | 9 | 19 | 19 |
| El Salvador | 33 | 33 | 9 | 9 |
| Guatemala | 85 | 85 | 18 | 18 |
| Honduras | 44 | 43 | 17 | 14 |
| Nicaragua | 27 | 27 | 14 | 14 |
| Panama | 14 | 14 | 13 | 13 |
| <u>Regional</u> | <u>294</u> | <u>187</u> | <u>221</u> | <u>95</u> |
| <u>Combined</u> | 506 | 398 | 311 | 182 |

Source: Tables 12', 14', 18', 20'.

The average levels of foodgrain reserves for corn and rice required to achieve the targeted ± 5.0 percent stability, with and without stabilizing trade, are shown in units of 1000 MT whole corn equivalent and 1000 MT paddy rice equivalent in Summary Table 9.2.

The average annual inventory level of a combined (in-country and regional) reserve for rice is higher for Panama than for the other countries under each of the alternatives considered. Panama's participation amounts to about 25 percent of the total.

In the case of a combined corn reserve, Honduras has about 30 percent of the average annual inventory level for the entire region, both with and without trade adjustments.

In general, the computed reserve storage capacity and the average annual inventory levels were higher for corn under each of the alternatives considered with the exception of Costa Rica.

SUMMARY TABLE 9.2. Average Annual Inventory Levels
(1000 Metric Tons of Whole Grain)

| Grain Location | C O R N O N L Y | | R I C E O N L Y | |
|--------------------|------------------|----------------|------------------|----------------|
| | Historical Trade | Adjusted Trade | Historical Trade | Adjusted Trade |
| <u>In-Country:</u> | <u>86.5</u> | <u>92.9</u> | <u>30.1</u> | <u>37.2</u> |
| Costa Rica | 4.6 | 5.7 | 8.1 | 9.1 |
| El Salvador | 17.1 | 15.6 | 2.8 | 4.0 |
| Guatemala | 25.5 | 31.8 | 4.8 | 5.9 |
| Honduras | 20.5 | 18.5 | 5.4 | 4.1 |
| Nicaragua | 13.3 | 14.8 | 4.0 | 4.9 |
| Panama | 5.4 | 6.5 | 4.9 | 9.2 |
| <u>Regional:</u> | <u>167.2</u> | <u>156.2</u> | <u>95.9</u> | <u>64.3</u> |
| Costa Rica | 7.5 | 7.6 | 9.5 | 10.6 |
| El Salvador | 16.8 | 18.4 | 16.0 | 11.3 |
| Guatemala | 33.5 | 35.8 | 15.5 | 7.0 |
| Honduras | 58.4 | 54.1 | 8.0 | 4.2 |
| Nicaragua | 38.8 | 26.6 | 19.0 | 15.3 |
| Panama | 12.1 | 13.8 | 27.9 | 15.8 |

Source: Tables 12, 14, 18, 20.

B. Recommendations for Further Research

The analysis used in this study could be extended to include other food staples such as edible beans, sorghum, and wheat, if desired. However, it must be pointed out that there are data limitations for edible beans which may lead to considerable errors and inconsistencies in estimation. There are no such problems for either sorghum or wheat as more accurate data appears to be available. But, these grains are less important in the diets of the population of Central America. Besides, all the countries but Guatemala are wholly dependent on imports for milling wheat.

The results of this study could be used as the basis for measuring the costs incurred and the benefits to be expected from a foodgrain security reserve program. Approaches to both measurements are suggested in the literature. The individual research studies of Custodio, Olan, and Ryu draw from the established methodology developed by Phillips and colleagues at Kansas State University to measure costs. These studies suggest that under certain conditions benefits may be estimated without utilizing the consumer-producer surplus criterion. But it is also recognized that there is a need for more research to demonstrate the benefits from foodgrain security reserve programs.

The present simulation study also could be extended for projected periods into the future which has the potential of providing useful guidelines as to the storage capacity and levels of security reserves required to alleviate the year-to-year fluctuations in foodgrain supplies of corn and rice for each country.

The targeted range of 5-percent of variability in available quantities for food consumption is somewhat arbitrary. The study could be extended to include other targeted stability bands (e.g., 0%, 1.5%, 3%).

As the range is made smaller the needed reserve transactions and the corresponding reserve stock levels would be correspondingly higher. It is usually the case that a 0-percent deviation (or complete stability) is not a feasible goal because of the size and cost associated with the reserve required to reach it.

APPENDIX A

POPULATION TRENDS BY COUNTRY, 1960-1980

| | Page |
|--|------|
| Midyear Population Estimates by Central American Country and Panama | A2 |
| Plot of Observed and Estimated Data, Costa Rica | A3 |
| Plot of Observed and Estimated Data, El Salvador | A4 |
| Plot of Observed and Estimated Data, Guatemala | A5 |
| Plot of Observed and Estimated Data, Honduras | A6 |
| Plot of Observed and Estimated Data, Nicaragua | A7 |
| Plot of Observed and Estimated Data, Panama | A8 |

TABLE 3
MIDYEAR POPULATION ESTIMATES BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980

(1000 PERSONS)

LOGARITHM PROJECTION

| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
|--------------------|---------------|----------------|-----------|----------|-----------|--------|-------|
| 1 1960 | 1250 | 2527 | 3990 | 1873 | 1472 | 1083 | 12195 |
| 2 1961 | 1297 | 2604 | 4104 | 1936 | 1515 | 1117 | 12573 |
| 3 1962 | 1346 | 2685 | 4218 | 2002 | 1559 | 1151 | 12961 |
| 4 1963 | 1395 | 2769 | 4335 | 2071 | 1605 | 1197 | 13362 |
| 5 1964 | 1445 | 2859 | 4456 | 2140 | 1652 | 1224 | 13776 |
| 6 1965 | 1495 | 3005 | 4580 | 2209 | 1701 | 1261 | 14251 |
| 7 1966 | 1545 | 3057 | 4716 | 2275 | 1751 | 1299 | 14643 |
| 8 1967 | 1592 | 3168 | 4855 | 2339 | 1802 | 1337 | 15093 |
| 9 1968 | 1639 | 3283 | 4998 | 2405 | 1855 | 1377 | 15557 |
| 10 1969 | 1688 | 3412 | 5146 | 2475 | 1911 | 1417 | 16049 |
| 11 1970 | 1732 | 3582 | 5373 | 2639 | 1970 | 1458 | 16754 |
| 12 1971 | 1779 | 3694 | 5519 | 2720 | 2033 | 1500 | 17245 |
| 13 1972 | 1825 | 3803 | 5692 | 2805 | 2100 | 1542 | 17767 |
| 14 1973 | 1872 | 3913 | 5870 | 2895 | 2170 | 1585 | 18305 |
| 15 1974 | 1918 | 4025 | 6054 | 2991 | 2243 | 1630 | 18861 |
| 16 1975 | 1965 | 4143 | 6243 | 3093 | 2318 | 1676 | 19438 |
| 17 1976 | 2013 | 4266 | 6437 | 3202 | 2396 | 1724 | 20038 |
| 18 1977 | 2062 | 4393 | 6635 | 3318 | 2476 | 1772 | 20656 |
| 19 1978 | 2111 | 4524 | 6839 | 3439 | 2559 | 1823 | 21295 |
| 20 1979 | 2162 | 4658 | 7048 | 3564 | 2644 | 1874 | 21950 |
| 21 1980 | 2213 | 4797 | 7262 | 3691 | 2733 | 1927 | 22623 |
| LOG YBAR | 7.4419 | 8.1635 | 8.5858 | 7.8689 | 7.5943 | 7.2811 | |
| B(%) | 0.0281 | 0.0327 | 0.0303 | 0.0339 | 0.0310 | 0.0287 | |
| RSQ | 0.9947 | 0.9976 | 0.9978 | 0.9981 | 0.9990 | 0.9999 | |
| SYZ | 0.0131 | 0.0102 | 0.0090 | 0.0094 | 0.0062 | 0.0018 | |
| SB | 0.0005 | 0.0004 | 0.0003 | 0.0003 | 0.0002 | 0.0001 | |

SOURCE:

UNITED NATIONS DEMOGRAPHIC YEARBOOK FOR LATIN AMERICA, 1975, 1976, 1980 (1960-1980).
IT REFLECTS ADJUSTMENTS FOR UNDERENUMERATION.

PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 3

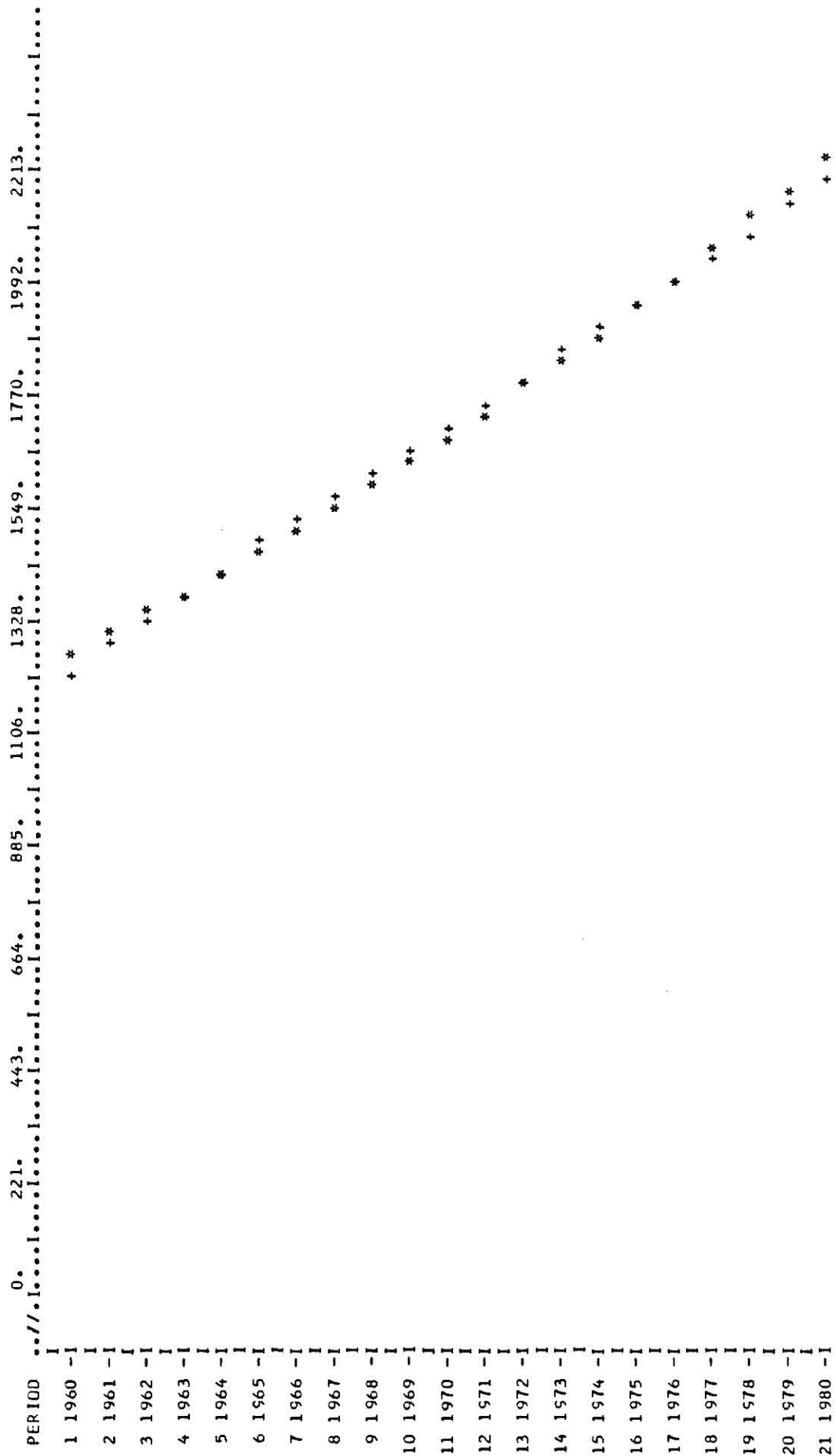
COSTA RICA

UNIT IS 1000 PERSONS

X

1

(RSQ = 0.9947)



PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 3

EL SALVADOR

UNIT IS 1000 PEPSONS

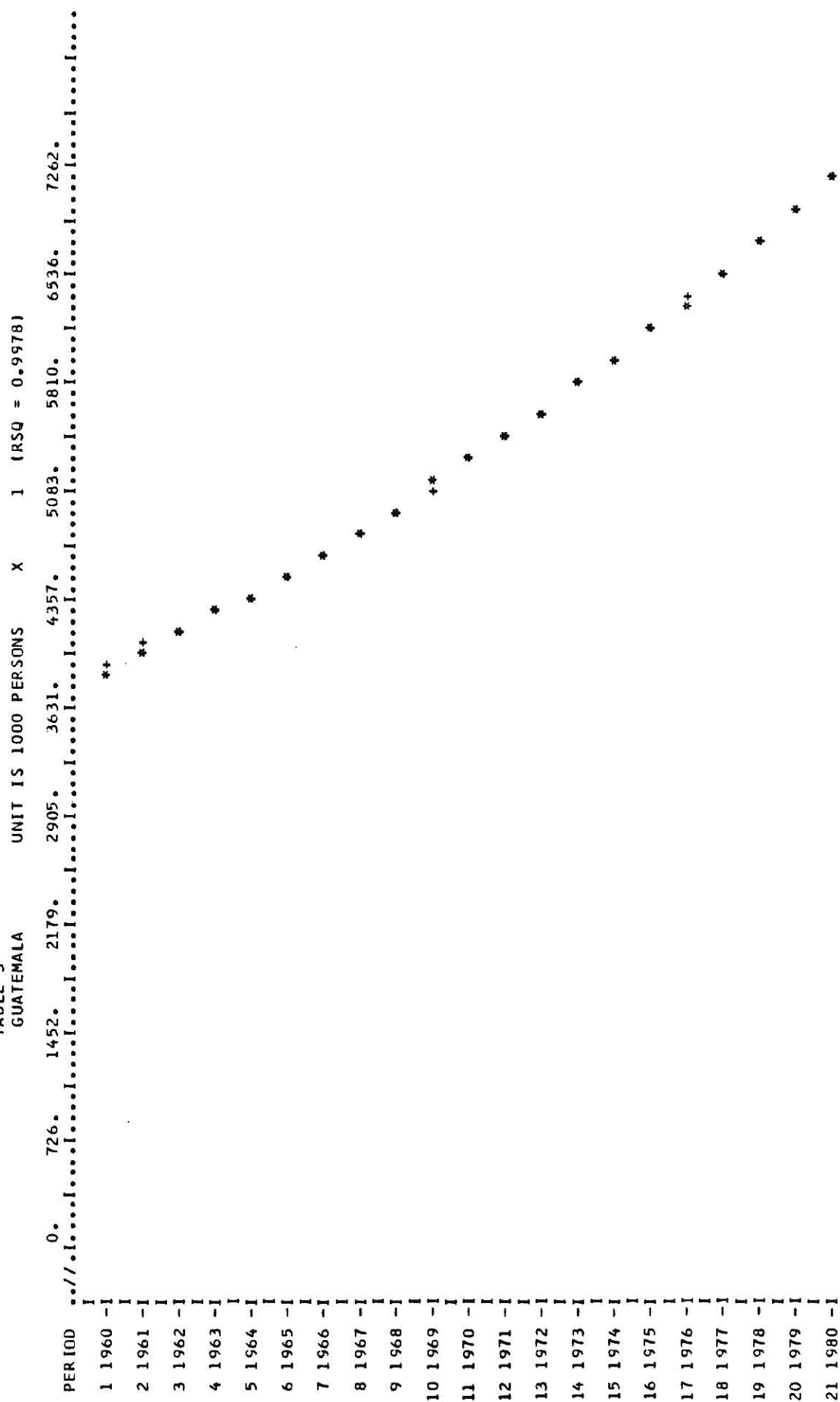
X

1

(RSQ = 0.9516)

| PERIOD | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
|---------|----|------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 1960 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 2 1961 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 3 1962 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 4 1963 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 5 1964 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 6 1965 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 7 1966 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 8 1967 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 9 1968 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 10 1969 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 11 1970 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 12 1971 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 13 1972 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 14 1973 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 15 1974 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 16 1975 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 17 1976 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 18 1977 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 19 1978 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 20 1979 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |
| 21 1980 | 0. | 480. | 959. | 1439. | 1919. | 2398. | 2878. | 3358. | 3838. | 4317. | 4797. |

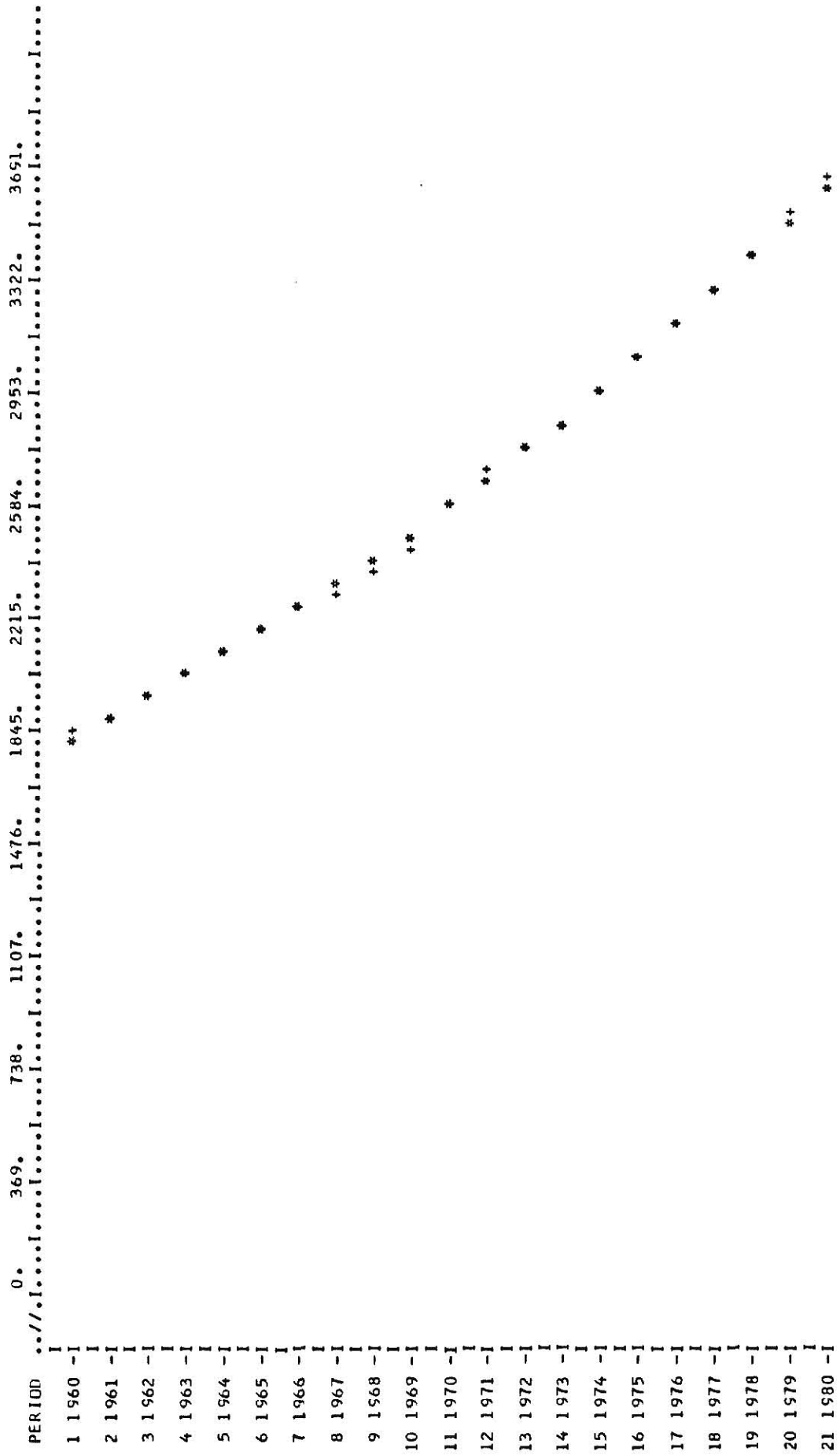
PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 3
GUATEMALA

PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 3
HONDURAS

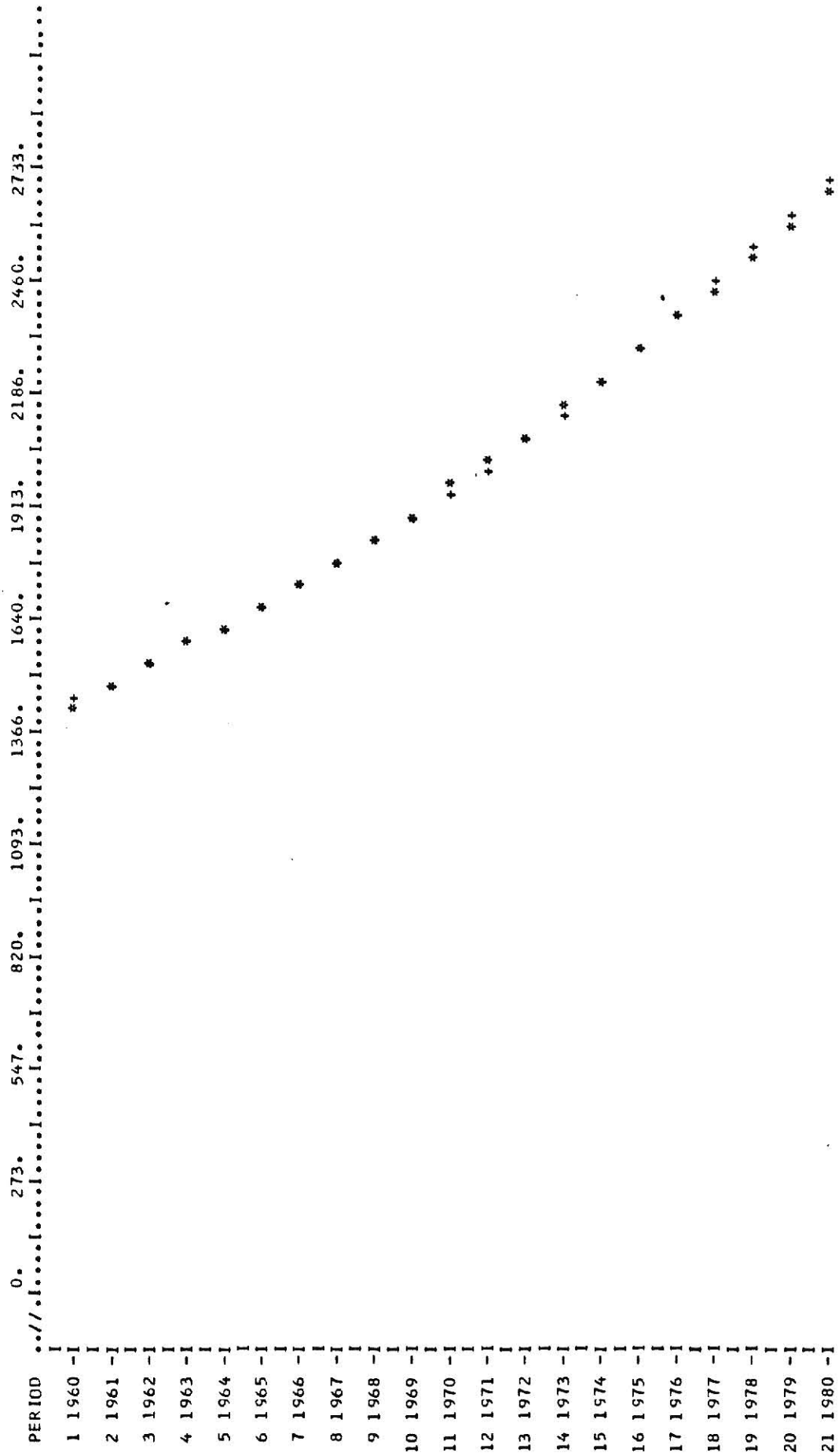
UNIT IS 1000 PERSONS X 1 (RSQ = 0.9981)



PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 3
NICARAGUA

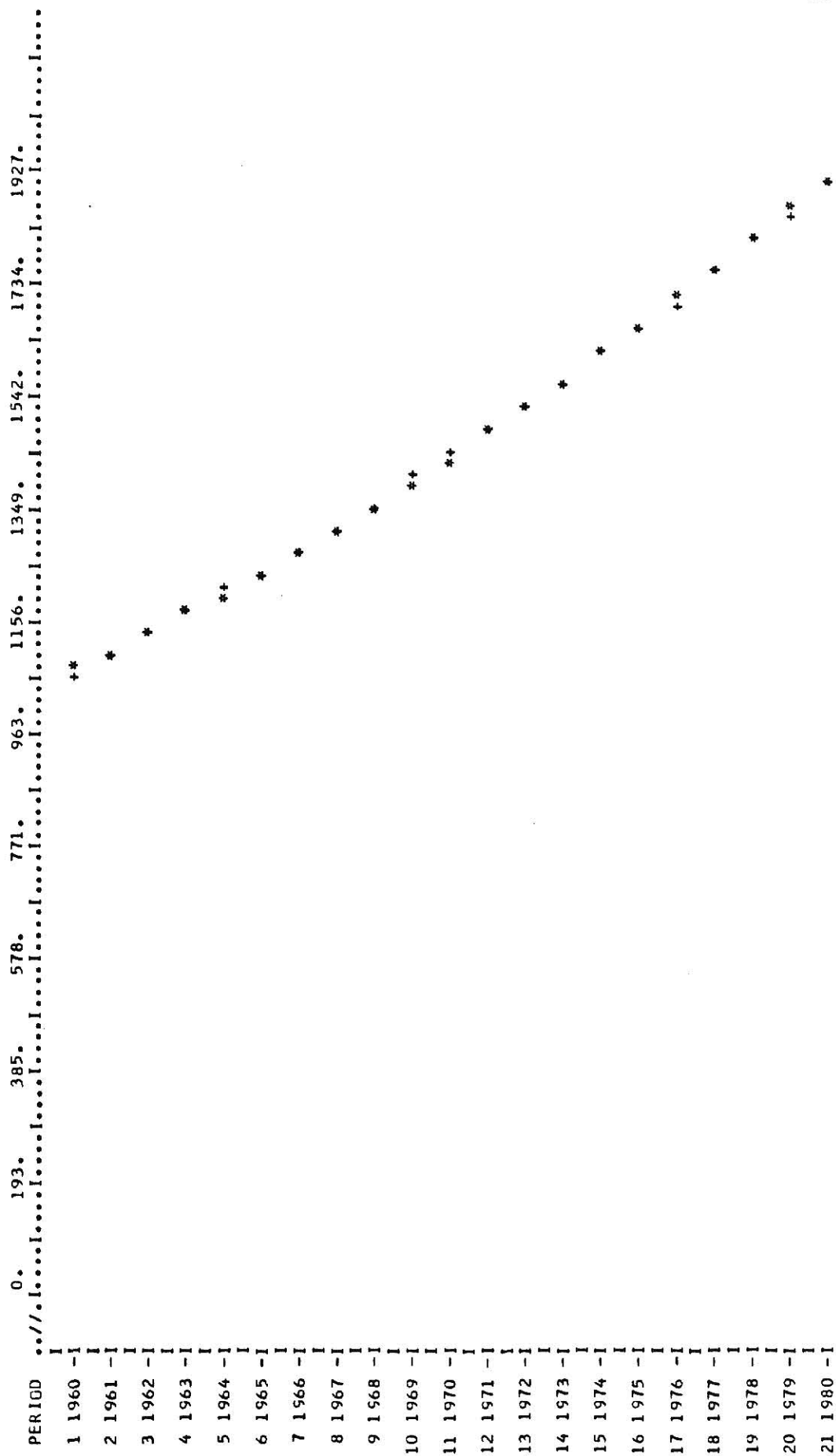
UNIT IS 1000 PERSONS X 1 (RSQ = 0.9990)



PLOT OF OBSERVED AND ESTIMATED DATA

TABLE 3
PANAMA

UNIT IS 1000 PERSONS X 1 (RSQ = 0.9999)



APPENDIX B

ANNUAL SUPPLY AND UTILIZATION OF CORN AND RICE BY COUNTRY

| | Page |
|----------------------------|------|
| Table 1. Costa Rica, Corn | B2 |
| Table 1. Costa Rica, Rice | B3 |
| Table 1. El Salvador, Corn | B4 |
| Table 1. El Salvador, Rice | B5 |
| Table 1. Guatemala, Corn | B6 |
| Table 1. Guatemala, Rice | B7 |
| Table 1. Honduras, Corn | B8 |
| Table 1. Honduras, Rice | B9 |
| Table 1. Nicaragua, Corn | B10 |
| Table 1. Nicaragua, Rice | B11 |
| Table 1. Panama, Corn | B12 |
| Table 1. Panama, Rice | B13 |

TABLE 1
COSTA RICA, CCRN ONLY.
FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980

EXPONENT IS 1.00

(1000 METRIC TONS, WHOLE CCRN EQUIVALENT)

| PERIOD NO. YEAR | (1) PRODUCTION | (2) IMPORTS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEED AND LOSS | (6) FOOD USE | (7) BALANCE | (8) TOTAL UTILIZATION |
|--------------------|-------------------|----------------|-------------------------|---------------------|----------------------|-----------------|----------------|--------------------------|
| 1 1960 | 73 | -10 | -14 | 77 | 7 | 70 | 0 | 77 |
| 2 1961 | 77 | 1 | 4 | 74 | 8 | 66 | 0 | 74 |
| 3 1962 | 73 | 1 | 0 | 74 | 7 | 67 | 0 | 74 |
| 4 1963 | 55 | 9 | -3 | 67 | 5 | 62 | 0 | 67 |
| 5 1964 | 64 | 8 | 0 | 72 | 6 | 66 | 0 | 72 |
| 6 1965 | 64 | 7 | 3 | 68 | 6 | 62 | 0 | 68 |
| 7 1966 | 65 | 4 | 0 | 69 | 6 | 63 | 0 | 69 |
| 8 1967 | 75 | 5 | 4 | 76 | 7 | 69 | 0 | 76 |
| 9 1968 | 78 | 16 | 5 | 89 | 8 | 81 | 0 | 85 |
| 10 1969 | 59 | 18 | -8 | 85 | 6 | 79 | 0 | 85 |
| 11 1970 | 45 | 35 | 2 | 78 | 4 | 74 | 0 | 78 |
| 12 1971 | 64 | 22 | -7 | 93 | 6 | 87 | 0 | 93 |
| 13 1972 | 64 | 28 | 0 | 92 | 6 | 86 | 0 | 92 |
| 14 1973 | 52 | 48 | 13 | 87 | 5 | 82 | 0 | 87 |
| 15 1974 | 42 | 26 | -3 | 71 | 4 | 67 | 0 | 71 |
| 16 1975 | 92 | 5 | -3 | 100 | 9 | 91 | 0 | 100 |
| 17 1976 | 52 | 4 | -7 | 63 | 5 | 58 | 0 | 63 |
| 18 1977 | 54 | 8 | 0 | 102 | 9 | 93 | 0 | 102 |
| 19 1978 | 63 | 20 | 0 | 83 | 6 | 77 | 0 | 83 |
| 20 1979 | 57 | 40 | 0 | 97 | 6 | 91 | 0 | 97 |
| 21 1980 | 71 | 30 | 0 | 101 | 7 | 94 | 0 | 101 |
| YEAR | 65.67 | 15.48 | -0.63 | 81.81 | 6.23 | 75.48 | 0.10 | 81.81 |
| B | -0.16 | 1.44 | 0.08 | 1.20 | -0.01 | 1.21 | 0.00 | 1.20 |
| RSQ | 0.0054 | 0.3646 | 0.0078 | 0.3715 | 0.0016 | 0.4201 | 0.0000 | 0.3715 |
| SVX | 13.75 | 12.08 | 5.67 | 9.95 | 1.43 | 9.05 | 0.00 | 9.95 |
| SB | 0.50 | 0.44 | 0.20 | 0.36 | 0.05 | 0.33 | 0.00 | 0.36 |

SOURCE:
PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAY 1976 AND JAN. 1981.
(5) AT 10% OF COL. 1; (6) REPORTED CONSUMPTION LESS COL. 5; (7) COL. 4 LESS COLS. 5 AND 6. CROP YEAR JULY-JUNE.

TABLE 1
COSTA RICA, RICE ONLY.
FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980
EXPONENT IS 1.00

| (1000 METRIC TONS, MILLED RICE EQUIVALENT) | | | | | | | |
|--|-------------------|----------------|-------------------------|---------------------|----------------------|-------------------------|--------------------------|
| PERIOD NO. YEAR | (1) PRODUCTION | (2) IMPORTS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEED AND LOSS | (6) FOOD USE BALANCE | (8) TOTAL UTILIZATION |
| 1 1960 | 35 | 9 | 0 | 44 | 0 | 44 | 44 |
| 2 1961 | 36 | 8 | 0 | 44 | 0 | 44 | 44 |
| 3 1962 | 38 | 9 | 0 | 47 | 0 | 47 | 47 |
| 4 1963 | 41 | 0 | 0 | 41 | 0 | 41 | 41 |
| 5 1964 | 42 | 2 | 0 | 44 | 0 | 44 | 44 |
| 6 1965 | 45 | 8 | 0 | 53 | 0 | 53 | 53 |
| 7 1966 | 48 | 4 | 0 | 52 | 0 | 52 | 52 |
| 8 1967 | 51 | 4 | 0 | 55 | 0 | 55 | 55 |
| 9 1968 | 52 | -5 | 0 | 47 | 0 | 47 | 47 |
| 10 1969 | 65 | 5 | -4 | 74 | 0 | 74 | 74 |
| 11 1970 | 49 | 16 | 1 | 64 | 0 | 64 | 64 |
| 12 1971 | 56 | 2 | 13 | 45 | 0 | 45 | 45 |
| 13 1972 | 56 | 0 | -15 | 71 | 0 | 71 | 71 |
| 14 1973 | 65 | -12 | 8 | 45 | 0 | 45 | 45 |
| 15 1974 | 80 | -4 | 10 | 66 | 0 | 66 | 66 |
| 16 1975 | 99 | 0 | 30 | 69 | 0 | 69 | 69 |
| 17 1976 | 104 | -33 | -29 | 100 | 0 | 100 | 100 |
| 18 1977 | 93 | -30 | -17 | 80 | 0 | 80 | 80 |
| 19 1978 | 123 | -45 | -2 | 80 | 0 | 80 | 80 |
| 20 1979 | 131 | -40 | 19 | 72 | 0 | 72 | 72 |
| 21 1980 | 108 | -35 | 7 | 80 | 0 | 80 | 80 |
| YEAR | 67.48 | -6.51 | 1.04 | 60.62 | 0.10 | 60.62 | 60.62 |
| B | 4.47 | -2.39 | 0.17 | 2.09 | 0.00 | 2.09 | 2.09 |
| RSQ | 0.8456 | 0.6497 | 0.0071 | 0.6187 | 0.0000 | 0.6187 | 0.6187 |
| SVX | 12.15 | 11.15 | 12.51 | 10.45 | 0.00 | 10.45 | 10.45 |
| SB | 0.44 | 0.40 | 0.45 | 0.38 | 0.00 | 0.38 | 0.38 |

SOURCE:
PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAR. 1978 AND DEC. 1980.
(6) REPORTED TOTAL CONSUMPTION INCLUDE ALLOWANCES FOR FEED, SEED, AND WASTE. CROP YEAR JANUARY- DECEMBER.

TABLE I
EL SALVADOR, CORN ONLY.

FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980
EXPONENT IS 1.00

(1000 METRIC TONS, WHOLE CORN EQUIVALENT)

| PERIOD NO. YEAR | (1) PRODUCTION | (2) IMPORTS IN STOCKS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEED AND LOSS | (6) FOOD USE BALANCE | (7) (8) TOTAL UTILIZATION |
|--------------------|-------------------|--------------------------|-------------------------|---------------------|----------------------|-------------------------|------------------------------|
| 1 1960 | 178 | 3 | 0 | 181 | 18 | 163 | 181 |
| 2 1961 | 145 | 22 | 0 | 167 | 14 | 153 | 167 |
| 3 1962 | 213 | 28 | 0 | 241 | 21 | 220 | 241 |
| 4 1963 | 207 | 21 | 0 | 228 | 21 | 207 | 228 |
| 5 1964 | 192 | 58 | 0 | 250 | 19 | 231 | 250 |
| 6 1965 | 203 | 63 | 0 | 266 | 20 | 246 | 266 |
| 7 1966 | 266 | 18 | 0 | 284 | 27 | 257 | 284 |
| 8 1967 | 209 | 25 | 0 | 234 | 21 | 213 | 234 |
| 9 1968 | 258 | 43 | 15 | 286 | 26 | 260 | 286 |
| 10 1969 | 279 | 3 | 0 | 282 | 28 | 254 | 282 |
| 11 1970 | 363 | -37 | 26 | 300 | 36 | 264 | 300 |
| 12 1971 | 371 | -24 | -1 | 354 | 38 | 316 | 354 |
| 13 1972 | 237 | 34 | -30 | 301 | 24 | 277 | 301 |
| 14 1973 | 406 | 69 | 17 | 458 | 41 | 417 | 458 |
| 15 1974 | 353 | 26 | -13 | 392 | 35 | 357 | 392 |
| 16 1975 | 435 | 1 | 22 | 418 | 44 | 374 | 418 |
| 17 1976 | 342 | 24 | -34 | 400 | 34 | 366 | 400 |
| 18 1977 | 375 | 80 | 15 | 440 | 37 | 403 | 440 |
| 19 1978 | 507 | 44 | 54 | 497 | 51 | 446 | 497 |
| 20 1979 | 523 | -18 | -7 | 512 | 52 | 460 | 512 |
| 21 1980 | 537 | -5 | 12 | 520 | 54 | 466 | 520 |
| YBAR | 314.71 | 22.76 | 3.66 | 333.86 | 31.48 | 302.38 | 333.86 |
| B | 17.66 | -0.38 | 0.52 | 16.74 | 1.77 | 14.98 | 16.74 |
| RSQ | 0.8373 | 0.0060 | 0.0303 | 0.9099 | 0.8332 | 0.9086 | 0.9099 |
| SYX | 49.54 | 31.34 | 18.84 | 33.54 | 5.04 | 30.24 | 33.54 |
| SB | 1.79 | 1.13 | 0.68 | 1.21 | 0.18 | 1.09 | 1.21 |

SOURCE:

PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAY 1976 AND JAN. 1981.
15) AT 10% OF COL. 1; (6) REPORTED CONSUMPTION LESS COL. 5; (7) COL. 4 LESS COLS. 5 AND 6. CROP YEAR JULY-JUNE.

TABLE 1
EL SALVADOR, RICE ONLY.
FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980
EXPONENT IS 1.00

| (1000 METRIC TONS, MILLED RICE EQUIVALENT) | | | | | | | |
|--|-------------------|----------------|-------------------------|---------------------|----------------------|-----------------|--------------------------|
| PERIOD NO. YEAR | (1) PRODUCTION | (2) IMPORTS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEED AND LOSS | (6) FOOD USE | (8) TOTAL UTILIZATION |
| 1 1960 | 18 | 0 | 0 | 18 | 0 | 18 | 18 |
| 2 1961 | 12 | 3 | 0 | 15 | 0 | 15 | 15 |
| 3 1962 | 17 | 1 | 0 | 18 | 0 | 18 | 18 |
| 4 1963 | 14 | -1 | 0 | 13 | 0 | 13 | 13 |
| 5 1964 | 21 | -1 | 0 | 20 | 0 | 20 | 20 |
| 6 1965 | 23 | -1 | 0 | 22 | 0 | 22 | 22 |
| 7 1966 | 33 | -12 | 0 | 21 | 0 | 21 | 21 |
| 8 1967 | 51 | -22 | 0 | 29 | 0 | 29 | 29 |
| 9 1968 | 52 | -11 | 0 | 41 | 0 | 41 | 41 |
| 10 1969 | 23 | -3 | -10 | 30 | 0 | 30 | 30 |
| 11 1970 | 29 | -2 | 0 | 27 | 0 | 27 | 27 |
| 12 1971 | 36 | 2 | 3 | 35 | 0 | 35 | 35 |
| 13 1972 | 23 | -3 | -2 | 22 | 0 | 22 | 22 |
| 14 1973 | 35 | 0 | -1 | 36 | 0 | 36 | 36 |
| 15 1974 | 21 | 14 | 8 | 27 | 0 | 27 | 27 |
| 16 1975 | 38 | 0 | 10 | 28 | 0 | 28 | 28 |
| 17 1976 | 23 | 0 | -6 | 29 | 0 | 29 | 29 |
| 18 1977 | 21 | 0 | -10 | 31 | 0 | 31 | 31 |
| 19 1978 | 33 | 5 | 0 | 38 | 0 | 38 | 38 |
| 20 1979 | 38 | 2 | 0 | 40 | 0 | 40 | 40 |
| 21 1980 | 37 | 2 | 0 | 39 | 0 | 39 | 39 |
| YBAR | 28.48 | -1.26 | -0.32 | 27.57 | 0.10 | 27.57 | 27.57 |
| B | 0.71 | 0.33 | -0.03 | 1.06 | 0.00 | 1.06 | 1.06 |
| RSQ | 0.1576 | 0.0846 | 0.0014 | 0.6023 | 0.0000 | 0.6023 | 0.6023 |
| SYX | 10.45 | 6.88 | 4.65 | 5.49 | 0.00 | 5.49 | 5.49 |
| SB | 0.38 | 0.25 | 0.17 | 0.20 | 0.00 | 0.20 | 0.20 |

SOURCE:
PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAR. 1978 AND DEC. 1980.
(6) REPORTED TOTAL CONSUMPTION INCLUDE ALLOWANCES FOR FEED, SEED, AND WASTE. CROP YEAR JANUARY- DECEMBER.

TABLE 1
GUATEMALA, CORN ONLY.
FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980
EXPONENT IS 1.00

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | | | |
|---|-------------------|----------------|-------------------------|---------------------|----------------------|-----------------|----------------|--------------------------|--|
| PERIOD NO. YEAR | (1) PRODUCTION | (2) IMPORTS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEED AND LOSS | (6) FOOD USE | (7) BALANCE | (8) TOTAL UTILIZATION | |
| 1 1960 | 506 | -1 | -15 | 520 | 51 | 469 | 0 | 520 | |
| 2 1961 | 518 | 19 | -25 | 562 | 52 | 510 | 0 | 562 | |
| 3 1962 | 559 | 37 | 20 | 576 | 56 | 529 | 0 | 576 | |
| 4 1963 | 589 | 0 | 1 | 588 | 59 | 529 | 0 | 588 | |
| 5 1964 | 643 | 12 | 12 | 643 | 64 | 579 | 0 | 643 | |
| 6 1965 | 646 | 6 | 12 | 640 | 65 | 575 | 0 | 640 | |
| 7 1966 | 594 | -1 | 34 | 559 | 59 | 500 | 0 | 559 | |
| 8 1967 | 607 | 21 | -18 | 646 | 61 | 585 | 0 | 646 | |
| 9 1968 | 689 | 13 | 19 | 683 | 69 | 614 | 0 | 683 | |
| 10 1969 | 709 | 11 | -42 | 762 | 71 | 691 | 0 | 762 | |
| 11 1970 | 719 | 15 | -15 | 749 | 72 | 677 | 0 | 749 | |
| 12 1971 | 726 | 18 | -8 | 752 | 73 | 679 | 0 | 752 | |
| 13 1972 | 685 | 30 | -48 | 763 | 68 | 695 | 0 | 763 | |
| 14 1973 | 701 | 71 | 0 | 772 | 70 | 702 | 0 | 772 | |
| 15 1974 | 698 | 51 | -8 | 757 | 70 | 687 | 0 | 757 | |
| 16 1975 | 881 | 52 | 91 | 842 | 88 | 754 | 0 | 842 | |
| 17 1976 | 842 | 27 | -48 | 917 | 84 | 833 | 0 | 917 | |
| 18 1977 | 821 | 128 | 95 | 854 | 82 | 772 | 0 | 854 | |
| 19 1978 | 944 | 68 | -106 | 1118 | 94 | 1024 | 0 | 1118 | |
| 20 1979 | 1058 | 115 | -8 | 1181 | 106 | 1075 | 0 | 1181 | |
| 21 1980 | 1150 | 115 | 30 | 1235 | 115 | 1120 | 0 | 1235 | |
| YEAR | 727.86 | 38.43 | -1.28 | 767.57 | 72.81 | 694.76 | 0.10 | 767.57 | |
| B | 24.78 | 5.05 | 0.10 | 29.73 | 2.46 | 27.27 | 0.00 | 29.73 | |
| RSC | 0.8266 | 0.6206 | 0.0002 | 0.8320 | 0.8229 | 0.8292 | 0.0030 | 0.8320 | |
| SYX | 72.25 | 25.12 | 45.64 | 85.05 | 7.28 | 78.79 | 0.00 | 85.05 | |
| SB | 2.60 | 0.91 | 1.64 | 3.06 | 0.26 | 2.84 | 0.00 | 3.06 | |

SOURCE:

PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAY 1976 AND JAN. 1981.
(5) AT 10% OF COL. 1; (6) REPORTED CONSUMPTION LESS COL. 5; (7) COL. 4 LESS COLS. 5 AND 6. CROP YEAR JULY-JUNE.

TABLE 1
GUATEMALA, RICE ONLY.
FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980
EXPONENT IS 1.00

| (1000 METRIC TONS, MILLED RICE EQUIVALENT) | | | | | | | |
|--|-------------------|----------------|-------------------------|---------------------|----------------------|-----------------|--------------------------|
| PERIOD NO. YEAR | (1) PRODUCTION | (2) IMPORTS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEED AND LOSS | (6) FOOD USE | (8) TOTAL UTILIZATION |
| 1 1960 | 5 | 0 | 0 | 9 | 0 | 9 | 9 |
| 2 1961 | 9 | -2 | 0 | 7 | 0 | 7 | 7 |
| 3 1962 | 11 | 0 | 0 | 11 | 0 | 11 | 11 |
| 4 1963 | 12 | 1 | 0 | 13 | 0 | 13 | 13 |
| 5 1964 | 13 | -1 | 0 | 12 | 0 | 12 | 12 |
| 6 1965 | 9 | -1 | 0 | 8 | 0 | 8 | 8 |
| 7 1966 | 10 | 4 | 0 | 14 | 0 | 14 | 14 |
| 8 1967 | 14 | 0 | 0 | 14 | 0 | 14 | 14 |
| 9 1968 | 17 | 0 | 0 | 17 | 0 | 17 | 17 |
| 10 1969 | 18 | 0 | 0 | 18 | 0 | 18 | 18 |
| 11 1970 | 13 | 6 | 4 | 15 | 0 | 15 | 15 |
| 12 1971 | 38 | 3 | 6 | 35 | 0 | 35 | 35 |
| 13 1972 | 40 | 1 | -1 | 42 | 0 | 42 | 42 |
| 14 1973 | 44 | 1 | -2 | 47 | 0 | 47 | 47 |
| 15 1974 | 34 | 0 | -4 | 38 | 0 | 38 | 38 |
| 16 1975 | 48 | 2 | 6 | 44 | 0 | 44 | 44 |
| 17 1976 | 14 | 7 | -3 | 24 | 0 | 24 | 24 |
| 18 1977 | 17 | 10 | -5 | 32 | 0 | 32 | 32 |
| 19 1978 | 17 | 12 | 9 | 20 | 0 | 20 | 20 |
| 20 1979 | 27 | 4 | -5 | 36 | 0 | 36 | 36 |
| 21 1980 | 39 | 3 | 3 | 35 | 0 | 39 | 35 |
| YBAR | 21.57 | 2.41 | 0.43 | 23.57 | 0.10 | 23.57 | 23.57 |
| B | 1.30 | 0.38 | 0.01 | 1.66 | 0.00 | 1.66 | 1.66 |
| RSQ | 0.3752 | 0.4212 | 0.0006 | 0.5935 | 0.0000 | 0.5935 | 0.5935 |
| SYX | 10.65 | 2.87 | 3.66 | 8.76 | 0.00 | 8.76 | 8.76 |
| SB | 0.38 | 0.10 | 0.13 | 0.32 | 0.00 | 0.32 | 0.32 |

SOURCE:
PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAR. 1978 AND DEC. 1980.
(6) REPORTED TOTAL CONSUMPTION INCLUDE ALLOWANCES FOR FEED, SEED, AND WASTE. CROP YEAR JANUARY- DECEMBER.

TABLE 1
HONDURAS, CORN ONLY.
FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980

EXPONENT IS 1.00

(11000 METRIC TONS, WHOLE CORN EQUIVALENT)

| PERIOD NO. YEAR | (1) PRODUCTION | (2) IMPORTS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEED AND LOSS | (6) FOOD USE | (7) BALANCE | (8) TOTAL UTILIZATION |
|--------------------|-------------------|----------------|-------------------------|---------------------|----------------------|-----------------|----------------|--------------------------|
| 1 1960 | 262 | 5 | -25 | 292 | 26 | 266 | 0 | 292 |
| 2 1961 | 277 | -9 | 15 | 253 | 28 | 225 | 0 | 253 |
| 3 1962 | 299 | -32 | -5 | 272 | 30 | 242 | 0 | 272 |
| 4 1963 | 302 | -29 | 5 | 268 | 30 | 238 | 0 | 268 |
| 5 1964 | 277 | -73 | 5 | 199 | 28 | 171 | 0 | 199 |
| 6 1965 | 286 | -54 | 5 | 227 | 29 | 198 | 0 | 227 |
| 7 1966 | 316 | -21 | 25 | 270 | 32 | 238 | 0 | 270 |
| 8 1967 | 335 | -38 | -10 | 307 | 33 | 274 | 0 | 307 |
| 9 1968 | 353 | -30 | -110 | 433 | 35 | 398 | 0 | 433 |
| 10 1969 | 339 | -7 | 0 | 332 | 34 | 298 | 0 | 332 |
| 11 1970 | 346 | -14 | 8 | 324 | 35 | 289 | 0 | 324 |
| 12 1971 | 351 | -13 | 7 | 331 | 35 | 296 | 0 | 331 |
| 13 1972 | 290 | -7 | -9 | 292 | 29 | 263 | 0 | 292 |
| 14 1973 | 350 | 0 | 0 | 350 | 35 | 315 | 0 | 350 |
| 15 1974 | 335 | 0 | -5 | 340 | 33 | 307 | 0 | 340 |
| 16 1975 | 334 | 37 | 32 | 339 | 33 | 306 | 0 | 339 |
| 17 1976 | 308 | -2 | -25 | 331 | 31 | 300 | 0 | 331 |
| 18 1977 | 332 | 47 | 33 | 346 | 33 | 313 | 0 | 346 |
| 19 1978 | 423 | 7 | 35 | 395 | 42 | 353 | 0 | 395 |
| 20 1979 | 342 | 60 | -2 | 404 | 34 | 370 | 0 | 404 |
| 21 1980 | 399 | 20 | -10 | 429 | 40 | 389 | 0 | 429 |
| YEAR | 326.48 | -7.28 | -1.47 | 320.67 | 32.62 | 288.05 | 0.10 | 320.67 |
| B | 4.66 | 3.55 | 0.76 | 7.45 | 0.45 | 7.00 | 0.00 | 7.45 |
| RSQ | 0.5352 | 0.4860 | 0.0249 | 0.5545 | 0.5260 | 0.5405 | 0.0000 | 0.5545 |
| SVX | 27.66 | 23.25 | 30.41 | 42.51 | 2.73 | 41.08 | 0.00 | 42.51 |
| SB | 1.00 | 0.84 | 1.10 | 1.53 | 0.10 | 1.48 | 0.00 | 1.53 |

SOURCE:

PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAY 1976 AND JAN. 1981.
(5) AT 10% OF COL. 1; (6) REPORTED CONSUMPTION LESS COL. 5; (7) COL. 4 LESS COLS. 5 AND 6. CROP YEAR JULY-JUNE.

TABLE 1
HONDURAS, RICE ONLY.
FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980
EXPLANATION IS 1.00

| (1000 METRIC TONS, MILLED RICE EQUIVALENT) | | | | | | | | | |
|--|-------------------|--------------------------|-------------------------|---------------------|----------------------|-----------------|----------------|--------------------------|--|
| PERIOD AC. YEAR | (1) PRODUCTION | (2) IMPORTS IN STOCKS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEED AND LOSS | (6) FOOD USE | (7) BALANCE | (8) TOTAL UTILIZATION | |
| 1 1960 | 13 | 0 | 0 | 13 | 0 | 13 | 0 | 13 | |
| 2 1961 | 13 | 2 | 0 | 15 | 0 | 15 | 0 | 15 | |
| 3 1962 | 15 | 1 | 0 | 16 | 0 | 16 | 0 | 16 | |
| 4 1963 | 14 | 2 | 0 | 16 | 0 | 16 | 0 | 16 | |
| 5 1964 | 14 | 0 | 0 | 14 | 0 | 14 | 0 | 14 | |
| 6 1965 | 6 | 0 | 0 | 6 | 0 | 6 | 0 | 6 | |
| 7 1966 | 3 | 8 | 0 | 11 | 0 | 11 | 0 | 11 | |
| 8 1967 | 5 | 6 | 0 | 11 | 0 | 11 | 0 | 11 | |
| 9 1968 | 4 | 5 | 0 | 9 | 0 | 9 | 0 | 9 | |
| 10 1969 | 4 | 9 | 0 | 13 | 0 | 13 | 0 | 13 | |
| 11 1970 | 4 | 10 | 0 | 14 | 0 | 14 | 0 | 14 | |
| 12 1971 | 8 | 5 | 0 | 13 | 0 | 13 | 0 | 13 | |
| 13 1972 | 10 | 5 | 0 | 15 | 0 | 15 | 0 | 15 | |
| 14 1973 | 20 | 0 | 0 | 20 | 0 | 20 | 0 | 20 | |
| 15 1974 | 18 | 1 | 0 | 19 | 0 | 19 | 0 | 19 | |
| 16 1975 | 18 | 11 | -9 | 38 | 0 | 38 | 0 | 38 | |
| 17 1976 | 36 | 1 | 9 | 28 | 0 | 28 | 0 | 28 | |
| 18 1977 | 26 | 7 | 1 | 32 | 0 | 32 | 0 | 32 | |
| 19 1978 | 26 | 5 | -5 | 36 | 0 | 36 | 0 | 36 | |
| 20 1979 | 32 | 5 | -2 | 39 | 0 | 39 | 0 | 39 | |
| 21 1980 | 34 | 5 | -1 | 40 | 0 | 40 | 0 | 40 | |
| YEAR | 15.38 | 4.21 | -0.26 | 19.90 | 0.10 | 19.90 | 0.10 | 19.90 | |
| B | 1.12 | 0.20 | -0.07 | 1.39 | 0.00 | 1.39 | 0.00 | 1.39 | |
| PSO | 0.4541 | 0.1270 | 0.0216 | 0.6418 | 0.0000 | 0.6418 | 0.0000 | 0.6418 | |
| SYX | 7.85 | 3.32 | 3.14 | 6.63 | 0.00 | 6.63 | 0.00 | 6.63 | |
| SB | 0.28 | 0.12 | 0.11 | 0.24 | 0.00 | 0.24 | 0.00 | 0.24 | |

SOURCE:
PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAR. 1978 AND DEC. 1980.
(6) REPORTED TOTAL CONSUMPTION INCLUDE ALLOWANCES FOR FEED, SEED, AND WASTE. CROP YEAR JANUARY-DECEMBER.

TABLE 1
NICARAGUA, CORN ONLY.
FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980
EXPONENT IS 1.00

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|-------------------|--------------------------|-------------------------|---------------------|----------------------|-----------------|--------------------------|
| PERIOD NO. YEAR | (1) PRODUCTION | (2) IMPORTS IN STOCKS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEED AND LOSS | (6) FOOD USE | (8) TOTAL UTILIZATION |
| 1 1960 | 119 | -1 | 0 | 118 | 12 | 106 | 116 |
| 2 1961 | 123 | 3 | 0 | 126 | 12 | 114 | 126 |
| 3 1962 | 125 | 1 | 0 | 126 | 12 | 114 | 126 |
| 4 1963 | 142 | 4 | 0 | 146 | 14 | 132 | 146 |
| 5 1964 | 158 | 8 | 0 | 166 | 16 | 150 | 166 |
| 6 1965 | 171 | 4 | 0 | 175 | 17 | 158 | 175 |
| 7 1966 | 176 | 9 | 6 | 179 | 18 | 161 | 175 |
| 8 1967 | 202 | 9 | 4 | 207 | 20 | 187 | 207 |
| 9 1968 | 216 | -16 | -10 | 210 | 22 | 188 | 210 |
| 10 1969 | 231 | -3 | 0 | 228 | 23 | 205 | 228 |
| 11 1970 | 177 | -6 | 0 | 171 | 18 | 153 | 171 |
| 12 1971 | 239 | 4 | 10 | 233 | 24 | 209 | 233 |
| 13 1972 | 129 | 60 | 0 | 189 | 13 | 176 | 189 |
| 14 1973 | 220 | 25 | 9 | 236 | 22 | 214 | 236 |
| 15 1974 | 239 | -10 | -16 | 245 | 24 | 221 | 245 |
| 16 1975 | 239 | -4 | 10 | 225 | 24 | 201 | 225 |
| 17 1976 | 201 | 20 | 1 | 220 | 20 | 200 | 220 |
| 18 1977 | 181 | 40 | -1 | 222 | 18 | 204 | 222 |
| 19 1978 | 251 | -2 | 29 | 219 | 25 | 194 | 219 |
| 20 1979 | 173 | 18 | -13 | 204 | 17 | 187 | 204 |
| 21 1980 | 250 | 38 | 56 | 232 | 25 | 207 | 232 |
| YEAR | 188.67 | 9.52 | 4.09 | 194.14 | 18.86 | 175.29 | 194.14 |
| B | 4.91 | 1.18 | 0.88 | 5.20 | 0.49 | 4.71 | 5.20 |
| RSQ | 0.4647 | 0.1575 | 0.1325 | 0.6657 | 0.4543 | 0.6747 | 0.6657 |
| SYX | 33.53 | 17.36 | 14.31 | 23.47 | 3.43 | 20.82 | 23.47 |
| SB | 1.21 | 0.63 | 0.52 | 0.85 | 0.12 | 0.75 | 0.85 |

SOURCE:
PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAY 1976 AND JAN. 1981.
(5) AT 10% OF COL. 1; (6) REPORTED CONSUMPTION LESS COL. 5; (7) COL. 4 LESS COLS. 5 AND 6. CROP YEAR JULY-JUNE.

TABLE 1
NICARAGUA, RICE ONLY.
FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980
EXPONENT IS 1.00

| (1000 METRIC TONS, FILLED RICE EQUIVALENT) | | | | | | | |
|--|-------------------|----------------|-------------------------|---------------------|----------------------|-----------------|----------------------------------|
| PERIOD NO. YEAR | (1) PRODUCTION | (2) IMPORTS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEED AND LOSS | (6) FOOD USE | (8) TOTAL BALANCE UTILIZATION |
| 1 1960 | 21 | 6 | 0 | 27 | 0 | 27 | 27 |
| 2 1961 | 24 | -1 | 0 | 23 | 0 | 23 | 23 |
| 3 1962 | 23 | 3 | 0 | 26 | 0 | 26 | 26 |
| 4 1963 | 25 | 8 | 0 | 37 | 0 | 37 | 37 |
| 5 1964 | 30 | 10 | 0 | 40 | 0 | 40 | 40 |
| 6 1965 | 33 | 11 | 0 | 44 | 0 | 44 | 44 |
| 7 1966 | 40 | 12 | 0 | 52 | 0 | 52 | 52 |
| 8 1967 | 42 | 13 | 0 | 55 | 0 | 55 | 55 |
| 9 1968 | 54 | -6 | 0 | 48 | 0 | 48 | 48 |
| 10 1969 | 41 | -20 | 0 | 21 | 0 | 21 | 21 |
| 11 1970 | 47 | -8 | 0 | 35 | 0 | 39 | 35 |
| 12 1971 | 52 | -6 | 0 | 46 | 0 | 46 | 46 |
| 13 1972 | 47 | -5 | 0 | 42 | 0 | 42 | 42 |
| 14 1973 | 53 | -6 | 4 | 43 | 0 | 43 | 43 |
| 15 1974 | 57 | -4 | 2 | 51 | 0 | 51 | 51 |
| 16 1975 | 73 | -2 | 17 | 54 | 0 | 54 | 54 |
| 17 1976 | 38 | -7 | -23 | 54 | 0 | 54 | 54 |
| 18 1977 | 48 | 0 | 7 | 41 | 0 | 41 | 41 |
| 19 1978 | 55 | 0 | 1 | 58 | 0 | 58 | 58 |
| 20 1979 | 37 | 26 | 11 | 52 | 0 | 52 | 52 |
| 21 1980 | 58 | 13 | -1 | 72 | 0 | 72 | 72 |
| YBAR | 43.14 | 1.77 | 0.92 | 44.05 | 0.10 | 44.05 | 44.05 |
| 8 | 1.63 | -0.05 | 0.14 | 1.43 | 0.00 | 1.43 | 1.43 |
| RSQ | 0.5489 | 0.0009 | 0.0152 | 0.4952 | 0.0000 | 0.4952 | 0.4952 |
| SYX | 9.40 | 10.48 | 7.17 | 9.20 | 0.00 | 9.20 | 9.20 |
| SB | 0.34 | 0.38 | 0.26 | 0.33 | 0.00 | 0.33 | 0.33 |

SOURCE:
PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAR. 1978 AND DEC. 1980.
(6) REPORTED TOTAL CONSUMPTION INCLUDE ALLOWANCES FOR FEED, SEED, AND WASTE. CROP YEAR JANUARY-DECEMBER.

TABLE 1
PANAMA, CCRN ONLY.
FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980
EXPLANATION IS 1.00

| (1000 METRIC TONS, WHEAT CCRN EQUIVALENT) | | | | | | | |
|---|-------------------|--------------------------|-------------------------|---------------------|---------------------|-----------------|--------------------------|
| PERIOD NO. YEAR | (1) PRODUCTION | (2) IMPORTS IN STOCKS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEE AND LOSS | (6) FOOD USE | (8) TOTAL UTILIZATION |
| 1 1960 | 59 | 8 | 1 | 66 | 6 | 60 | 66 |
| 2 1961 | 74 | 6 | 0 | 80 | 7 | 73 | 80 |
| 3 1962 | 72 | 4 | 11 | 65 | 7 | 58 | 65 |
| 4 1963 | 76 | 6 | 3 | 79 | 8 | 71 | 75 |
| 5 1964 | 82 | 6 | 3 | 85 | 8 | 77 | 85 |
| 6 1965 | 84 | 20 | 2 | 102 | 8 | 94 | 102 |
| 7 1966 | 84 | 5 | 1 | 88 | 8 | 80 | 88 |
| 8 1967 | 89 | 3 | 1 | 91 | 9 | 82 | 91 |
| 9 1968 | 84 | 2 | -12 | 98 | 8 | 90 | 98 |
| 10 1969 | 88 | 2 | -1 | 91 | 9 | 82 | 91 |
| 11 1970 | 56 | 15 | -10 | 81 | 6 | 75 | 81 |
| 12 1971 | 54 | 14 | 8 | 60 | 5 | 55 | 60 |
| 13 1972 | 44 | 17 | -8 | 69 | 4 | 65 | 69 |
| 14 1973 | 56 | 13 | 0 | 69 | 6 | 63 | 69 |
| 15 1974 | 55 | 28 | 0 | 87 | 6 | 81 | 87 |
| 16 1975 | 65 | 16 | 0 | 81 | 6 | 75 | 81 |
| 17 1976 | 64 | 13 | 0 | 77 | 6 | 71 | 77 |
| 18 1977 | 80 | 3 | 0 | 83 | 8 | 75 | 83 |
| 19 1978 | 65 | 18 | 0 | 83 | 6 | 77 | 83 |
| 20 1979 | 82 | 27 | 0 | 109 | 8 | 101 | 109 |
| 21 1980 | 110 | 10 | 0 | 120 | 11 | 109 | 120 |
| YBAR | 72.71 | 11.24 | -0.00 | 84.00 | 7.14 | 76.86 | 84.00 |
| B | 0.05 | 0.63 | -0.17 | 0.86 | -0.00 | 0.86 | 0.86 |
| RSQ | 0.0004 | 0.2498 | 0.0441 | 0.1294 | 0.0000 | 0.1311 | 0.1294 |
| SVX | 15.91 | 6.96 | 5.11 | 14.18 | 1.63 | 12.85 | 14.18 |
| SB | 0.57 | 0.25 | 0.18 | 0.51 | 0.06 | 0.46 | 0.51 |

SOURCE:
PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAY 1976 AND JAN. 1981.
(5) AT 10% OF COL. 1; (6) REPORTED CONSUMPTION LESS COL. 5; (7) COL. 4 LESS COLS. 5 AND 6. CROP YEAR JULY-JUNE.

TABLE 1
PANAMA, RICE ONLY.
FOOD GRAIN SUPPLY AND UTILIZATION BALANCE SHEET, 1960-1980
EXPCNENT IS 1.00

| (1000 METRIC TONS, MILLED RICE EQUIVALENT) | | | | | | | |
|--|-------------------|----------------|-------------------------|---------------------|----------------------|-----------------|--------------------------|
| PERIOD NO. YEAR | (1) PRODUCTION | (2) IMPORTS | (3) CHANGE IN STOCKS | (4) TOTAL SUPPLY | (5) SEED AND LOSS | (6) FOOD USE | (8) TOTAL UTILIZATION |
| 1 1960 | 62 | 5 | 0 | 67 | 0 | 67 | 67 |
| 2 1961 | 71 | 4 | 0 | 75 | 0 | 75 | 75 |
| 3 1962 | 72 | 4 | 0 | 76 | 0 | 76 | 76 |
| 4 1963 | 72 | 4 | 0 | 76 | 0 | 76 | 76 |
| 5 1964 | 83 | 0 | 0 | 83 | 0 | 83 | 83 |
| 6 1965 | 98 | -2 | 0 | 96 | 0 | 96 | 96 |
| 7 1966 | 91 | 0 | 0 | 91 | 0 | 91 | 91 |
| 8 1967 | 98 | 0 | 0 | 98 | 0 | 98 | 98 |
| 9 1968 | 106 | 0 | 0 | 106 | 0 | 106 | 106 |
| 10 1969 | 107 | 0 | 0 | 107 | 0 | 107 | 107 |
| 11 1970 | 85 | 23 | 0 | 108 | 0 | 108 | 108 |
| 12 1971 | 88 | 6 | 0 | 94 | 0 | 94 | 94 |
| 13 1972 | 81 | 2 | -4 | 87 | 0 | 87 | 87 |
| 14 1973 | 105 | -6 | 0 | 99 | 0 | 99 | 99 |
| 15 1974 | 116 | 0 | 2 | 114 | 0 | 114 | 114 |
| 16 1975 | 120 | 0 | 10 | 110 | 0 | 110 | 110 |
| 17 1976 | 94 | -2 | -13 | 105 | 0 | 105 | 105 |
| 18 1977 | 121 | -14 | 2 | 105 | 0 | 105 | 105 |
| 19 1978 | 121 | -12 | 0 | 109 | 0 | 109 | 109 |
| 20 1979 | 135 | -25 | -5 | 115 | 0 | 115 | 115 |
| 21 1980 | 115 | 17 | 7 | 125 | 0 | 125 | 125 |
| YBAR | 57.19 | 0.22 | 0.02 | 97.43 | 0.10 | 97.43 | 97.43 |
| B | 2.69 | -0.53 | 0.01 | 2.15 | 0.00 | 2.15 | 2.15 |
| RSQ | 0.7011 | 0.1102 | 0.0002 | 0.7472 | 0.0000 | 0.7472 | 0.7472 |
| SYX | 11.17 | 9.53 | 4.40 | 7.95 | 0.00 | 7.95 | 7.95 |
| SB | 0.40 | 0.34 | 0.16 | 0.25 | 0.00 | 0.25 | 0.29 |

SOURCE:
PRODUCTION, IMPORTS, STOCKS AND UTILIZATION FROM FOREIGN AGRICULTURE CIRCULAR, USDA, MAR. 1978 AND DEC. 1980.
(6) REPORTED TOTAL CONSUMPTION INCLUDE ALLOWANCES FOR FEED, SEED, AND WASTE. CROP YEAR JANUARY-DECEMBER.

APPENDIX C

TREND ESTIMATES AND DEVIATION PATTERNS IN
FOOD SUPPLIES OF CORN AND RICE
(Tables 2, 4, 5, 6, 7, 8)

| | Page |
|---|------|
| 1. Actual Corn and Rice Consumption | |
| Table 2. Domestic Consumption by Central American Country and Panama, 1000 MT | C2 |
| Table 2. Domestic Consumption by Central American Country and Panama, 1000 MT | C3 |
| Table 4. Domestic Per Capita Consumption by Central American Country and Panama, Grams per Year | C4 |
| Table 4. Domestic Per Capita Consumption by Central American Country and Panama, Grams per Year | C5 |
| 2. Estimated Corn and Rice Consumption | |
| Table 5. Estimated Domestic Consumption by Central American Country and Panama, Grams per Capita per Year | C6 |
| Table 5. Estimated Domestic Consumption by Central American Country and Panama, Grams per Capita per Year | C7 |
| Table 6. Estimated Domestic Consumption by Central American Country and Panama, 1000 MT | C8 |
| Table 6. Estimated Domestic Consumption by Central American Country and Panama, 1000 MT | C9 |
| 3. Corn and Rice Deviation Patterns | |
| Table 7. Deviations Between Actual and Estimated Consumption, Central America and Panama, Grams per Capita per Year | C10 |
| Table 7. Deviations Between Actual and Estimated Consumption, Central America and Panama, Grams per Capita per Year | C11 |
| Table 8. Deviations Between Actual and Estimated Consumption, Central America and Panama, 1000 MT | C12 |
| Table 8. Deviations Between Actual and Estimated Consumption, Central America and Panama, 1000 MT | C13 |

TABLE 2, CORN ONLY.
DOMESTIC CONSUMPTION BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980.

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 70 | 163 | 469 | 266 | 106 | 60 | 1134 |
| 2 1961 | 66 | 153 | 510 | 225 | 114 | 73 | 1141 |
| 3 1962 | 67 | 220 | 520 | 242 | 114 | 58 | 1221 |
| 4 1963 | 62 | 207 | 529 | 238 | 132 | 71 | 1239 |
| 5 1964 | 66 | 231 | 579 | 171 | 150 | 77 | 1274 |
| 6 1965 | 62 | 246 | 575 | 198 | 158 | 94 | 1333 |
| 7 1966 | 63 | 257 | 500 | 238 | 161 | 80 | 1299 |
| 8 1967 | 69 | 213 | 585 | 274 | 187 | 82 | 1410 |
| 9 1968 | 81 | 260 | 614 | 398 | 188 | 90 | 1631 |
| 10 1969 | 79 | 254 | 691 | 298 | 205 | 82 | 1609 |
| 11 1970 | 74 | 264 | 677 | 289 | 153 | 75 | 1532 |
| 12 1971 | 87 | 316 | 679 | 296 | 209 | 55 | 1642 |
| 13 1972 | 86 | 277 | 695 | 263 | 176 | 65 | 1562 |
| 14 1973 | 82 | 417 | 702 | 315 | 214 | 63 | 1793 |
| 15 1974 | 67 | 357 | 687 | 307 | 221 | 81 | 1720 |
| 16 1975 | 91 | 374 | 754 | 306 | 201 | 75 | 1801 |
| 17 1976 | 58 | 366 | 833 | 300 | 200 | 71 | 1828 |
| 18 1977 | 93 | 403 | 772 | 313 | 204 | 75 | 1860 |
| 19 1978 | 77 | 446 | 1024 | 353 | 194 | 77 | 2171 |
| 20 1979 | 91 | 460 | 1075 | 370 | 167 | 101 | 2284 |
| 21 1980 | 94 | 466 | 1120 | 389 | 207 | 109 | 2385 |

SOURCE:
TABLE 1, COLUMN 6.

TABLE 2, RICE ONLY.
DOMESTIC CONSUMPTION BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980.

| (1000 METRIC TONS, MILLED RICE EQUIVALENT) | | | | | | | |
|--|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 44 | 18 | 9 | 13 | 27 | 67 | 178 |
| 2 1961 | 44 | 15 | 7 | 15 | 23 | 75 | 179 |
| 3 1962 | 47 | 18 | 11 | 16 | 26 | 76 | 194 |
| 4 1963 | 41 | 13 | 13 | 16 | 37 | 76 | 196 |
| 5 1964 | 44 | 20 | 12 | 14 | 40 | 83 | 213 |
| 6 1965 | 53 | 22 | 8 | 6 | 44 | 96 | 229 |
| 7 1966 | 52 | 21 | 14 | 11 | 52 | 91 | 241 |
| 8 1967 | 55 | 29 | 14 | 11 | 55 | 98 | 262 |
| 9 1968 | 47 | 41 | 17 | 9 | 48 | 106 | 268 |
| 10 1969 | 74 | 30 | 18 | 13 | 21 | 107 | 263 |
| 11 1970 | 64 | 27 | 15 | 14 | 39 | 108 | 267 |
| 12 1971 | 45 | 35 | 35 | 13 | 46 | 94 | 268 |
| 13 1972 | 71 | 22 | 42 | 15 | 42 | 87 | 279 |
| 14 1973 | 45 | 36 | 47 | 20 | 43 | 99 | 290 |
| 15 1974 | 66 | 27 | 38 | 19 | 51 | 114 | 315 |
| 16 1975 | 69 | 28 | 44 | 38 | 54 | 110 | 343 |
| 17 1976 | 100 | 29 | 24 | 28 | 54 | 105 | 340 |
| 18 1977 | 80 | 31 | 32 | 32 | 41 | 105 | 321 |
| 19 1978 | 80 | 38 | 20 | 36 | 58 | 109 | 341 |
| 20 1979 | 72 | 40 | 36 | 39 | 52 | 115 | 354 |
| 21 1980 | 80 | 39 | 39 | 40 | 72 | 125 | 395 |

SOURCE:
TABLE 1, COLUMN 6.

TABLE 4. CORN ONLY.
DOMESTIC PERCAPITA CONSUMPTION BY CENTRAL AMERICAN COUNTRY AND PANAMA
1960-1980

| (GRAMS PER YEAR, WHOLE CORN EQUIVALENT) | | | | | | |
|---|---------------|----------------|-----------|-----------|-----------|----------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960 | 56090 | 64503 | 117544 | 142018 | 72011 | 55402 |
| 2 1961 | 50887 | 58756 | 124269 | 116219 | 75248 | 65354 |
| 3 1962 | 49777 | 81937 | 123281 | 120879 | 73124 | 50391 |
| 4 1963 | 44444 | 74756 | 122030 | 114920 | 82243 | 59815 |
| 5 1964 | 45675 | 80797 | 129937 | 79907 | 90799 | 62908 |
| 6 1965 | 41472 | 81864 | 125546 | 89633 | 92887 | 74544 |
| 7 1966 | 40777 | 84069 | 106022 | 104615 | 91947 | 61586 |
| 8 1967 | 43342 | 67235 | 120494 | 117144 | 103774 | 61331 |
| 9 1968 | 49420 | 79196 | 122849 | 165489 | 101348 | 65356 |
| 10 1969 | 46801 | 74443 | 134279 | 120404 | 107274 | 57869 |
| 11 1970 | 42725 | 73702 | 126000 | 109511 | 77665 | 51440 |
| 12 1971 | 48904 | 85544 | 123029 | 108824 | 102804 | 36667 |
| 13 1972 | 47123 | 72837 | 122101 | 93761 | 83810 | 42153 |
| 14 1973 | 43803 | 106568 | 119591 | 108808 | 98618 | 39748 |
| 15 1974 | 34932 | 88696 | 113479 | 102641 | 98529 | 49693 |
| 16 1975 | 46310 | 90273 | 120775 | 98933 | 86713 | 44749 |
| 17 1976 | 28813 | 85795 | 129408 | 93691 | 83472 | 41183 |
| 18 1977 | 45102 | 91737 | 116353 | 94334 | 82391 | 42325 |
| 19 1978 | 36476 | 98585 | 149729 | 102646 | 75811 | 42238 |
| 20 1979 | 42091 | 98755 | 152526 | 103816 | 70726 | 53895 |
| 21 1980 | 42476 | 97144 | 154227 | 105391 | 75741 | 56565 |
| YEAR | 44159.52 | 82723.37 | 126355.62 | 109218.25 | 86996.87 | 53105.47 |
| B | -542.44 | 1487.48 | 1013.40 | -1073.54 | -109.61 | -958.98 |
| RSQ | 0.3241 | 0.5769 | 0.2605 | 0.1296 | 0.0034 | 0.3344 |
| SYX | 4987.22 | 8109.18 | 10869.36 | 17713.84 | 11933.39 | 8613.18 |
| SB | 179.73 | 292.23 | 391.70 | 638.36 | 430.05 | 310.40 |

SOURCE:
FIGURES IN TABLE 2 TIMES 1,000,000 DIVIDED BY FIGURES IN TABLE 3.

TABLE 4, RICE ONLY.
DOMESTIC PERCAPITA CONSUMPTION BY CENTRAL AMERICAN COUNTRY AND PANAMA
1960-1980

| (GRAMS PER YEAR, MILLED RICE EQUIVALENT) | | | | | | |
|--|---------------|----------------|-----------|----------|-----------|----------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960 | 35200 | 7123 | 2256 | 6941 | 18342 | 61865 |
| 2 1961 | 33924 | 5760 | 1706 | 7748 | 15182 | 67144 |
| 3 1962 | 34918 | 6704 | 2608 | 7992 | 16677 | 66030 |
| 4 1963 | 29391 | 4695 | 2999 | 7726 | 23053 | 64027 |
| 5 1964 | 30450 | 6995 | 2693 | 6542 | 24213 | 67810 |
| 6 1965 | 35452 | 7321 | 1747 | 2716 | 25867 | 76130 |
| 7 1966 | 33657 | 6869 | 2969 | 4835 | 29697 | 70054 |
| 8 1967 | 34548 | 9154 | 2884 | 4703 | 30522 | 73298 |
| 9 1968 | 28676 | 12489 | 3401 | 3742 | 25876 | 76979 |
| 10 1969 | 43839 | 8792 | 3498 | 5253 | 10989 | 75512 |
| 11 1970 | 36952 | 7538 | 2792 | 5305 | 19797 | 74074 |
| 12 1971 | 25295 | 9475 | 6342 | 4779 | 22627 | 62667 |
| 13 1972 | 38904 | 5785 | 7379 | 5348 | 20000 | 56420 |
| 14 1973 | 24038 | 9200 | 8007 | 6908 | 19816 | 62461 |
| 15 1974 | 34411 | 6708 | 6277 | 6352 | 22737 | 69939 |
| 16 1975 | 35115 | 6758 | 7048 | 12286 | 23296 | 65632 |
| 17 1976 | 49677 | 6798 | 3728 | 8745 | 22538 | 60905 |
| 18 1977 | 38797 | 7057 | 4823 | 9644 | 16559 | 59255 |
| 19 1978 | 37897 | 8400 | 2924 | 10468 | 22665 | 59792 |
| 20 1979 | 33302 | 8587 | 5108 | 10943 | 19667 | 61366 |
| 21 1980 | 36150 | 8130 | 5370 | 10837 | 26345 | 64868 |
| YBAR | 34790.14 | 7635.14 | 4121.86 | 7133.95 | 21736.43 | 66487.00 |
| B | 234.61 | 62.84 | 193.73 | 230.44 | 51.76 | -371.60 |
| RSQ | 0.0653 | 0.0550 | 0.3877 | 0.3026 | 0.0046 | 0.1451 |
| SYX | 5650.12 | 1657.77 | 1549.92 | 2227.10 | 4837.59 | 5742.25 |
| SB | 203.62 | 59.74 | 55.86 | 80.26 | 174.33 | 206.94 |

SOURCE:

FIGURES IN TABLE 2 TIMES 1,000,000 DIVIDED BY FIGURES IN TABLE 3.

TABLE 5, CORN ONLY.
ESTIMATED DOMESTIC CONSUMPTION BY CENTRAL AMERICAN COUNTRY AND PANAMA

1960-1980

| (GRAMS PER CAPITA PER YEAR, WHEAT CORN EQUIVALENT) | | | | | | |
|--|---------------|----------------|-----------|----------|-----------|--------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960 | 49584 | 67849 | 116222 | 119954 | 88053 | 62695 |
| 2 1961 | 49041 | 69336 | 117235 | 118880 | 87983 | 61736 |
| 3 1962 | 48495 | 70823 | 118248 | 117806 | 87874 | 60777 |
| 4 1963 | 47957 | 72311 | 119262 | 116733 | 87764 | 59818 |
| 5 1964 | 47414 | 73758 | 120275 | 115659 | 87654 | 58859 |
| 6 1965 | 46872 | 75286 | 121289 | 114586 | 87545 | 57900 |
| 7 1966 | 46329 | 76773 | 122302 | 113512 | 87435 | 56941 |
| 8 1967 | 45787 | 78261 | 123315 | 112439 | 87326 | 55982 |
| 9 1968 | 45244 | 79748 | 124329 | 111365 | 87216 | 55023 |
| 10 1969 | 44702 | 81236 | 125342 | 110292 | 87106 | 54064 |
| 11 1970 | 44160 | 82723 | 126356 | 109218 | 86997 | 53105 |
| 12 1971 | 43617 | 84211 | 127369 | 108145 | 86887 | 52146 |
| 13 1972 | 43075 | 85698 | 128382 | 107071 | 86778 | 51187 |
| 14 1973 | 42532 | 87186 | 129396 | 105998 | 86668 | 50229 |
| 15 1974 | 41990 | 88673 | 130409 | 104924 | 86558 | 49270 |
| 16 1975 | 41447 | 90161 | 131423 | 103851 | 86449 | 48311 |
| 17 1976 | 40905 | 91648 | 132436 | 102777 | 86339 | 47352 |
| 18 1977 | 40362 | 93136 | 133449 | 101703 | 86230 | 46393 |
| 19 1978 | 39820 | 94623 | 134463 | 100630 | 86120 | 45434 |
| 20 1979 | 39278 | 96111 | 135476 | 99556 | 86010 | 44475 |
| 21 1980 | 38735 | 97598 | 136490 | 98483 | 85901 | 43516 |

SOURCE:

STATISTICAL ESTIMATES BASED ON THE REGRESSION EQUATIONS FROM TABLE 4.

TABLE 5, RICE ONLY.
ESTIMATED DOMESTIC CONSUMPTION BY CENTRAL AMERICAN COUNTRY AND PANAMA
1960-1980

| (GRAMS PER CAPITA PER YEAR, MILLED RICE EQUIVALENT) | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960. | 32444 | 7007 | 2185 | 4830 | 21219 | 70203 |
| 2 1961 | 32679 | 7070 | 2378 | 5060 | 21271 | 69831 |
| 3 1962 | 32913 | 7132 | 2572 | 5290 | 21322 | 69460 |
| 4 1963 | 33148 | 7195 | 2766 | 5521 | 21374 | 69088 |
| 5 1964 | 33383 | 7258 | 2959 | 5751 | 21426 | 68717 |
| 6 1965 | 33617 | 7321 | 3153 | 5982 | 21478 | 68345 |
| 7 1966 | 33852 | 7384 | 3347 | 6212 | 21529 | 67973 |
| 8 1967 | 34086 | 7447 | 3541 | 6443 | 21581 | 67602 |
| 9 1968 | 34321 | 7509 | 3734 | 6673 | 21633 | 67230 |
| 10 1969 | 34556 | 7572 | 3928 | 6904 | 21685 | 66858 |
| 11 1970 | 34790 | 7635 | 4122 | 7134 | 21736 | 66487 |
| 12 1971 | 35025 | 7698 | 4316 | 7364 | 21788 | 66115 |
| 13 1972 | 35259 | 7761 | 4509 | 7595 | 21840 | 65744 |
| 14 1973 | 35494 | 7824 | 4703 | 7825 | 21892 | 65372 |
| 15 1974 | 35729 | 7886 | 4897 | 8056 | 21943 | 65001 |
| 16 1975 | 35963 | 7949 | 5090 | 8286 | 21995 | 64629 |
| 17 1976 | 36198 | 8012 | 5284 | 8517 | 22047 | 64257 |
| 18 1977 | 36432 | 8075 | 5478 | 8747 | 22099 | 63886 |
| 19 1978 | 36667 | 8138 | 5672 | 8977 | 22151 | 63514 |
| 20 1979 | 36902 | 8201 | 5865 | 9208 | 22202 | 63143 |
| 21 1980 | 37136 | 8263 | 6059 | 9438 | 22254 | 62771 |

SOURCE:

STATISTICAL ESTIMATES BASED ON THE REGRESSION EQUATIONS FROM TABLE 4.

TABLE 6, CORN ONLY.
ESTIMATED DOMESTIC CONSUMPTION BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 62 | 171 | 464 | 225 | 130 | 68 | 1120 |
| 2 1961 | 64 | 181 | 481 | 230 | 133 | 69 | 1158 |
| 3 1962 | 65 | 190 | 499 | 236 | 137 | 70 | 1197 |
| 4 1963 | 67 | 200 | 517 | 242 | 141 | 71 | 1238 |
| 5 1964 | 69 | 211 | 536 | 248 | 145 | 72 | 1281 |
| 6 1965 | 70 | 226 | 556 | 253 | 149 | 73 | 1327 |
| 7 1966 | 72 | 235 | 577 | 258 | 153 | 74 | 1369 |
| 8 1967 | 73 | 248 | 599 | 263 | 157 | 75 | 1415 |
| 9 1968 | 74 | 262 | 621 | 268 | 162 | 76 | 1463 |
| 10 1969 | 75 | 277 | 645 | 273 | 166 | 77 | 1513 |
| 11 1970 | 76 | 296 | 679 | 288 | 171 | 77 | 1587 |
| 12 1971 | 78 | 311 | 703 | 294 | 177 | 78 | 1641 |
| 13 1972 | 79 | 326 | 731 | 300 | 182 | 79 | 1697 |
| 14 1973 | 80 | 341 | 760 | 307 | 188 | 80 | 1756 |
| 15 1974 | 81 | 357 | 789 | 314 | 194 | 80 | 1815 |
| 16 1975 | 81 | 374 | 820 | 321 | 200 | 81 | 1877 |
| 17 1976 | 82 | 391 | 852 | 329 | 207 | 82 | 1943 |
| 18 1977 | 83 | 409 | 885 | 337 | 214 | 82 | 2010 |
| 19 1978 | 84 | 428 | 920 | 346 | 220 | 83 | 2081 |
| 20 1979 | 85 | 448 | 955 | 355 | 227 | 83 | 2153 |
| 21 1980 | 86 | 468 | 991 | 364 | 235 | 84 | 2228 |

SOURCE:

FIGURES IN TABLE 6: DIFFERENCE BETWEEN FIGURES IN TABLE 2 AND 8.

FIGURES IN TABLE 9: FIGURES IN TABLE 6 MULTIPLIED BY 5%.

TABLE 6, RICE ONLY.
ESTIMATED DOMESTIC CONSUMPTION BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980

| (1000 METRIC TONS, MILLED RICE EQUIVALENT) | | | | | | | |
|--|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 41 | 18 | 9 | 9 | 31 | 76 | 184 |
| 2 1961 | 42 | 18 | 10 | 10 | 32 | 78 | 190 |
| 3 1962 | 44 | 19 | 11 | 11 | 33 | 80 | 198 |
| 4 1963 | 46 | 20 | 12 | 11 | 34 | 82 | 205 |
| 5 1964 | 48 | 21 | 13 | 12 | 35 | 84 | 213 |
| 6 1965 | 50 | 22 | 14 | 13 | 37 | 86 | 222 |
| 7 1966 | 52 | 23 | 16 | 14 | 38 | 88 | 231 |
| 8 1967 | 54 | 24 | 17 | 15 | 39 | 90 | 239 |
| 9 1968 | 56 | 25 | 19 | 16 | 40 | 93 | 249 |
| 10 1969 | 58 | 26 | 20 | 17 | 41 | 95 | 257 |
| 11 1970 | 60 | 27 | 22 | 19 | 43 | 97 | 268 |
| 12 1971 | 62 | 28 | 24 | 20 | 44 | 99 | 277 |
| 13 1972 | 64 | 30 | 26 | 21 | 46 | 101 | 288 |
| 14 1973 | 66 | 31 | 28 | 23 | 48 | 104 | 300 |
| 15 1974 | 69 | 32 | 30 | 24 | 49 | 106 | 310 |
| 16 1975 | 71 | 33 | 32 | 26 | 51 | 108 | 321 |
| 17 1976 | 73 | 34 | 34 | 27 | 53 | 111 | 332 |
| 18 1977 | 75 | 35 | 36 | 29 | 55 | 113 | 343 |
| 19 1978 | 77 | 37 | 39 | 31 | 57 | 116 | 357 |
| 20 1979 | 80 | 38 | 41 | 33 | 59 | 118 | 369 |
| 21 1980 | 82 | 40 | 44 | 35 | 61 | 121 | 383 |

SOURCE:

FIGURES IN TABLE 6: DIFFERENCE BETWEEN FIGURES IN TABLE 2 AND 8.

FIGURES IN TABLE 9: FIGURES IN TABLE 6 MULTIPLIED BY 5%.

TABLE 7, CORN ONLY.
 DEVIATIONS BETWEEN ACTUAL AND ESTIMATED CONSUMPTION, CENTRAL AMERICA AND PANAMA
 1960-1980

| (GRAMS PER CAPITA PER YEAR, WHOLE CORN EQUIVALENT) | | | | | | |
|--|---------------|----------------|-----------|-----------|-----------|----------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960 | 6416 | -3346 | 1322 | 22064 | -16082 | -7293 |
| 2 1961 | 1846 | -10580 | 7034 | -2661 | -12735 | 3618 |
| 3 1962 | 1278 | 11114 | 5033 | 3073 | -14750 | -10386 |
| 4 1963 | -3513 | 2445 | 2768 | -1813 | -5521 | -3 |
| 5 1964 | -1739 | 6999 | 9662 | -35752 | 3145 | 4049 |
| 6 1965 | -5400 | 6578 | 4257 | -24953 | 5342 | 16644 |
| 7 1966 | -5552 | 7296 | -16280 | -8897 | 4512 | 4645 |
| 8 1967 | -2445 | -11026 | -2821 | 4705 | 16448 | 5349 |
| 9 1968 | 4176 | -552 | -1480 | 54124 | 14132 | 10336 |
| 10 1969 | 2099 | -6793 | 8937 | 10112 | 20168 | 3805 |
| 11 1970 | -1435 | -9021 | -356 | 293 | -9332 | -1665 |
| 12 1971 | 5287 | 1333 | -4340 | 679 | 15917 | -15479 |
| 13 1972 | 4048 | -12861 | -6281 | -13310 | -2968 | -9034 |
| 14 1973 | 1271 | 19382 | -9805 | 2810 | 11950 | -10481 |
| 15 1974 | -7058 | 23 | -16930 | -2283 | 11971 | 423 |
| 16 1975 | 4863 | 112 | -10648 | -4918 | 264 | -3562 |
| 17 1976 | -12092 | -5853 | -3028 | -9086 | -2867 | -6169 |
| 18 1977 | 4740 | -1399 | -17096 | -7369 | -3839 | -4068 |
| 19 1978 | -3344 | 3962 | 15266 | 2016 | -10309 | -3196 |
| 20 1979 | 2813 | 2644 | 17050 | 4260 | -15284 | 9420 |
| 21 1980 | 3741 | -454 | 17737 | 6908 | -10160 | 13049 |
| YBAR | 44159.52 | 82723.37 | 126355.62 | 109218.25 | 86996.87 | 53105.47 |
| B | -542.44 | 1487.48 | 1013.40 | -1073.54 | -109.61 | -958.98 |
| RSQ | 0.3241 | 0.5769 | 0.2605 | 0.1296 | 0.0034 | 0.3344 |
| SYX | 4987.22 | 8109.18 | 10869.36 | 17713.84 | 11933.39 | 8613.18 |
| SB | 179.73 | 292.23 | 391.70 | 638.36 | 430.05 | 310.40 |

SOURCE:
 FIGURES IN TABLE 4 MINUS FIGURES IN TABLE 5.

TABLE 7, RICE ONLY.
 DEVIATIONS BETWEEN ACTUAL AND ESTIMATED CONSUMPTION, CENTRAL AMERICA AND PANAMA
 1960-1980

| (GRAMS PER CAPITA PER YEAR, MILLED RICE EQUIVALENT) | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|----------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960 | 2756 | 116 | 71 | 2111 | -2877 | -8338 |
| 2 1961 | 1245 | -1310 | -672 | 2688 | -6089 | -2687 |
| 3 1962 | 2005 | -428 | 36 | 2702 | -4645 | -3430 |
| 4 1963 | -3757 | -2500 | 233 | 2205 | 1679 | -5061 |
| 5 1964 | -2933 | -263 | -266 | 791 | 2787 | -907 |
| 6 1965 | 1835 | 0 | -1406 | -3266 | 4389 | 7785 |
| 7 1966 | -195 | -515 | -378 | -1377 | 8168 | 2081 |
| 8 1967 | 462 | 1707 | -657 | -1740 | 8941 | 5696 |
| 9 1968 | -5645 | 4980 | -333 | -2931 | 4243 | 9749 |
| 10 1969 | 9283 | 1220 | -430 | -1651 | -10696 | 8654 |
| 11 1970 | 2162 | -97 | -1330 | -1829 | -1939 | 7587 |
| 12 1971 | -9730 | 1777 | 2026 | -2585 | 839 | -3448 |
| 13 1972 | 3645 | -1976 | 2870 | -2247 | -1840 | -9324 |
| 14 1973 | -11456 | 1376 | 3304 | -917 | -2076 | -2911 |
| 15 1974 | -1318 | -1178 | 1380 | -1704 | 794 | 4938 |
| 16 1975 | -848 | -1191 | 1958 | 4000 | 1301 | 1003 |
| 17 1976 | 13479 | -1214 | -1556 | 228 | 491 | -3352 |
| 18 1977 | 2365 | -1018 | -655 | 897 | -5540 | -4631 |
| 19 1978 | 1230 | 262 | -2748 | 1491 | 514 | -3722 |
| 20 1979 | -3600 | 386 | -757 | 1735 | -2535 | -1777 |
| 21 1980 | -986 | -133 | -689 | 1399 | 4091 | 2097 |
| YBAR | 34790.14 | 7635.14 | 4121.86 | 7133.95 | 21736.43 | 66487.00 |
| B | 234.61 | 62.84 | 193.73 | 230.44 | 51.76 | -371.60 |
| RSQ | 0.0653 | 0.0550 | 0.3877 | 0.3026 | 0.0046 | 0.1451 |
| SYX | 5650.12 | 1657.77 | 1549.92 | 2227.10 | 4837.59 | 5742.25 |
| SB | 203.62 | 59.74 | 55.86 | 80.26 | 174.33 | 206.94 |

SOURCE:
 FIGURES IN TABLE 4 MINUS FIGURES IN TABLE 5.

TABLE 8, CORN ONLY.
 DEVIATIONS BETWEEN ACTUAL AND ESTIMATED CONSUMPTION, CENTRAL AMERICA AND PANAMA
 1960-1980

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 8 | -8 | 5 | 41 | -24 | -8 | 14 |
| 2 1961 | 2 | -28 | 29 | -5 | -19 | 4 | -17 |
| 3 1962 | 2 | 30 | 21 | 6 | -23 | -12 | 24 |
| 4 1963 | -5 | 7 | 12 | -4 | -9 | 0 | 1 |
| 5 1964 | -3 | 20 | 43 | -77 | 5 | 5 | -7 |
| 6 1965 | -8 | 20 | 19 | -55 | 9 | 21 | 6 |
| 7 1966 | -9 | 22 | -77 | -20 | 8 | 6 | -70 |
| 8 1967 | -4 | -35 | -14 | 11 | 30 | 7 | -5 |
| 9 1968 | 7 | -2 | -7 | 130 | 26 | 14 | 168 |
| 10 1969 | 4 | -23 | 46 | 25 | 39 | 5 | 96 |
| 11 1970 | -2 | -32 | -2 | 1 | -18 | -2 | -55 |
| 12 1971 | 9 | 5 | -24 | 2 | 32 | -23 | 1 |
| 13 1972 | 7 | -49 | -36 | -37 | -6 | -14 | -135 |
| 14 1973 | 2 | 76 | -58 | 8 | 26 | -17 | 37 |
| 15 1974 | -14 | 0 | -102 | -7 | 27 | 1 | -95 |
| 16 1975 | 10 | 0 | -66 | -15 | 1 | -6 | -76 |
| 17 1976 | -24 | -25 | -19 | -29 | -7 | -11 | -115 |
| 18 1977 | 10 | -6 | -113 | -24 | -10 | -7 | -150 |
| 19 1978 | -7 | 18 | 104 | 7 | -26 | -6 | 90 |
| 20 1979 | 6 | 12 | 120 | 15 | -40 | 18 | 131 |
| 21 1980 | 8 | -2 | 129 | 25 | -28 | 25 | 157 |

SOURCE:
 FIGURES IN TABLE 7 MULTIPLIED BY FIGURES IN TABLE 3.

TABLE 8, RICE ONLY.
 DEVIATIONS BETWEEN ACTUAL AND ESTIMATED CONSUMPTION, CENTRAL AMERICA AND PANAMA
 1960-1980

| (1000 METRIC TCNS, MILLED RICE EQUIVALENT) | | | | | | | |
|--|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 3 | 0 | 0 | 4 | -4 | -9 | -6 |
| 2 1961 | 2 | -3 | -3 | 5 | -9 | -3 | -11 |
| 3 1962 | 3 | -1 | 0 | 5 | -7 | -4 | -4 |
| 4 1963 | -5 | -7 | 1 | 5 | 3 | -6 | -9 |
| 5 1964 | -4 | -1 | -1 | 2 | 5 | -1 | 0 |
| 6 1965 | 3 | 0 | -6 | -7 | 7 | 10 | 7 |
| 7 1966 | 0 | -2 | -2 | -3 | 14 | 3 | 10 |
| 8 1967 | 1 | 5 | -3 | -4 | 16 | 8 | 23 |
| 9 1968 | -9 | 16 | -2 | -7 | 8 | 13 | 19 |
| 10 1969 | 16 | 4 | -2 | -4 | -20 | 12 | 6 |
| 11 1970 | 4 | 0 | -7 | -5 | -4 | 11 | -1 |
| 12 1971 | -17 | 7 | 11 | -7 | 2 | -5 | -9 |
| 13 1972 | 7 | -8 | 16 | -6 | -4 | -14 | -9 |
| 14 1973 | -21 | 5 | 19 | -3 | -5 | -5 | -10 |
| 15 1974 | -3 | -5 | 8 | -5 | 2 | 8 | 5 |
| 16 1975 | -2 | -5 | 12 | 12 | 3 | 2 | 22 |
| 17 1976 | 27 | -5 | -10 | 1 | 1 | -6 | 8 |
| 18 1977 | 5 | -4 | -4 | 3 | -14 | -8 | -22 |
| 19 1978 | 3 | 1 | -19 | 5 | 1 | -7 | -16 |
| 20 1979 | -8 | 2 | -5 | 6 | -7 | -3 | -15 |
| 21 1980 | -2 | -1 | -5 | 5 | 11 | 4 | 12 |

SOURCE:
 FIGURES IN TABLE 7 MULTIPLIED BY FIGURES IN TABLE 3.

APPENDIX D

SIMULATED REQUIREMENTS FOR RESERVE TRANSACTIONS
(Tables 9, 9', 10, 15, 16, All in Units of 1000 MT of Whole Grain)

| | | Page |
|----|---|------|
| 1. | Simulated Requirements with Historical Imports | |
| | Table 9, Corn Only. Computed Allowable Variation in Supply, Central America and Panama. | D2 |
| | Table 9, Rice Only. Computed Allowable Variation in Supply, Central America and Panama. | D3 |
| | Table 9', Corn Only. Adjusted Allowable Variation for 5-Percent Supply Stability. | D4 |
| | Table 9', Rice Only. Adjusted Allowable Variation for 5-Percent Supply Stability. | D5 |
| | Table 10, Corn Only. Needed Transactions with Reserves for 5-Percent Supply Stability. | D6 |
| | Table 10, Rice Only. Needed Transactions with Reserves for 5-Percent Supply Stability. | D7 |
| 2. | Simulated Requirements with Import Adjustments | |
| | Table 15, Corn Only. Computed Annual Net Import Adjustments by Central American Country and Panama Using Historical Imports. | D8 |
| | Table 15, Rice Only. Computed Annual Net Import Adjustments by Central American Country and Panama Using Historical Imports. | D9 |
| | Table 16, Corn Only. Needed Transactions with Reserves After Import Adjustments by Central American Country and Panama Assuming Import Adjustments. | D10 |
| | Table 16, Rice Only. Needed Transactions with Reserves After Import Adjustments by Central American Country and Panama Assuming Import Adjustments. | D11 |

TABLE 9, CORN ONLY.
COMPUTED ALLOWABLE VARIATION IN SUPPLY, CENTRAL AMERICA AND PANAMA, 1960-1980.

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 3 | 9 | 23 | 11 | 7 | 3 | 56 |
| 2 1961 | 3 | 9 | 24 | 12 | 7 | 3 | 58 |
| 3 1962 | 3 | 10 | 25 | 12 | 7 | 4 | 61 |
| 4 1963 | 3 | 10 | 26 | 12 | 7 | 4 | 62 |
| 5 1964 | 3 | 11 | 27 | 12 | 7 | 4 | 64 |
| 6 1965 | 4 | 11 | 28 | 13 | 7 | 4 | 67 |
| 7 1966 | 4 | 12 | 29 | 13 | 8 | 4 | 70 |
| 8 1967 | 4 | 12 | 30 | 13 | 8 | 4 | 71 |
| 9 1968 | 4 | 13 | 31 | 13 | 8 | 4 | 73 |
| 10 1969 | 4 | 14 | 32 | 14 | 8 | 4 | 76 |
| 11 1970 | 4 | 15 | 34 | 14 | 9 | 4 | 80 |
| 12 1971 | 4 | 16 | 35 | 15 | 9 | 4 | 83 |
| 13 1972 | 4 | 16 | 37 | 15 | 9 | 4 | 85 |
| 14 1973 | 4 | 17 | 38 | 15 | 9 | 4 | 87 |
| 15 1974 | 4 | 18 | 39 | 16 | 10 | 4 | 91 |
| 16 1975 | 4 | 19 | 41 | 16 | 10 | 4 | 94 |
| 17 1976 | 4 | 20 | 43 | 16 | 10 | 4 | 97 |
| 18 1977 | 4 | 20 | 44 | 17 | 11 | 4 | 100 |
| 19 1978 | 4 | 21 | 46 | 17 | 11 | 4 | 103 |
| 20 1979 | 4 | 22 | 48 | 18 | 11 | 4 | 107 |
| 21 1980 | 4 | 23 | 50 | 18 | 12 | 4 | 111 |

SOURCE:

FIGURES IN TABLE 6: DIFFERENCE BETWEEN FIGURES IN TABLE 2 AND 8.

FIGURES IN TABLE 9: FIGURES IN TABLE 6 MULTIPLIED BY 5%.

TABLE 9, RICE ONLY.
COMPUTED ALLOWABLE VARIATION IN SUPPLY, CENTRAL AMERICA AND PANAMA, 1960-1980.

| (1000 METRIC TONS, MILLED RICE EQUIVALENT) | | | | | | | |
|--|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 2 | 1 | 0 | 0 | 2 | 4 | 9 |
| 2 1961 | 2 | 1 | 1 | 1 | 2 | 4 | 11 |
| 3 1962 | 2 | 1 | 1 | 1 | 2 | 4 | 11 |
| 4 1963 | 2 | 1 | 1 | 1 | 2 | 4 | 11 |
| 5 1964 | 2 | 1 | 1 | 1 | 2 | 4 | 11 |
| 6 1965 | 3 | 1 | 1 | 1 | 2 | 4 | 12 |
| 7 1966 | 3 | 1 | 1 | 1 | 2 | 4 | 12 |
| 8 1967 | 3 | 1 | 1 | 1 | 2 | 5 | 13 |
| 9 1968 | 3 | 1 | 1 | 1 | 2 | 5 | 13 |
| 10 1969 | 3 | 1 | 1 | 1 | 2 | 5 | 13 |
| 11 1970 | 3 | 1 | 1 | 1 | 2 | 5 | 13 |
| 12 1971 | 3 | 1 | 1 | 1 | 2 | 5 | 13 |
| 13 1972 | 3 | 2 | 1 | 1 | 2 | 5 | 14 |
| 14 1973 | 3 | 2 | 1 | 1 | 2 | 5 | 14 |
| 15 1974 | 3 | 2 | 2 | 1 | 2 | 5 | 15 |
| 16 1975 | 4 | 2 | 2 | 1 | 3 | 5 | 17 |
| 17 1976 | 4 | 2 | 2 | 1 | 3 | 6 | 18 |
| 18 1977 | 4 | 2 | 2 | 1 | 3 | 6 | 18 |
| 19 1978 | 4 | 2 | 2 | 2 | 3 | 6 | 19 |
| 20 1979 | 4 | 2 | 2 | 2 | 3 | 6 | 19 |
| 21 1980 | 4 | 2 | 2 | 2 | 3 | 6 | 19 |

SOURCE:

FIGURES IN TABLE 6: DIFFERENCE BETWEEN FIGURES IN TABLE 2 AND 8.

FIGURES IN TABLE 9: FIGURES IN TABLE 6 MULTIPLIED BY 5%.

TABLE 9', CORN ONLY.
ADJUSTED ALLOWABLE VARIATION FOR 5 PERCENT SUPPLY STABILITY

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960 | 3 | -8 | 5 | 11 | -7 | -3 |
| 2 1961 | 2 | -9 | 24 | -5 | -7 | 3 |
| 3 1962 | 2 | 10 | 21 | 6 | -7 | -4 |
| 4 1963 | -3 | 7 | 12 | -4 | -7 | 0 |
| 5 1964 | -3 | 11 | 27 | -12 | 5 | 4 |
| 6 1965 | -4 | 11 | 19 | -13 | 7 | 4 |
| 7 1966 | -4 | 12 | -29 | -13 | 8 | 4 |
| 8 1967 | -4 | -12 | -14 | 11 | 8 | 4 |
| 9 1968 | 4 | -2 | -7 | 13 | 8 | 4 |
| 10 1969 | 4 | -14 | 32 | 14 | 8 | 4 |
| 11 1970 | -2 | -15 | -2 | 1 | -9 | -2 |
| 12 1971 | 4 | 5 | -24 | 2 | 9 | -4 |
| 13 1972 | 4 | -16 | -36 | -15 | -6 | -4 |
| 14 1973 | 2 | 17 | -38 | 8 | 9 | -4 |
| 15 1974 | -4 | 0 | -39 | -7 | 10 | 1 |
| 16 1975 | 4 | 0 | -41 | -15 | 1 | -4 |
| 17 1976 | -4 | -20 | -19 | -16 | -7 | -4 |
| 18 1977 | 4 | -6 | -44 | -17 | -10 | -4 |
| 19 1978 | -4 | 18 | 46 | 7 | -11 | -4 |
| 20 1979 | 4 | 12 | 48 | 15 | -11 | 4 |
| 21 1980 | 4 | -2 | 50 | 18 | -12 | 4 |

SOURCE:

SMALLER OF THE ABSOLUTE VALUES IN TABLES 8 AND 9, WITH THE DIFFERENCE
GIVEN THE SIGN FROM TABLE 8.

TABLE 9', RICE ONLY.
ADJUSTED ALLOWABLE VARIATION FOR 5 PERCENT SUPPLY STABILITY

| (1000 METRIC TONS, MILLED RICE EQUIVALENT) | | | | | | |
|--|---------------|----------------|-----------|----------|-----------|--------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960 | 2 | 0 | 0 | 0 | -2 | -4 |
| 2 1961 | 2 | -1 | -1 | 1 | -2 | -3 |
| 3 1962 | 2 | -1 | 0 | 1 | -2 | -4 |
| 4 1963 | -2 | -1 | 1 | 1 | 2 | -4 |
| 5 1964 | -2 | -1 | -1 | 1 | 2 | -1 |
| 6 1965 | 3 | 0 | -1 | -1 | 2 | 4 |
| 7 1966 | 0 | -1 | -1 | -1 | 2 | 3 |
| 8 1967 | 1 | 1 | -1 | -1 | 2 | 5 |
| 9 1968 | -3 | 1 | -1 | -1 | 2 | 5 |
| 10 1969 | 3 | 1 | -1 | -1 | -2 | 5 |
| 11 1970 | 3 | 0 | -1 | -1 | -2 | 5 |
| 12 1971 | -3 | 1 | 1 | -1 | 2 | -5 |
| 13 1972 | 3 | -2 | 1 | -1 | -2 | -5 |
| 14 1973 | -3 | 2 | 1 | -1 | -2 | -5 |
| 15 1974 | -3 | -2 | 2 | -1 | 2 | 5 |
| 16 1975 | -2 | -2 | 2 | 1 | 3 | 2 |
| 17 1976 | 4 | -2 | -2 | 1 | 1 | -6 |
| 18 1977 | 4 | -2 | -2 | 1 | -3 | -6 |
| 19 1978 | 3 | 1 | -2 | 2 | 1 | -6 |
| 20 1979 | -4 | 2 | -2 | 2 | -3 | -3 |
| 21 1980 | -2 | -1 | -2 | 2 | 3 | 4 |

SOURCE:

SMALLER OF THE ABSOLUTE VALUES IN TABLES 8 AND 9, WITH THE DIFFERENCE GIVEN THE SIGN FROM TABLE 8.

TABLE 10, CORN ONLY.
NEEDED TRANSACTIONS WITH RESERVES FOR 5-PERCENT SUPPLY STABILITY

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960 | 5 | 0 | 0 | 30 | -17 | -5 |
| 2 1961 | 0 | -19 | 5 | 0 | -12 | 1 |
| 3 1962 | 0 | 20 | 0 | 0 | -16 | -8 |
| 4 1963 | -2 | 0 | 0 | 0 | -2 | 0 |
| 5 1964 | 0 | 9 | 16 | -65 | 0 | 1 |
| 6 1965 | -4 | 9 | 0 | -42 | 2 | 17 |
| 7 1966 | -5 | 10 | -48 | -7 | 0 | 2 |
| 8 1967 | 0 | -23 | 0 | 0 | 22 | 3 |
| 9 1968 | 3 | 0 | 0 | 117 | 18 | 10 |
| 10 1969 | 0 | -9 | 14 | 11 | 31 | 1 |
| 11 1970 | 0 | -17 | 0 | 0 | -9 | 0 |
| 12 1971 | 5 | 0 | 0 | 0 | 23 | -19 |
| 13 1972 | 3 | -33 | 0 | -22 | 0 | -10 |
| 14 1973 | 0 | 59 | -20 | 0 | 17 | -13 |
| 15 1974 | -10 | 0 | -63 | 0 | 17 | 0 |
| 16 1975 | 6 | 0 | -25 | 0 | 0 | -2 |
| 17 1976 | -20 | -5 | 0 | -13 | 0 | -7 |
| 18 1977 | 6 | 0 | -69 | -7 | 0 | -3 |
| 19 1978 | -3 | 0 | 58 | 0 | -15 | -2 |
| 20 1979 | 2 | 0 | 72 | 0 | -29 | 14 |
| 21 1980 | 4 | 0 | 79 | 7 | -16 | 21 |

SOURCE:
FIGURES IN TABLE 8 MINUS FIGURES IN TABLE 9*.

TABLE 10, RICE ONLY.
NEEDED TRANSACTIONS WITH RESERVES FOR 5-PERCENT SUPPLY STABILITY

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960 | 2 | 0 | 0 | 6 | -3 | -8 |
| 2 1961 | 0 | -3 | -3 | 6 | -11 | 0 |
| 3 1962 | 2 | 0 | 0 | 6 | -8 | 0 |
| 4 1963 | -5 | -9 | 0 | 6 | 2 | -3 |
| 5 1964 | -3 | 0 | 0 | 2 | 5 | 0 |
| 6 1965 | 0 | 0 | -8 | -10 | 8 | 9 |
| 7 1966 | 0 | -2 | -2 | -3 | 19 | 0 |
| 8 1967 | 0 | 6 | -3 | -5 | 22 | 5 |
| 9 1968 | -10 | 23 | -2 | -10 | 10 | 12 |
| 10 1969 | 21 | 5 | -2 | -5 | -29 | 11 |
| 11 1970 | 2 | 0 | -9 | -6 | -3 | 9 |
| 12 1971 | -22 | 9 | 15 | -10 | 0 | 0 |
| 13 1972 | 6 | -9 | 23 | -8 | -3 | -14 |
| 14 1973 | -29 | 5 | 27 | -3 | -5 | 0 |
| 15 1974 | 0 | -5 | 9 | -6 | 0 | 5 |
| 16 1975 | 0 | -5 | 15 | 17 | 0 | 0 |
| 17 1976 | 37 | -5 | -12 | 0 | 0 | 0 |
| 18 1977 | 2 | -3 | -3 | 3 | -17 | -3 |
| 19 1978 | 0 | 0 | -26 | 5 | 0 | -2 |
| 20 1979 | -6 | 0 | -5 | 6 | -6 | 0 |
| 21 1980 | 0 | 0 | -5 | 5 | 13 | 0 |

SOURCE:
RATES(%): 62.5 65 66 63 63 65
FIGURES IN TABLE 10 MILLED RICE DIVIDED BY MILLING RATES.

TABLE 15. COMPUTED ANNUAL NET IMPORT ADJUSTMENTS FOR CORN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | -3 | 0 | 0 | -15 | 9 | 3 | -6 |
| 2 1961 | -1 | 10 | -3 | -8 | 10 | 1 | 9 |
| 3 1962 | 1 | -5 | -1 | 4 | 9 | 3 | 11 |
| 4 1963 | 1 | -7 | 1 | -2 | 5 | 2 | 0 |
| 5 1964 | 1 | -1 | -8 | 33 | -1 | -2 | 22 |
| 6 1965 | 2 | -9 | -4 | 37 | 0 | -8 | 18 |
| 7 1966 | 4 | -5 | 26 | 6 | -1 | -5 | 25 |
| 8 1967 | 1 | 9 | 11 | 0 | -11 | 0 | 10 |
| 9 1968 | -2 | 7 | -6 | -59 | -15 | -7 | -82 |
| 10 1969 | -1 | 1 | -4 | -35 | -17 | -2 | -58 |
| 11 1970 | 0 | 12 | -5 | 12 | -2 | 1 | 18 |
| 12 1971 | -3 | 2 | 2 | -6 | -6 | 9 | -2 |
| 13 1972 | -3 | 15 | -1 | 14 | -9 | 10 | 26 |
| 14 1973 | 0 | -21 | 11 | 4 | -4 | 7 | -3 |
| 15 1974 | 5 | -19 | 36 | -2 | -15 | 3 | 8 |
| 16 1975 | -1 | 10 | 26 | 1 | -1 | -1 | 34 |
| 17 1976 | 7 | -2 | 0 | 6 | 1 | 5 | 17 |
| 18 1977 | 3 | 4 | 35 | 7 | 0 | 3 | 52 |
| 19 1978 | -3 | -2 | -12 | 0 | 8 | 1 | -8 |
| 20 1979 | 2 | 1 | -59 | 0 | 18 | -7 | -45 |
| 21 1980 | -4 | 0 | -46 | -4 | 13 | -14 | -55 |

SOURCE:

BASED ON TABLE 10, ASSUMING 50 PERCENT IMPORT (EXPORT) ADJUSTMENT EFFECTIVE
CURRENT YEAR AND REMAINDER THE FOLLOWING YEAR.

TABLE 15. COMPUTED ANNUAL NET IMPORT ADJUSTMENTS FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | -1 | 0 | 0 | -3 | 2 | 4 | 2 |
| 2 1961 | -1 | 2 | 2 | -5 | 6 | 2 | 6 |
| 3 1962 | -1 | 1 | 1 | -4 | 6 | -1 | 2 |
| 4 1963 | 2 | 4 | 0 | -4 | 0 | 2 | 4 |
| 5 1964 | 3 | 2 | 0 | -2 | -3 | 1 | 1 |
| 6 1965 | 0 | -1 | 4 | 5 | -1 | -5 | 2 |
| 7 1966 | 0 | 2 | 3 | 4 | -9 | -2 | -2 |
| 8 1967 | 0 | -3 | 1 | 2 | -16 | -1 | -17 |
| 9 1968 | 5 | -13 | 2 | 7 | -8 | -8 | -15 |
| 10 1969 | -8 | -7 | 1 | 4 | 14 | -8 | -4 |
| 11 1970 | -7 | 1 | 5 | 3 | 9 | -6 | 5 |
| 12 1971 | 14 | -5 | -6 | 6 | -3 | -1 | 5 |
| 13 1972 | 1 | 3 | -16 | 6 | 3 | 8 | 5 |
| 14 1973 | 11 | 1 | -17 | 3 | 2 | 3 | 3 |
| 15 1974 | 9 | 0 | -10 | 3 | 1 | -4 | -1 |
| 16 1975 | -5 | 5 | -7 | -7 | -1 | 0 | -15 |
| 17 1976 | -16 | 2 | 2 | -5 | 0 | 0 | -17 |
| 18 1977 | -11 | 3 | 6 | 1 | 8 | 1 | 8 |
| 19 1978 | 5 | 0 | 11 | -4 | 4 | 2 | 18 |
| 20 1979 | 1 | 0 | 10 | -3 | 1 | 0 | 9 |
| 21 1980 | 3 | 0 | 0 | -4 | -4 | 0 | -5 |

SOURCE:

BASED ON TABLE 10, ASSUMING 50 PERCENT IMPORT (EXPORT) ADJUSTMENT EFFECTIVE
CURRENT YEAR AND REMAINDER THE FOLLOWING YEAR.

TABLE 16. NEEDED TRANSACTIONS WITH RESERVES AFTER IMPORT ADJUSTMENTS FOR CORN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING IMPORT ADJUSTMENTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 2 | 0 | 0 | 15 | -8 | -2 | 7 |
| 2 1961 | -1 | -9 | 2 | -8 | -2 | 2 | -16 |
| 3 1962 | 1 | 15 | -1 | 4 | -7 | -5 | 7 |
| 4 1963 | -1 | -7 | 1 | -2 | 3 | 2 | -4 |
| 5 1964 | 1 | 8 | 8 | -32 | -1 | -1 | -17 |
| 6 1965 | -2 | 0 | -4 | -5 | 2 | 9 | 0 |
| 7 1966 | -1 | 5 | -22 | -1 | -1 | -3 | -23 |
| 8 1967 | 1 | -14 | 11 | 0 | 11 | 3 | 12 |
| 9 1968 | 1 | 7 | -6 | 58 | 3 | 3 | 66 |
| 10 1969 | -1 | -8 | 10 | -24 | 14 | -1 | -10 |
| 11 1970 | 0 | -5 | -5 | 12 | -11 | 1 | -8 |
| 12 1971 | 2 | 2 | 2 | -6 | 17 | -10 | 7 |
| 13 1972 | 0 | -18 | -1 | -8 | -9 | 0 | -36 |
| 14 1973 | 0 | 38 | -9 | 4 | 13 | -6 | 40 |
| 15 1974 | -5 | -19 | -27 | -2 | 2 | 3 | -48 |
| 16 1975 | 5 | 10 | 1 | 1 | -1 | -3 | 13 |
| 17 1976 | -13 | -7 | 0 | -7 | 1 | -2 | -28 |
| 18 1977 | 9 | 4 | -34 | 0 | 0 | 0 | -21 |
| 19 1978 | -6 | -2 | 46 | 0 | -7 | -1 | 30 |
| 20 1979 | 4 | 1 | 13 | 0 | -11 | 7 | 14 |
| 21 1980 | 0 | 0 | 33 | 3 | -3 | 7 | 40 |

SOURCE:
FIGURES FROM TABLE 10 PLUS THOSE IN TABLE 15.

TABLE 16. NEEDED TRANSACTIONS WITH RESERVES AFTER IMPORT ADJUSTMENTS FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING IMPORT ADJUSTMENTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 1 | 0 | 0 | 3 | -1 | -4 | -1 |
| 2 1961 | -1 | -1 | -1 | 1 | -5 | 2 | -5 |
| 3 1962 | 1 | 1 | 1 | 2 | -2 | -1 | 2 |
| 4 1963 | -3 | -5 | 0 | 2 | 2 | -1 | -5 |
| 5 1964 | 0 | 2 | 0 | 0 | 2 | 1 | 5 |
| 6 1965 | 0 | -1 | -4 | -5 | 7 | 4 | 1 |
| 7 1966 | 0 | 0 | 1 | 1 | 10 | -2 | 10 |
| 8 1967 | 0 | 3 | -2 | -3 | 6 | 4 | 8 |
| 9 1968 | -5 | 10 | 0 | -3 | 2 | 4 | 8 |
| 10 1969 | 13 | -2 | -1 | -1 | -15 | 3 | -3 |
| 11 1970 | -5 | 1 | -4 | -3 | 6 | 3 | -2 |
| 12 1971 | -8 | 4 | 9 | -4 | -3 | -1 | -3 |
| 13 1972 | 7 | -6 | 7 | -2 | 0 | -6 | 0 |
| 14 1973 | -18 | 6 | 10 | 0 | -3 | 3 | -2 |
| 15 1974 | 9 | -5 | -1 | -3 | 1 | 1 | 2 |
| 16 1975 | -5 | 0 | 8 | 10 | -1 | 0 | 12 |
| 17 1976 | 21 | -3 | -10 | -5 | 0 | 0 | 3 |
| 18 1977 | -9 | 0 | 3 | 4 | -9 | -2 | -13 |
| 19 1978 | 5 | 0 | -15 | 1 | 4 | 0 | -5 |
| 20 1979 | -5 | 0 | 5 | 3 | -5 | 0 | -2 |
| 21 1980 | 3 | 0 | -5 | 1 | 9 | 0 | 8 |

SOURCE:

FIGURES FROM TABLE 10 PLUS THOSE IN TABLE 15.

APPENDIX E

SIMULATED TRANSACTIONS WITH SECURITY RESERVES
(Tables 11, 13, 17, 19, All in Units of 1000 MT of Whole Grain)

| | Page |
|--|------|
| 1. Corn Reserve Transactions | |
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| 2. Rice Reserve Transactions | |
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TABLE 11. COMPUTED ANNUAL TRANSACTIONS WITH IN-COUNTRY RESERVES FOR CORN ONLY BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 0 | 0 | 0 | 0 | -17 | -5 | -22 |
| 2 1961 | 0 | -17 | 1 | 0 | -1 | 1 | -16 |
| 3 1962 | 0 | 19 | 0 | 0 | 0 | -7 | 12 |
| 4 1963 | -2 | 0 | 0 | 0 | 0 | 0 | -2 |
| 5 1964 | 0 | 2 | 5 | -36 | 0 | 1 | -28 |
| 6 1965 | -4 | 1 | 0 | 0 | 2 | 11 | 10 |
| 7 1966 | -1 | 1 | -46 | 0 | 0 | 0 | -46 |
| 8 1967 | 0 | -23 | 0 | 0 | 20 | 0 | -3 |
| 9 1968 | 3 | 0 | 0 | 43 | 0 | 0 | 46 |
| 10 1969 | 0 | 0 | 14 | 1 | 1 | 0 | 16 |
| 11 1970 | 0 | 0 | 0 | 0 | -9 | 0 | -9 |
| 12 1971 | 5 | 0 | 0 | 0 | 10 | -12 | 3 |
| 13 1972 | 1 | 0 | 0 | -22 | 0 | 0 | -21 |
| 14 1973 | 0 | 33 | -14 | 0 | 2 | 0 | 21 |
| 15 1974 | -9 | 0 | 0 | 0 | 1 | 0 | -8 |
| 16 1975 | 6 | 0 | 0 | 0 | 0 | 0 | 6 |
| 17 1976 | -6 | -5 | 0 | -13 | 0 | 0 | -24 |
| 18 1977 | 6 | 0 | 0 | -7 | 0 | 0 | -1 |
| 19 1978 | -3 | 0 | 58 | 0 | -15 | 0 | 40 |
| 20 1979 | 2 | 0 | 24 | 0 | -12 | 13 | 27 |
| 21 1980 | 4 | 0 | 3 | 7 | 0 | 1 | 15 |

SOURCE:

TABLE 10 DATA, SUBJECT TO THE CONSTRAINTS THAT TABLE 12 FIGURES BE NO LESS THAN ZERO AND NO MORE THAN THE MAXIMUMS FROM TABLE 11'.

TABLE 13. COMPUTED ANNUAL TRANSACTIONS WITH REGIONAL RESERVES FOR CORN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| [1000 METRIC TONS, WHOLE CORN EQUIVALENT] | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 5 | 0 | 0 | 30 | 0 | 0 | 35 |
| 2 1961 | 0 | -2 | 4 | 0 | -11 | 0 | -9 |
| 3 1962 | 0 | 1 | 0 | 0 | -16 | -1 | -16 |
| 4 1963 | 0 | 0 | 0 | 0 | -2 | 0 | -2 |
| 5 1964 | 0 | 7 | 11 | -29 | 0 | 0 | -11 |
| 6 1965 | 0 | 8 | 0 | -42 | 0 | 6 | -28 |
| 7 1966 | -4 | 9 | -2 | -7 | 0 | 2 | -2 |
| 8 1967 | 0 | 0 | 0 | 0 | 2 | 3 | 5 |
| 9 1968 | 0 | 0 | 0 | 74 | 18 | 10 | 102 |
| 10 1969 | 0 | -9 | 0 | 10 | 30 | 1 | 32 |
| 11 1970 | 0 | -17 | 0 | 0 | 0 | 0 | -17 |
| 12 1971 | 0 | 0 | 0 | 0 | 13 | -7 | 6 |
| 13 1972 | 2 | -33 | 0 | 0 | 0 | -10 | -41 |
| 14 1973 | 0 | 26 | -6 | 0 | 15 | -13 | 22 |
| 15 1974 | -1 | 0 | -63 | 0 | 16 | 0 | -48 |
| 16 1975 | 0 | 0 | -25 | 0 | 0 | -2 | -27 |
| 17 1976 | -14 | 0 | 0 | 0 | 0 | -7 | -21 |
| 18 1977 | 0 | 0 | -69 | 0 | 0 | -3 | -72 |
| 19 1978 | 0 | 0 | 0 | 0 | 0 | -2 | -2 |
| 20 1979 | 0 | 0 | 48 | 0 | -17 | 1 | 32 |
| 21 1980 | 0 | 0 | 76 | 0 | -16 | 20 | 80 |

SOURCE:
FIGURES FROM TABLE 10 MINUS THOSE IN TABLE 11.

TABLE 17. COMPUTED ANNUAL TRANSACTIONS WITH IN-COUNTRY RESERVES FOR CORN ONLY BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING IMPORT ADJUSTMENTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 0 | 0 | 0 | 0 | -8 | -2 | -10 |
| 2 1961 | -1 | -9 | 1 | -8 | -2 | 2 | -17 |
| 3 1962 | 1 | 11 | -1 | 4 | -7 | -5 | 3 |
| 4 1963 | -1 | -7 | 1 | -2 | 3 | 2 | -4 |
| 5 1964 | 1 | 8 | 5 | -30 | -1 | -1 | -18 |
| 6 1965 | -2 | 0 | -4 | 0 | 2 | 5 | 1 |
| 7 1966 | -1 | 3 | -22 | 0 | -1 | -3 | -24 |
| 8 1967 | 1 | -14 | 11 | 0 | 11 | 3 | 12 |
| 9 1968 | 1 | 7 | -6 | 43 | 3 | 0 | 48 |
| 10 1969 | -1 | -8 | 10 | -24 | 5 | -1 | -19 |
| 11 1970 | 0 | -5 | -5 | 12 | -11 | 1 | -8 |
| 12 1971 | 2 | 2 | 2 | -6 | 12 | -10 | 2 |
| 13 1972 | 0 | -5 | -1 | -8 | -9 | 0 | -23 |
| 14 1973 | 0 | 33 | -9 | 4 | 11 | -2 | 37 |
| 15 1974 | -5 | -19 | -22 | -2 | 1 | 3 | -44 |
| 16 1975 | 5 | 10 | 1 | 1 | -1 | -3 | 13 |
| 17 1976 | -7 | -7 | 0 | -7 | 1 | 0 | -20 |
| 18 1977 | 9 | 4 | -1 | 0 | 0 | 0 | 12 |
| 19 1978 | -6 | -2 | 46 | 0 | -7 | 0 | 31 |
| 20 1979 | 4 | 1 | 13 | 0 | -11 | 7 | 14 |
| 21 1980 | 0 | 0 | 26 | 3 | -3 | 7 | 33 |

SOURCE:

TABLE 16 DATA, SUBJECT TO THE CONSTRAINTS THAT TABLE 18 FIGURES BE NO LESS THAN ZERO AND NO MORE THAN MAXIMUMS FROM TABLE 11'.

TABLE 19. COMPUTED ANNUAL TRANSACTIONS WITH REGIONAL RESERVES FOR CORN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING IMPORT ADJUSTMENTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 2 | 0 | 0 | 15 | 0 | 0 | 17 |
| 2 1961 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 3 1962 | 0 | 4 | 0 | 0 | 0 | 0 | 4 |
| 4 1963 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 1964 | 0 | 0 | 3 | -2 | 0 | 0 | 1 |
| 6 1965 | 0 | 0 | 0 | -5 | 0 | 4 | -1 |
| 7 1966 | 0 | 2 | 0 | -1 | 0 | 0 | 1 |
| 8 1967 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 1968 | 0 | 0 | 0 | 15 | 0 | 3 | 18 |
| 10 1969 | 0 | 0 | 0 | 0 | 9 | 0 | 9 |
| 11 1970 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 1971 | 0 | 0 | 0 | 0 | 5 | 0 | 5 |
| 13 1972 | 0 | -13 | 0 | 0 | 0 | 0 | -13 |
| 14 1973 | 0 | 5 | 0 | 0 | 2 | -4 | 3 |
| 15 1974 | 0 | 0 | -5 | 0 | 1 | 0 | -4 |
| 16 1975 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 1976 | -6 | 0 | 0 | 0 | 0 | -2 | -8 |
| 18 1977 | 0 | 0 | -33 | 0 | 0 | 0 | -33 |
| 19 1978 | 0 | 0 | 0 | 0 | 0 | -1 | -1 |
| 20 1979 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21 1980 | 0 | 0 | 7 | 0 | 0 | 0 | 7 |

SOURCE:
FIGURES IN TABLE 17 MINUS THOSE IN TABLE 16.

TABLE 11. COMPUTED ANNUAL TRANSACTIONS WITH IN-COUNTRY RESERVES FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 0 | 0 | 0 | 0 | -3 | -8 | -11 |
| 2 1961 | 0 | -3 | -3 | 1 | -8 | 0 | -13 |
| 3 1962 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 1963 | -5 | -3 | 0 | 0 | 2 | -2 | -8 |
| 5 1964 | -3 | 0 | 0 | 1 | 5 | 0 | 3 |
| 6 1965 | 0 | 0 | -2 | -6 | 6 | 9 | 7 |
| 7 1966 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 1967 | 0 | 6 | 0 | 0 | 1 | 3 | 10 |
| 9 1968 | -3 | 2 | 0 | 0 | 0 | 0 | -1 |
| 10 1969 | 15 | 1 | 0 | 0 | -14 | 1 | 3 |
| 11 1970 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 12 1971 | -16 | 0 | 14 | 0 | 0 | 0 | -2 |
| 13 1972 | 6 | -9 | 1 | 0 | 0 | -13 | -15 |
| 14 1973 | -6 | 5 | 1 | 0 | 0 | 0 | 0 |
| 15 1974 | 0 | -5 | 1 | 0 | 0 | 5 | 1 |
| 16 1975 | 0 | 0 | 1 | 13 | 0 | 0 | 14 |
| 17 1976 | 19 | 0 | -12 | 0 | 0 | 0 | 7 |
| 18 1977 | 0 | 0 | -3 | 1 | 0 | -3 | -5 |
| 19 1978 | 0 | 0 | -3 | 1 | 0 | -2 | -4 |
| 20 1979 | -6 | 0 | 0 | 1 | 0 | 0 | -5 |
| 21 1980 | 0 | 0 | 0 | 1 | 13 | 0 | 14 |

SOURCE:

TABLE 10 DATA, SUBJECT TO THE CONSTRAINTS THAT TABLE 12 FIGURES BE NO LESS THAN ZERO AND NO MORE THAN THE MAXIMUMS FROM TABLE 11'.

TABLE 13. COMPUTED ANNUAL TRANSACTIONS WITH REGIONAL RESERVES FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CCSTA RICA | EL SÁLVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 2 | 0 | 0 | 6 | 0 | 0 | 8 |
| 2 1961 | 0 | 0 | 0 | 5 | -3 | 0 | 2 |
| 3 1962 | 2 | 0 | 0 | 6 | -8 | 0 | 0 |
| 4 1963 | 0 | -6 | 0 | 6 | 0 | -1 | -1 |
| 5 1964 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 6 1965 | 0 | 0 | -6 | -4 | 2 | 0 | -8 |
| 7 1966 | 0 | -2 | -2 | -3 | 19 | 0 | 12 |
| 8 1967 | 0 | 0 | -3 | -5 | 21 | 2 | 15 |
| 9 1968 | -7 | 21 | -2 | -10 | 10 | 12 | 24 |
| 10 1969 | 6 | 4 | -2 | -5 | -15 | 10 | -2 |
| 11 1970 | 1 | 0 | -9 | -6 | -3 | 9 | -8 |
| 12 1971 | -6 | 9 | 1 | -10 | 0 | 0 | -6 |
| 13 1972 | 0 | 0 | 22 | -8 | -3 | -1 | 10 |
| 14 1973 | -23 | 0 | 26 | -3 | -5 | 0 | -5 |
| 15 1974 | 0 | 0 | 8 | -6 | 0 | 0 | 2 |
| 16 1975 | 0 | -5 | 14 | 4 | 0 | 0 | 13 |
| 17 1976 | 18 | -5 | 0 | 0 | 0 | 0 | 13 |
| 18 1977 | 2 | -3 | 0 | 2 | -17 | 0 | -16 |
| 19 1978 | 0 | 0 | -23 | 4 | 0 | 0 | -19 |
| 20 1979 | 0 | 0 | -5 | 5 | -6 | 0 | -6 |
| 21 1980 | 0 | 0 | -5 | 4 | 0 | 0 | -1 |

SOURCE:
FIGURES FROM TABLE 10 MINUS THOSE IN TABLE 11.

TABLE 17. COMPUTED ANNUAL TRANSACTIONS WITH IN-COUNTRY RESERVES FOR RICE ONLY BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING IMPORT ADJUSTMENTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 0 | 0 | 0 | 0 | -1 | -4 | -5 |
| 2 1961 | -1 | -1 | -1 | 1 | -5 | 2 | -5 |
| 3 1962 | 1 | 1 | 1 | 0 | -2 | -1 | 0 |
| 4 1963 | -3 | -5 | 0 | 0 | 2 | -1 | -7 |
| 5 1964 | 0 | 2 | 0 | 0 | 2 | 1 | 5 |
| 6 1965 | 0 | -1 | -4 | -5 | -1 | 4 | -7 |
| 7 1966 | 0 | 0 | 1 | 1 | 7 | -2 | 7 |
| 8 1967 | 0 | 3 | -2 | -1 | 1 | 3 | 4 |
| 9 1968 | -5 | 3 | 0 | 0 | 0 | 0 | -2 |
| 10 1969 | 12 | -2 | 0 | 0 | -14 | 1 | -3 |
| 11 1970 | -5 | 1 | 0 | 0 | 6 | 0 | 2 |
| 12 1971 | -8 | 2 | 9 | 0 | -3 | -1 | -1 |
| 13 1972 | 7 | -6 | 6 | 0 | 0 | -6 | 1 |
| 14 1973 | -9 | 6 | 1 | 0 | -3 | 3 | -2 |
| 15 1974 | 9 | -5 | -1 | 0 | 1 | 1 | 5 |
| 16 1975 | -5 | 0 | 3 | 10 | -1 | 0 | 7 |
| 17 1976 | 15 | -3 | -10 | -5 | 0 | 0 | -3 |
| 18 1977 | -9 | 0 | 3 | 4 | 0 | -2 | -4 |
| 19 1978 | 5 | 0 | -11 | 1 | 4 | 0 | -1 |
| 20 1979 | -5 | 0 | 5 | 3 | -4 | 0 | -1 |
| 21 1980 | 3 | 0 | -5 | 1 | 9 | 0 | 8 |

SOURCE:

TABLE 16 DATA, SUBJECT TO THE CONSTRAINTS THAT TABLE 18 FIGURES BE NO LESS THAN ZERO AND NO MORE THAN MAXIMUMS FROM TABLE 11'.

TABLE 19. COMPUTED ANNUAL TRANSACTIONS WITH REGIONAL RESERVES FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING IMPORT ADJUSTMENTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 1 | 0 | 0 | 3 | 0 | 0 | 4 |
| 2 1961 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 1962 | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| 4 1963 | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| 5 1964 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 1965 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 1966 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |
| 8 1967 | 0 | 0 | 0 | -2 | 5 | 1 | 4 |
| 9 1968 | 0 | 7 | 0 | -3 | 2 | 4 | 10 |
| 10 1969 | 1 | 0 | -1 | -1 | -1 | 2 | 0 |
| 11 1970 | 0 | 0 | -4 | -3 | 0 | 3 | -4 |
| 12 1971 | 0 | 2 | 0 | -4 | 0 | 0 | -2 |
| 13 1972 | 0 | 0 | 1 | -2 | 0 | 0 | -1 |
| 14 1973 | -9 | 0 | 9 | 0 | 0 | 0 | 0 |
| 15 1974 | 0 | 0 | 0 | -3 | 0 | 0 | -3 |
| 16 1975 | 0 | 0 | 5 | 0 | 0 | 0 | 5 |
| 17 1976 | 6 | 0 | 0 | 0 | 0 | 0 | 6 |
| 18 1977 | 0 | 0 | 0 | 0 | -9 | 0 | -9 |
| 19 1978 | 0 | 0 | -4 | 0 | 0 | 0 | -4 |
| 20 1979 | 0 | 0 | 0 | 0 | -1 | 0 | -1 |
| 21 1980 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

SOURCE:
FIGURES IN TABLE 17 MINUS THOSE IN TABLE 16.

APPENDIX F

STORAGE CAPACITY AND INVENTORIES FOR SECURITY RESERVES
 ASSUMING HISTORICAL IMPORTS
 (Tables 11', 12, 12', 14, 14', All in Units of 1000 MT of Whole Grain)

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|--|------|
| 1. Corn Only | |
| Table 11'. Maximum Stocks Based on Standard Deviation Applied to Supply Trend | F2 |
| Table 12. Computed Year-End Balances for In-Country Reserves by Central American Country and Panama Using Historical Imports | F3 |
| Table 12'. Required Total Storage Capacity for In-Country Reserves by Central American Country and Panama Using Historical Imports | F4 |
| Table 14. Computed Year-End Balances for Regional Reserves by Central American Country and Panama Using Historical Imports | F5 |
| Table 14'. Required Total Storage Capacity for Regional Reserves by Central American Country and Panama Using Historical Imports | F6 |
| 2. Rice Only | |
| Table 11'. Maximum Stocks Based on Standard Deviation Applied to Supply Trend | F7 |
| Table 12. Computed Year-End Balances for In-Country Reserves by Central American Country and Panama Using Historical Imports | F8 |
| Table 12'. Required Total Storage Capacity for In-Country Reserves by Central American Country and Panama Using Historical Imports | F9 |
| Table 14. Computed Year-End Balances for Regional Reserves by Central American Country and Panama Using Historical Imports | F10 |
| Table 14'. Required Total Storage Capacity for Regional Reserves by Central American Country and Panama Using Historical Imports | F11 |

TABLE 11', CORN ONLY.
 MAXIMUM STOCKS BASED ON STANDARD DEVIATION APPLIED TO SUPPLY TREND
 1960-1980

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960 | 7 | 17 | 40 | 36 | 18 | 11 |
| 2 1961 | 7 | 18 | 41 | 37 | 18 | 11 |
| 3 1962 | 7 | 19 | 43 | 38 | 19 | 11 |
| 4 1963 | 8 | 20 | 44 | 39 | 19 | 12 |
| 5 1964 | 8 | 21 | 46 | 40 | 20 | 12 |
| 6 1965 | 8 | 22 | 48 | 41 | 20 | 12 |
| 7 1966 | 8 | 23 | 50 | 42 | 21 | 12 |
| 8 1967 | 8 | 24 | 52 | 43 | 22 | 12 |
| 9 1968 | 8 | 26 | 53 | 43 | 22 | 12 |
| 10 1969 | 8 | 27 | 55 | 44 | 23 | 12 |
| 11 1970 | 9 | 29 | 58 | 47 | 23 | 12 |
| 12 1971 | 9 | 30 | 60 | 48 | 24 | 13 |
| 13 1972 | 9 | 32 | 63 | 49 | 25 | 13 |
| 14 1973 | 9 | 33 | 65 | 50 | 26 | 13 |
| 15 1974 | 9 | 35 | 68 | 51 | 27 | 13 |
| 16 1975 | 9 | 37 | 71 | 52 | 27 | 13 |
| 17 1976 | 9 | 38 | 73 | 53 | 28 | 13 |
| 18 1977 | 9 | 40 | 76 | 55 | 29 | 13 |
| 19 1978 | 9 | 42 | 79 | 56 | 30 | 13 |
| 20 1979 | 10 | 44 | 82 | 58 | 31 | 13 |
| 21 1980 | 10 | 46 | 85 | 59 | 32 | 14 |

SOURCE:

STDE (%): 11.294 9.803 8.602 16.219 13.717 16.219
 STANDARD ERRORS OF ESTIMATE (TABLE 4) APPLIED TO FIGURES IN TABLE 6.

TABLE 12. COMPUTED YEAR-END BALANCES FOR IN-COUNTRY RESERVES FOR CORN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 7 | 17 | 40 | 36 | 1 | 6 | 107 |
| 2 1961 | 7 | 0 | 41 | 36 | 0 | 7 | 91 |
| 3 1962 | 7 | 19 | 41 | 36 | 0 | 0 | 103 |
| 4 1963 | 5 | 19 | 41 | 36 | 0 | 0 | 101 |
| 5 1964 | 5 | 21 | 46 | 0 | 0 | 1 | 73 |
| 6 1965 | 1 | 22 | 46 | 0 | 2 | 12 | 83 |
| 7 1966 | 0 | 23 | 0 | 0 | 2 | 12 | 37 |
| 8 1967 | 0 | 0 | 0 | 0 | 22 | 12 | 34 |
| 9 1968 | 3 | 0 | 0 | 43 | 22 | 12 | 80 |
| 10 1969 | 3 | 0 | 14 | 44 | 23 | 12 | 96 |
| 11 1970 | 3 | 0 | 14 | 44 | 14 | 12 | 87 |
| 12 1971 | 8 | 0 | 14 | 44 | 24 | 0 | 90 |
| 13 1972 | 9 | 0 | 14 | 22 | 24 | 0 | 69 |
| 14 1973 | 9 | 33 | 0 | 22 | 26 | 0 | 90 |
| 15 1974 | 0 | 33 | 0 | 22 | 27 | 0 | 82 |
| 16 1975 | 6 | 33 | 0 | 22 | 27 | 0 | 88 |
| 17 1976 | 0 | 28 | 0 | 9 | 27 | 0 | 64 |
| 18 1977 | 6 | 28 | 0 | 2 | 27 | 0 | 63 |
| 19 1978 | 3 | 28 | 58 | 2 | 12 | 0 | 103 |
| 20 1979 | 5 | 28 | 82 | 2 | 0 | 13 | 130 |
| 21 1980 | 9 | 28 | 85 | 9 | 0 | 14 | 145 |

SOURCE:

CUMULATIVE TOTALS FROM TABLE 11, STARTING WITH BEGINNING RESERVES EQUAL TO ONE
STANDARD DEVIATION (SEE TABLE 11').

TABLE 12'. REQUIRED TOTAL STORAGE CAPACITY FOR IN-COUNTRY RESERVES FOR CCRN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 7 | 17 | 40 | 36 | 1 | 6 | 107 |
| 2 1961 | 7 | 17 | 41 | 36 | 1 | 7 | 109 |
| 3 1962 | 7 | 19 | 41 | 36 | 1 | 7 | 111 |
| 4 1963 | 7 | 19 | 41 | 36 | 1 | 7 | 111 |
| 5 1964 | 7 | 21 | 46 | 36 | 1 | 7 | 118 |
| 6 1965 | 7 | 22 | 46 | 36 | 2 | 12 | 125 |
| 7 1966 | 7 | 23 | 46 | 36 | 2 | 12 | 126 |
| 8 1967 | 7 | 23 | 46 | 36 | 22 | 12 | 146 |
| 9 1968 | 7 | 23 | 46 | 43 | 22 | 12 | 153 |
| 10 1969 | 7 | 23 | 46 | 44 | 23 | 12 | 155 |
| 11 1970 | 7 | 23 | 46 | 44 | 23 | 12 | 155 |
| 12 1971 | 8 | 23 | 46 | 44 | 24 | 12 | 157 |
| 13 1972 | 9 | 23 | 46 | 44 | 24 | 12 | 158 |
| 14 1973 | 9 | 33 | 46 | 44 | 26 | 12 | 170 |
| 15 1974 | 9 | 33 | 46 | 44 | 27 | 12 | 171 |
| 16 1975 | 9 | 33 | 46 | 44 | 27 | 12 | 171 |
| 17 1976 | 9 | 33 | 46 | 44 | 27 | 12 | 171 |
| 18 1977 | 9 | 33 | 46 | 44 | 27 | 12 | 171 |
| 19 1978 | 9 | 33 | 58 | 44 | 27 | 12 | 183 |
| 20 1979 | 9 | 33 | 82 | 44 | 27 | 13 | 208 |
| 21 1980 | 9 | 33 | 85 | 44 | 27 | 14 | 212 |

SOURCE:
BASED ON MAXIMUM BALANCES FROM TABLE 12.

TABLE 14. COMPUTED YEAR-END BALANCES FOR REGIONAL RESERVES FOR CORN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 12 | 17 | 40 | 66 | 18 | 11 | 164 |
| 2 1961 | 12 | 15 | 44 | 66 | 7 | 11 | 155 |
| 3 1962 | 12 | 16 | 44 | 66 | -9 | 10 | 139 |
| 4 1963 | 12 | 16 | 44 | 66 | -11 | 10 | 137 |
| 5 1964 | 12 | 23 | 55 | 37 | -11 | 10 | 126 |
| 6 1965 | 12 | 31 | 55 | -5 | -11 | 16 | 98 |
| 7 1966 | 8 | 40 | 53 | -12 | -11 | 18 | 96 |
| 8 1967 | 8 | 40 | 53 | -12 | -9 | 21 | 101 |
| 9 1968 | 8 | 40 | 53 | 62 | 9 | 31 | 203 |
| 10 1969 | 8 | 31 | 53 | 72 | 39 | 32 | 235 |
| 11 1970 | 8 | 14 | 53 | 72 | 39 | 32 | 218 |
| 12 1971 | 8 | 14 | 53 | 72 | 52 | 25 | 224 |
| 13 1972 | 10 | -19 | 53 | 72 | 52 | 15 | 183 |
| 14 1973 | 10 | 7 | 47 | 72 | 67 | 2 | 205 |
| 15 1974 | 9 | 7 | -16 | 72 | 83 | 2 | 157 |
| 16 1975 | 9 | 7 | -41 | 72 | 83 | 0 | 130 |
| 17 1976 | -5 | 7 | -41 | 72 | 83 | -7 | 109 |
| 18 1977 | -5 | 7 | -110 | 72 | 83 | -10 | 37 |
| 19 1978 | -5 | 7 | -110 | 72 | 83 | -12 | 35 |
| 20 1979 | -5 | 7 | -62 | 72 | 66 | -11 | 67 |
| 21 1980 | -5 | 7 | 14 | 72 | 50 | 9 | 147 |

SOURCE:

CUMULATIVE TOTALS FROM TABLE 13 STARTING WITH BEGINNING RESERVES EQUAL TO ONE
STANDARD DEVIATION (SEE TABLE 11').

TABLE 14^a. REQUIRED TOTAL STORAGE CAPACITY FOR REGIONAL RESERVES FOR CORN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 12 | 17 | 40 | 66 | 18 | 11 | 164 |
| 2 1961 | 12 | 17 | 44 | 66 | 18 | 11 | 168 |
| 3 1962 | 12 | 17 | 44 | 66 | 18 | 11 | 168 |
| 4 1963 | 12 | 17 | 44 | 66 | 18 | 11 | 168 |
| 5 1964 | 12 | 23 | 55 | 66 | 18 | 11 | 185 |
| 6 1965 | 12 | 31 | 55 | 66 | 18 | 16 | 198 |
| 7 1966 | 12 | 40 | 55 | 66 | 18 | 18 | 209 |
| 8 1967 | 12 | 40 | 55 | 66 | 18 | 21 | 212 |
| 9 1968 | 12 | 40 | 55 | 66 | 18 | 31 | 222 |
| 10 1969 | 12 | 40 | 55 | 72 | 39 | 32 | 250 |
| 11 1970 | 12 | 40 | 55 | 72 | 39 | 32 | 250 |
| 12 1971 | 12 | 40 | 55 | 72 | 52 | 32 | 263 |
| 13 1972 | 12 | 40 | 55 | 72 | 52 | 32 | 263 |
| 14 1973 | 12 | 40 | 55 | 72 | 67 | 32 | 278 |
| 15 1974 | 12 | 40 | 55 | 72 | 83 | 32 | 294 |
| 16 1975 | 12 | 40 | 55 | 72 | 83 | 32 | 294 |
| 17 1976 | 12 | 40 | 55 | 72 | 83 | 32 | 294 |
| 18 1977 | 12 | 40 | 55 | 72 | 83 | 32 | 294 |
| 19 1978 | 12 | 40 | 55 | 72 | 83 | 32 | 294 |
| 20 1979 | 12 | 40 | 55 | 72 | 83 | 32 | 294 |
| 21 1980 | 12 | 40 | 55 | 72 | 83 | 32 | 294 |

SOURCE:
BASED ON MAXIMUM BALANCES FROM TABLE 14.

TABLE 11', RICE ONLY.
 MAXIMUM STOCKS BASED ON STANDARD DEVIATION APPLIED TO SUPPLY TREND
 1960-1980

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA |
| 1 1960 | 11 | 6 | 5 | 4 | 11 | 10 |
| 2 1961 | 11 | 6 | 6 | 5 | 11 | 10 |
| 3 1962 | 11 | 6 | 6 | 5 | 12 | 11 |
| 4 1963 | 12 | 7 | 7 | 5 | 12 | 11 |
| 5 1964 | 13 | 7 | 8 | 6 | 12 | 11 |
| 6 1965 | 13 | 7 | 8 | 7 | 13 | 11 |
| 7 1966 | 13 | 8 | 9 | 7 | 13 | 12 |
| 8 1967 | 14 | 8 | 10 | 7 | 14 | 12 |
| 9 1968 | 15 | 8 | 11 | 8 | 14 | 12 |
| 10 1969 | 15 | 9 | 11 | 8 | 14 | 13 |
| 11 1970 | 16 | 9 | 12 | 9 | 15 | 13 |
| 12 1971 | 16 | 9 | 14 | 10 | 16 | 13 |
| 13 1972 | 17 | 10 | 15 | 10 | 16 | 13 |
| 14 1973 | 17 | 10 | 16 | 12 | 17 | 14 |
| 15 1974 | 18 | 11 | 17 | 12 | 17 | 14 |
| 16 1975 | 19 | 11 | 18 | 13 | 18 | 14 |
| 17 1976 | 19 | 11 | 20 | 13 | 19 | 15 |
| 18 1977 | 19 | 12 | 21 | 14 | 19 | 15 |
| 19 1978 | 20 | 12 | 22 | 15 | 20 | 15 |
| 20 1979 | 21 | 13 | 23 | 16 | 21 | 16 |
| 21 1980 | 21 | 13 | 25 | 17 | 22 | 16 |

SOURCE:

SIDE (%): 16.241 21.712 37.602 31.218 22.256 8.637

STANDARD ERRORS OF ESTIMATE (TABLE 4) APPLIED TO FIGURES IN TABLE 6 PADDY RICE.

TABLE 12. COMPUTED YEAR-END BALANCES FOR IN-COUNTRY RESERVES FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 11 | 6 | 5 | 4 | 8 | 2 | 36 |
| 2 1961 | 11 | 3 | 2 | 5 | 0 | 2 | 23 |
| 3 1962 | 11 | 3 | 2 | 5 | 0 | 2 | 23 |
| 4 1963 | 6 | 0 | 2 | 5 | 2 | 0 | 15 |
| 5 1964 | 3 | 0 | 2 | 6 | 7 | 0 | 18 |
| 6 1965 | 3 | 0 | 0 | 0 | 13 | 9 | 25 |
| 7 1966 | 3 | 0 | 0 | 0 | 13 | 9 | 25 |
| 8 1967 | 3 | 6 | 0 | 0 | 14 | 12 | 35 |
| 9 1968 | 0 | 8 | 0 | 0 | 14 | 12 | 34 |
| 10 1969 | 15 | 9 | 0 | 0 | 0 | 13 | 37 |
| 11 1970 | 16 | 9 | 0 | 0 | 0 | 13 | 38 |
| 12 1971 | 0 | 9 | 14 | 0 | 0 | 13 | 36 |
| 13 1972 | 6 | 0 | 15 | 0 | 0 | 0 | 21 |
| 14 1973 | 0 | 5 | 16 | 0 | 0 | 0 | 21 |
| 15 1974 | 0 | 0 | 17 | 0 | 0 | 5 | 22 |
| 16 1975 | 0 | 0 | 18 | 13 | 0 | 5 | 36 |
| 17 1976 | 19 | 0 | 6 | 13 | 0 | 5 | 43 |
| 18 1977 | 19 | 0 | 3 | 14 | 0 | 2 | 38 |
| 19 1978 | 19 | 0 | 0 | 15 | 0 | 0 | 34 |
| 20 1979 | 13 | 0 | 0 | 16 | 0 | 0 | 29 |
| 21 1980 | 13 | 0 | 0 | 17 | 13 | 0 | 43 |

SOURCE:
CUMULATIVE TOTALS FROM TABLE 11, STARTING WITH BEGINNING RESERVES EQUAL TO ONE
STANDARD DEVIATION (SEE TABLE 11').

TABLE 12'. REQUIRED TOTAL STORAGE CAPACITY FOR IN-COUNTRY RESERVES FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 11 | 6 | 5 | 4 | 8 | 2 | 36 |
| 2 1961 | 11 | 6 | 5 | 5 | 8 | 2 | 37 |
| 3 1962 | 11 | 6 | 5 | 5 | 8 | 2 | 37 |
| 4 1963 | 11 | 6 | 5 | 5 | 8 | 2 | 37 |
| 5 1964 | 11 | 6 | 5 | 6 | 8 | 2 | 38 |
| 6 1965 | 11 | 6 | 5 | 6 | 13 | 9 | 50 |
| 7 1966 | 11 | 6 | 5 | 6 | 13 | 9 | 50 |
| 8 1967 | 11 | 6 | 5 | 6 | 14 | 12 | 54 |
| 9 1968 | 11 | 8 | 5 | 6 | 14 | 12 | 56 |
| 10 1969 | 15 | 9 | 5 | 6 | 14 | 13 | 62 |
| 11 1970 | 16 | 9 | 5 | 6 | 14 | 13 | 63 |
| 12 1971 | 16 | 9 | 14 | 6 | 14 | 13 | 72 |
| 13 1972 | 16 | 9 | 15 | 6 | 14 | 13 | 73 |
| 14 1973 | 16 | 9 | 16 | 6 | 14 | 13 | 74 |
| 15 1974 | 16 | 9 | 17 | 6 | 14 | 13 | 75 |
| 16 1975 | 16 | 9 | 18 | 13 | 14 | 13 | 83 |
| 17 1976 | 19 | 9 | 18 | 13 | 14 | 13 | 86 |
| 18 1977 | 19 | 9 | 18 | 14 | 14 | 13 | 87 |
| 19 1978 | 19 | 9 | 18 | 15 | 14 | 13 | 88 |
| 20 1979 | 19 | 9 | 18 | 16 | 14 | 13 | 89 |
| 21 1980 | 19 | 9 | 18 | 17 | 14 | 13 | 90 |

SOURCE:
BASED ON MAXIMUM BALANCES FROM TABLE 12.

TABLE 14. COMPUTED YEAR-END BALANCES FOR REGIONAL RESERVES FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 13 | 6 | 5 | 10 | 11 | 10 | 55 |
| 2 1961 | 13 | 6 | 5 | 15 | 8 | 10 | 57 |
| 3 1962 | 15 | 6 | 5 | 21 | 0 | 10 | 57 |
| 4 1963 | 15 | 0 | 5 | 27 | 0 | 9 | 56 |
| 5 1964 | 15 | 0 | 5 | 28 | 0 | 9 | 57 |
| 6 1965 | 15 | 0 | -1 | 24 | 2 | 9 | 49 |
| 7 1966 | 15 | -2 | -3 | 21 | 21 | 9 | 61 |
| 8 1967 | 15 | -2 | -6 | 16 | 42 | 11 | 76 |
| 9 1968 | 8 | 19 | -8 | 6 | 52 | 23 | 100 |
| 10 1969 | 14 | 23 | -10 | 1 | 37 | 33 | 98 |
| 11 1970 | 15 | 23 | -19 | -5 | 34 | 42 | 90 |
| 12 1971 | 9 | 32 | -18 | -15 | 34 | 42 | 84 |
| 13 1972 | 9 | 32 | 4 | -23 | 31 | 41 | 94 |
| 14 1973 | -14 | 32 | 30 | -26 | 26 | 41 | 89 |
| 15 1974 | -14 | 32 | 38 | -32 | 26 | 41 | 91 |
| 16 1975 | -14 | 27 | 52 | -28 | 26 | 41 | 104 |
| 17 1976 | 4 | 22 | 52 | -28 | 26 | 41 | 117 |
| 18 1977 | 6 | 19 | 52 | -26 | 9 | 41 | 101 |
| 19 1978 | 6 | 19 | 29 | -22 | 9 | 41 | 82 |
| 20 1979 | 6 | 19 | 24 | -17 | 3 | 41 | 76 |
| 21 1980 | 6 | 19 | 19 | -13 | 3 | 41 | 75 |

SOURCE:

CUMULATIVE TOTALS FROM TABLE 13 STARTING WITH BEGINNING RESERVES EQUAL TO ONE
STANDARD DEVIATION (SEE TABLE 11').

TABLE 14'. REQUIRED TOTAL STORAGE CAPACITY FOR REGIONAL RESERVES FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, USING HISTORICAL IMPORTS

| [1000 METRIC TONS, PADDY RICE EQUIVALENT] | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 13 | 6 | 5 | 10 | 11 | 10 | 55 |
| 2 1961 | 13 | 6 | 5 | 15 | 11 | 10 | 60 |
| 3 1962 | 15 | 6 | 5 | 21 | 11 | 10 | 68 |
| 4 1963 | 15 | 6 | 5 | 27 | 11 | 10 | 74 |
| 5 1964 | 15 | 6 | 5 | 28 | 11 | 10 | 75 |
| 6 1965 | 15 | 6 | 5 | 28 | 11 | 10 | 75 |
| 7 1966 | 15 | 6 | 5 | 28 | 21 | 10 | 85 |
| 8 1967 | 15 | 6 | 5 | 28 | 42 | 11 | 107 |
| 9 1968 | 15 | 19 | 5 | 28 | 52 | 23 | 142 |
| 10 1969 | 15 | 23 | 5 | 28 | 52 | 33 | 156 |
| 11 1970 | 15 | 23 | 5 | 28 | 52 | 42 | 165 |
| 12 1971 | 15 | 32 | 5 | 28 | 52 | 42 | 174 |
| 13 1972 | 15 | 32 | 5 | 28 | 52 | 42 | 174 |
| 14 1973 | 15 | 32 | 30 | 28 | 52 | 42 | 199 |
| 15 1974 | 15 | 32 | 38 | 28 | 52 | 42 | 207 |
| 16 1975 | 15 | 32 | 52 | 28 | 52 | 42 | 221 |
| 17 1976 | 15 | 32 | 52 | 28 | 52 | 42 | 221 |
| 18 1977 | 15 | 32 | 52 | 28 | 52 | 42 | 221 |
| 19 1978 | 15 | 32 | 52 | 28 | 52 | 42 | 221 |
| 20 1979 | 15 | 32 | 52 | 28 | 52 | 42 | 221 |
| 21 1980 | 15 | 32 | 52 | 28 | 52 | 42 | 221 |

SOURCE:
BASED ON MAXIMUM BALANCES FROM TABLE 14.

APPENDIX G

STORAGE CAPACITY AND INVENTORIES FOR SECURITY RESERVES
 ASSUMING IMPORT ADJUSTMENTS
 (Tables 18, 18', 20, 20', All in Units of 1000 MT of Whole Grain)

| | Page |
|---|------|
| 1. Corn Only | |
| Table 18. Computed Year-End Balances for In-Country Reserves by Central American Country and Panama Assuming Import Adjustments | G2 |
| Table 18'. Required Total Storage Capacity for In-Country Reserves by Central American Country and Panama Assuming Import Adjustments | G3 |
| Table 20. Computed Year-End Balances for Regional Reserves by Central American Country and Panama Assuming Import Adjustments | G4 |
| Table 20'. Required Total Storage Capacity for Regional Reserves by Central American Country and Panama Assuming Import Adjustments | G5 |
| 2. Rice Only | |
| Table 18. Computed Year-End Balances for In-Country Reserves by Central American Country and Panama Assuming Import Adjustments | G6 |
| Table 18'. Required Total Storage Capacity for In-Country Reserves by Central American Country and Panama Assuming Import Adjustments | G7 |
| Table 20. Computed Year-End Balances for Regional Reserves by Central American Country and Panama Assuming Import Adjustments | G8 |
| Table 20'. Required Total Storage Capacity for Regional Reserves by Central American Country and Panama Assuming Import Adjustments | G9 |

TABLE 18. COMPUTED YEAR-END BALANCES FOR IN-COUNTRY RESERVES FOR CORN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING IMPORT ADJUSTMENTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 7 | 17 | 40 | 36 | 10 | 9 | 119 |
| 2 1961 | 6 | 8 | 41 | 28 | 8 | 11 | 102 |
| 3 1962 | 7 | 19 | 40 | 32 | 1 | 6 | 105 |
| 4 1963 | 6 | 12 | 41 | 30 | 4 | 8 | 101 |
| 5 1964 | 7 | 20 | 46 | 0 | 3 | 7 | 83 |
| 6 1965 | 5 | 20 | 42 | 0 | 5 | 12 | 84 |
| 7 1966 | 4 | 23 | 20 | 0 | 4 | 9 | 60 |
| 8 1967 | 5 | 9 | 31 | 0 | 15 | 12 | 72 |
| 9 1968 | 6 | 16 | 25 | 43 | 18 | 12 | 120 |
| 10 1969 | 5 | 8 | 35 | 19 | 23 | 11 | 101 |
| 11 1970 | 5 | 3 | 30 | 31 | 12 | 12 | 93 |
| 12 1971 | 7 | 5 | 32 | 25 | 24 | 2 | 95 |
| 13 1972 | 7 | 0 | 31 | 17 | 15 | 2 | 72 |
| 14 1973 | 7 | 33 | 22 | 21 | 26 | 0 | 109 |
| 15 1974 | 2 | 14 | 0 | 19 | 27 | 3 | 65 |
| 16 1975 | 7 | 24 | 1 | 20 | 26 | 0 | 78 |
| 17 1976 | 0 | 17 | 1 | 13 | 27 | 0 | 58 |
| 18 1977 | 9 | 21 | 0 | 13 | 27 | 0 | 70 |
| 19 1978 | 3 | 19 | 46 | 13 | 20 | 0 | 101 |
| 20 1979 | 7 | 20 | 59 | 13 | 9 | 7 | 115 |
| 21 1980 | 7 | 20 | 85 | 16 | 6 | 14 | 148 |

SOURCE:

CUMULATIVE TOTALS FROM TABLE 17, STARTING WITH BEGINNING RESERVES EQUAL TO ONE
STANDARD DEVIATION (SEE TABLE 11').

TABLE 18'. REQUIRED TOTAL STORAGE CAPACITY FOR IN-COUNTRY RESERVES FOR CORN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING TRADE ADJUSTMENTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CESTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 7 | 17 | 40 | 36 | 10 | 9 | 119 |
| 2 1961 | 7 | 17 | 41 | 36 | 10 | 11 | 122 |
| 3 1962 | 7 | 19 | 41 | 36 | 10 | 11 | 124 |
| 4 1963 | 7 | 19 | 41 | 36 | 10 | 11 | 124 |
| 5 1964 | 7 | 20 | 46 | 36 | 10 | 11 | 130 |
| 6 1965 | 7 | 20 | 46 | 36 | 10 | 12 | 131 |
| 7 1966 | 7 | 23 | 46 | 36 | 10 | 12 | 134 |
| 8 1967 | 7 | 23 | 46 | 36 | 15 | 12 | 139 |
| 9 1968 | 7 | 23 | 46 | 43 | 18 | 12 | 149 |
| 10 1969 | 7 | 23 | 46 | 43 | 23 | 12 | 154 |
| 11 1970 | 7 | 23 | 46 | 43 | 23 | 12 | 154 |
| 12 1971 | 7 | 23 | 46 | 43 | 24 | 12 | 155 |
| 13 1972 | 7 | 23 | 46 | 43 | 24 | 12 | 155 |
| 14 1973 | 7 | 33 | 46 | 43 | 26 | 12 | 167 |
| 15 1974 | 7 | 33 | 46 | 43 | 27 | 12 | 168 |
| 16 1975 | 7 | 33 | 46 | 43 | 27 | 12 | 168 |
| 17 1976 | 7 | 33 | 46 | 43 | 27 | 12 | 168 |
| 18 1977 | 9 | 33 | 46 | 43 | 27 | 12 | 170 |
| 19 1978 | 9 | 33 | 46 | 43 | 27 | 12 | 170 |
| 20 1979 | 9 | 33 | 59 | 43 | 27 | 12 | 183 |
| 21 1980 | 9 | 33 | 85 | 43 | 27 | 14 | 211 |

SOURCE:
BASED ON MAXIMUM BALANCES FROM TABLE 18.

TABLE 20. COMPUTED YEAR-END BALANCES FOR REGIONAL RESERVES FOR CCRN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING IMPORT ADJUSTMENTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 9 | 17 | 40 | 51 | 18 | 11 | 146 |
| 2 1961 | 9 | 17 | 41 | 51 | 18 | 11 | 147 |
| 3 1962 | 9 | 21 | 41 | 51 | 18 | 11 | 151 |
| 4 1963 | 9 | 21 | 41 | 51 | 18 | 11 | 151 |
| 5 1964 | 9 | 21 | 44 | 49 | 18 | 11 | 152 |
| 6 1965 | 9 | 21 | 44 | 44 | 18 | 15 | 151 |
| 7 1966 | 9 | 23 | 44 | 43 | 18 | 15 | 152 |
| 8 1967 | 9 | 23 | 44 | 43 | 18 | 15 | 152 |
| 9 1968 | 9 | 23 | 44 | 58 | 18 | 18 | 170 |
| 10 1969 | 9 | 23 | 44 | 58 | 27 | 18 | 179 |
| 11 1970 | 9 | 23 | 44 | 58 | 27 | 18 | 179 |
| 12 1971 | 9 | 23 | 44 | 58 | 32 | 18 | 184 |
| 13 1972 | 9 | 10 | 44 | 58 | 32 | 18 | 171 |
| 14 1973 | 9 | 15 | 44 | 58 | 34 | 14 | 174 |
| 15 1974 | 9 | 15 | 39 | 58 | 35 | 14 | 170 |
| 16 1975 | 9 | 15 | 39 | 58 | 35 | 14 | 170 |
| 17 1976 | 3 | 15 | 39 | 58 | 35 | 12 | 162 |
| 18 1977 | 3 | 15 | 6 | 58 | 35 | 12 | 129 |
| 19 1978 | 3 | 15 | 6 | 58 | 35 | 11 | 128 |
| 20 1979 | 3 | 15 | 6 | 58 | 35 | 11 | 128 |
| 21 1980 | 3 | 15 | 13 | 58 | 35 | 11 | 135 |

SOURCE:

CUMULATIVE TOTALS FROM TABLE 19, STARTING WITH BEGINNING RESERVES EQUAL TO ONE
STANDARD DEVIATION (SEE TABLE 11').

TABLE 20'. REQUIRED TOTAL STORAGE CAPACITY FOR REGIONAL RESERVES FOR CORN ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING TRADE ADJUSTMENTS

| (1000 METRIC TONS, WHOLE CORN EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 9 | 17 | 40 | 51 | 18 | 11 | 146 |
| 2 1961 | 9 | 17 | 41 | 51 | 18 | 11 | 147 |
| 3 1962 | 9 | 21 | 41 | 51 | 18 | 11 | 151 |
| 4 1963 | 9 | 21 | 41 | 51 | 18 | 11 | 151 |
| 5 1964 | 9 | 21 | 44 | 51 | 18 | 11 | 154 |
| 6 1965 | 9 | 21 | 44 | 51 | 18 | 15 | 158 |
| 7 1966 | 9 | 23 | 44 | 51 | 18 | 15 | 160 |
| 8 1967 | 9 | 23 | 44 | 51 | 18 | 15 | 160 |
| 9 1968 | 9 | 23 | 44 | 58 | 18 | 18 | 170 |
| 10 1969 | 9 | 23 | 44 | 58 | 27 | 18 | 179 |
| 11 1970 | 9 | 23 | 44 | 58 | 27 | 18 | 179 |
| 12 1971 | 9 | 23 | 44 | 58 | 32 | 18 | 184 |
| 13 1972 | 9 | 23 | 44 | 58 | 32 | 18 | 184 |
| 14 1973 | 9 | 23 | 44 | 58 | 34 | 18 | 186 |
| 15 1974 | 9 | 23 | 44 | 58 | 35 | 18 | 187 |
| 16 1975 | 9 | 23 | 44 | 58 | 35 | 18 | 187 |
| 17 1976 | 9 | 23 | 44 | 58 | 35 | 18 | 187 |
| 18 1977 | 9 | 23 | 44 | 58 | 35 | 18 | 187 |
| 19 1978 | 9 | 23 | 44 | 58 | 35 | 18 | 187 |
| 20 1979 | 9 | 23 | 44 | 58 | 35 | 18 | 187 |
| 21 1980 | 9 | 23 | 44 | 58 | 35 | 18 | 187 |

SOURCE:
BASED ON MAXIMUM BALANCES FROM TABLE 20.

TABLE 18. COMPUTED YEAR-END BALANCES FOR IN-COUNTRY RESERVES FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING IMPORT ADJUSTMENTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 11 | 6 | 5 | 4 | 10 | 6 | 42 |
| 2 1961 | 10 | 5 | 4 | 5 | 5 | 8 | 37 |
| 3 1962 | 11 | 6 | 5 | 5 | 3 | 7 | 37 |
| 4 1963 | 8 | 1 | 5 | 5 | 5 | 6 | 30 |
| 5 1964 | 8 | 3 | 5 | 5 | 7 | 7 | 35 |
| 6 1965 | 8 | 2 | 1 | 0 | 6 | 11 | 28 |
| 7 1966 | 8 | 2 | 2 | 1 | 13 | 9 | 35 |
| 8 1967 | 8 | 5 | 0 | 0 | 14 | 12 | 39 |
| 9 1968 | 3 | 8 | 0 | 0 | 14 | 12 | 37 |
| 10 1969 | 15 | 6 | 0 | 0 | 0 | 13 | 34 |
| 11 1970 | 10 | 7 | 0 | 0 | 6 | 13 | 36 |
| 12 1971 | 2 | 9 | 9 | 0 | 3 | 12 | 35 |
| 13 1972 | 9 | 3 | 15 | 0 | 3 | 6 | 36 |
| 14 1973 | 0 | 9 | 16 | 0 | 0 | 9 | 34 |
| 15 1974 | 9 | 4 | 15 | 0 | 1 | 10 | 39 |
| 16 1975 | 4 | 4 | 18 | 10 | 0 | 10 | 46 |
| 17 1976 | 19 | 1 | 8 | 5 | 0 | 10 | 43 |
| 18 1977 | 10 | 1 | 11 | 9 | 0 | 8 | 39 |
| 19 1978 | 15 | 1 | 0 | 10 | 4 | 8 | 38 |
| 20 1979 | 10 | 1 | 5 | 13 | 0 | 8 | 37 |
| 21 1980 | 13 | 1 | 0 | 14 | 9 | 8 | 45 |

SOURCE:

CUMULATIVE TOTALS FROM TABLE 17, STARTING WITH BEGINNING RESERVES EQUAL TO ONE
STANDARD DEVIATION (SEE TABLE 11').

TABLE 18'. REQUIRED TOTAL STORAGE CAPACITY FOR IN-COUNTRY RESERVES FOR RICE ONLY
BY CENTRAL AMERICAN CCUNTRY AND PANAMA, 1960-1980, ASSUMING TRADE ADJUSTMENTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | COSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 11 | 6 | 5 | 4 | 10 | 6 | 42 |
| 2 1961 | 11 | 6 | 5 | 5 | 10 | 8 | 45 |
| 3 1962 | 11 | 6 | 5 | 5 | 10 | 8 | 45 |
| 4 1963 | 11 | 6 | 5 | 5 | 10 | 8 | 45 |
| 5 1964 | 11 | 6 | 5 | 5 | 10 | 8 | 45 |
| 6 1965 | 11 | 6 | 5 | 5 | 10 | 11 | 48 |
| 7 1966 | 11 | 6 | 5 | 5 | 13 | 11 | 51 |
| 8 1967 | 11 | 6 | 5 | 5 | 14 | 12 | 53 |
| 9 1968 | 11 | 8 | 5 | 5 | 14 | 12 | 55 |
| 10 1969 | 15 | 8 | 5 | 5 | 14 | 13 | 60 |
| 11 1970 | 15 | 8 | 5 | 5 | 14 | 13 | 60 |
| 12 1971 | 15 | 9 | 9 | 5 | 14 | 13 | 65 |
| 13 1972 | 15 | 9 | 15 | 5 | 14 | 13 | 71 |
| 14 1973 | 15 | 9 | 16 | 5 | 14 | 13 | 72 |
| 15 1974 | 15 | 9 | 16 | 5 | 14 | 13 | 72 |
| 16 1975 | 15 | 9 | 18 | 10 | 14 | 13 | 79 |
| 17 1976 | 19 | 9 | 18 | 10 | 14 | 13 | 83 |
| 18 1977 | 19 | 9 | 18 | 10 | 14 | 13 | 83 |
| 19 1978 | 19 | 9 | 18 | 10 | 14 | 13 | 83 |
| 20 1979 | 19 | 9 | 18 | 13 | 14 | 13 | 86 |
| 21 1980 | 19 | 9 | 18 | 14 | 14 | 13 | 87 |

SOURCE:
BASED ON MAXIMUM BALANCES FROM TABLE 18.

TABLE 20. COMPUTED YEAR-END BALANCES FOR REGIONAL RESERVES FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING IMPORT ADJUSTMENTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 12 | 6 | 5 | 7 | 11 | 10 | 51 |
| 2 1961 | 12 | 6 | 5 | 7 | 11 | 10 | 51 |
| 3 1962 | 12 | 6 | 5 | 9 | 11 | 10 | 53 |
| 4 1963 | 12 | 6 | 5 | 11 | 11 | 10 | 55 |
| 5 1964 | 12 | 6 | 5 | 11 | 11 | 10 | 55 |
| 6 1965 | 12 | 6 | 5 | 11 | 11 | 10 | 55 |
| 7 1966 | 12 | 6 | 5 | 11 | 14 | 10 | 58 |
| 8 1967 | 12 | 6 | 5 | 9 | 19 | 11 | 62 |
| 9 1968 | 12 | 13 | 5 | 6 | 21 | 15 | 72 |
| 10 1969 | 13 | 13 | 4 | 5 | 20 | 17 | 72 |
| 11 1970 | 13 | 13 | 0 | 2 | 20 | 20 | 68 |
| 12 1971 | 13 | 15 | 0 | -2 | 20 | 20 | 66 |
| 13 1972 | 13 | 15 | 1 | -4 | 20 | 20 | 65 |
| 14 1973 | 4 | 15 | 10 | -4 | 20 | 20 | 65 |
| 15 1974 | 4 | 15 | 10 | -7 | 20 | 20 | 62 |
| 16 1975 | 4 | 15 | 15 | -7 | 20 | 20 | 67 |
| 17 1976 | 10 | 15 | 15 | -7 | 20 | 20 | 73 |
| 18 1977 | 10 | 15 | 15 | -7 | 11 | 20 | 64 |
| 19 1978 | 10 | 15 | 11 | -7 | 11 | 20 | 60 |
| 20 1979 | 10 | 15 | 11 | -7 | 10 | 20 | 59 |
| 21 1980 | 10 | 15 | 11 | -7 | 10 | 20 | 59 |

SOURCE:

CUMULATIVE TOTALS FROM TABLE 19, STARTING WITH BEGINNING RESERVES EQUAL TO ONE
STANDARD DEVIATION (SEE TABLE 11').

TABLE 20'. REQUIRED TOTAL STORAGE CAPACITY FOR REGIONAL RESERVES FOR RICE ONLY
BY CENTRAL AMERICAN COUNTRY AND PANAMA, 1960-1980, ASSUMING TRADE ADJUSTMENTS

| (1000 METRIC TONS, PADDY RICE EQUIVALENT) | | | | | | | |
|---|---------------|----------------|-----------|----------|-----------|--------|-------|
| PERIOD NO. YEAR | CCSTA RICA | EL SALVADOR | GUATEMALA | HONDURAS | NICARAGUA | PANAMA | TOTAL |
| 1 1960 | 12 | 6 | 5 | 7 | 11 | 10 | 51 |
| 2 1961 | 12 | 6 | 5 | 7 | 11 | 10 | 51 |
| 3 1962 | 12 | 6 | 5 | 9 | 11 | 10 | 53 |
| 4 1963 | 12 | 6 | 5 | 11 | 11 | 10 | 55 |
| 5 1964 | 12 | 6 | 5 | 11 | 11 | 10 | 55 |
| 6 1965 | 12 | 6 | 5 | 11 | 11 | 10 | 55 |
| 7 1966 | 12 | 6 | 5 | 11 | 14 | 10 | 58 |
| 8 1967 | 12 | 6 | 5 | 11 | 19 | 11 | 64 |
| 9 1968 | 12 | 13 | 5 | 11 | 21 | 15 | 77 |
| 10 1969 | 13 | 13 | 5 | 11 | 21 | 17 | 80 |
| 11 1970 | 13 | 13 | 5 | 11 | 21 | 20 | 83 |
| 12 1971 | 13 | 15 | 5 | 11 | 21 | 20 | 85 |
| 13 1972 | 13 | 15 | 5 | 11 | 21 | 20 | 85 |
| 14 1973 | 13 | 15 | 10 | 11 | 21 | 20 | 90 |
| 15 1974 | 13 | 15 | 10 | 11 | 21 | 20 | 90 |
| 16 1975 | 13 | 15 | 15 | 11 | 21 | 20 | 95 |
| 17 1976 | 13 | 15 | 15 | 11 | 21 | 20 | 95 |
| 18 1977 | 13 | 15 | 15 | 11 | 21 | 20 | 95 |
| 19 1978 | 13 | 15 | 15 | 11 | 21 | 20 | 95 |
| 20 1979 | 13 | 15 | 15 | 11 | 21 | 20 | 95 |
| 21 1980 | 13 | 15 | 15 | 11 | 21 | 20 | 95 |

SOURCE:
BASED ON MAXIMUM BALANCES FROM TABLE 20.

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A SIMULATED FOODGRAIN SECURITY RESERVE PROGRAM
FOR CORN AND RICE IN CENTRAL AMERICA
AND PANAMA FROM 1960 TO 1980

by

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B.S., University of Vermont, 1978

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

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The main objective of this study was to measure the specific storage capacity and inventory levels that would have been required from 1960 to 1980 in order to stabilize the long-term trend in supply quantities of corn and rice for the Central American region.

The analysis is based on research methodology developed by the Food and Feed Grain Institute at Kansas State University, and utilizes country by country data on population, and grain production, utilization, international trade and levels of stocks published by the United Nations Demographic Yearbook for Latin America and U.S. Department of Agriculture Foreign Agricultural Service.

The findings indicate that the required storage capacity for corn to achieve the targeted stability band of ± 5.0 percent would have been 506,000 MT (whole corn equivalent) based on historical import patterns and 398,000 MT (whole corn equivalent) with stabilizing import adjustments. The required storage capacity for rice to achieve the same targeted stability band would have been 311,000 MT (paddy rice equivalent) with historical import patterns and 182,000 MT (paddy rice equivalent) with stabilizing import adjustments. The major reduction comes in the needed storage capacity for the regional reserves--from 294,000 MT to 187,000 MT for corn reserves, and from 221,000 MT to 95,000 MT for rice reserves.

In general, under the stabilizing trade alternatives the utilization of storage capacity for the in-country corn and rice reserves would have been higher than under the historical trade alternatives with the exception of Honduras. In the case of regional and combined reserves, the indicated rate of capacity utilization would have been higher under the stabilizing trade alternatives for both corn and rice in all countries.