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TRATADO GENERAL DE INTEGRACION ECONOMICA CENTROAMERICANA

Study of the Effects of Agricultural Development Policies on Food Consumption in Central America
Agreement AID/931-1274

SECTORIAL MODEL OF LINEAR PROGRAMMING FOR NATIONAL PRODUCTION OF BASIC GRAINS

Doc. No. 48A/84
July, 1984

Tegucigalpa, D.C.
Honduras, C.A.

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This documents is part of a group of studies prepared by the Project "Study of the Effects of Agricultural Development Policies on Food Consumption in Central America", whose initial objective is the development and application of a quantitative methodology, to analize the impact in Honduras of agricultural policies on consumption and nutritional patterns on sectorial and institutional planning units of the Government of Honduras, and subsequently, to disseminate technical and methodological results in other Central American countries.

This Project is a result of a Technical Cooperation Agreement suscribed by the Secretaría Permanente del Tratado General de Integración Económica Centroamericana (SIECA); the Secretary of the Council of Economic Planning (CONSUPLANE), and the Secretary of Natural Resources, on behalf of the Government of the Republic of Honduras. The Project also received the financial contribution from the Regional Office for Central América and Panama (ROCAP).

This study is the result of the work of the Project team under the technical direction of the undersigned and Lic. Magdalena García, Main Researcher on Demand Analysis.

J. Mario Ponce
Director

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Program. Distinguisehd professional in the agricultural field, forerunner of the use of linear programming in the agricultural sector in Central American countries and devoted to the centroamericanist ideal, excellent associate and friend, whose sensible passing away in September 1983 leaves behind eternal memories and a deep emptiness in the process of economic integration of the region.

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EXECUTIVE SUMMARY

This is the last report of the Project "Effects of Agricultural development polciies on food consumption of Central American population" in accordance with the Technical Cooperation Agreement subscribed by SIECA and the Government of the Republic of Honduras.

It refers to a linear programming model for the production of basic grains in Honduras. Its first part contains a description of the model. Annex one refers to the description of agriculture in Honduras; Annex two contains tables with basic information of the model; Annex three contains the mathematical layout of the model; Annex four refers to the classification of soils and Annex five lists the documents prepared by the Project.

The agricultural sector model presented in this report is based on linear programming technics and uses as an objective the maximization of the producers and consumers surplus, which allows the analysis of production and consumption responses to different policies within a framework of general equilibrium.

The information used for the construction of the model comes from different sources: Survey on production costs by the Sectorial Planning Direction of the Ministry of Natural Resources; Agricultural Survey 1980, General Direction of Statistics and Census of the

Secretary of Natural Resources; Central Bank of Honduras; National Agricultural Census 1974; General Direction of Statistics and Census, producer and cosumer prices, Central Bank of Honduras and others.

Being this the first model that has been conducted at a national level, its coverage has been restricted to the production and consumption of basic grains. On the supply side, the production component of basic grains is separated by regions, taking into account the regionalization from the Secretary of Natural Resources, identifying seven regions, and within each region identifying 3 producers groups, subsistence (small producers with less than 7 manzanas), familiar (medium-size producers with 7 to 70 manzanas), and commercial (large producers with more than 70 manzanas); three types of technologies (no technology, intermediate technology and advanced technology) and two different cropping seasons; first(or spring), and second (or post-spring). The use and availibility of resources and inputs is also identified. The labour is differentiated in familiar and employed labour. It also introduces producers behaviour and attitude toward risk through deviations of gross income in 8 successive years.

On the demand side, it contains demand functions at a national level, which are estimated from price elasticities of demand, and average prices and quantities. The demand for maize and beans was separated by cropping season.

The results are validated agains values observed in 1974, being this

the base-year for the model. The variables used to validate are: cultivated area, production and prices of products. The comparison of the model solution with values observed demonstrated that the model shows adequately the behaviour of production at a national level(7% margin of error), and similarly at a regional and producers level, between 10% and 20% and between 10% and 30% margin of error, respectively. The error margin varies between regions and between types of producers, the most significant are found among large producers and in the production of rice.

Using the validated model, issues such as credit policies, product prices and input subsidies were analyzed, giving as a result that a credit policy has lesser impact on small producers income than a product price policy.

The analysis of policies related to supply requires the estimation of supply elasticities, using the model it was estimated for maize a direct elasticity of 0.08 for a price range between L. 9.00 and L. 9.50 Lps/hundredweights and of 4.02 for beans.

The model may have several applications. One of them would be to evaluate the impact of alternative technologies on small farms. It would also be useful to utilize the model to determine what kind of incentives are the most adequate to induce farmers to adopt more modern technologies.

Another topic to which the national model could usefully be applied is to evaluate the trade policy of grains and its relation to price policies.

Taking into account the effort which has been invested in conducting this model, relatively minor amounts of additional work can produce many useful and interesting results for agricultural planning in Honduras.

I INTRODUCTION

This is the final report of the Project "Study of the Effects of Agricultural Development Policies on Food Consumption in Central America", which is the result of a technical cooperation agreement suscribed in July 1980 by the Permanent Secretariat of the General Treaty for Central American Economic Integration (SIECA) and the Government of the Republic of Honduras represented by the Council of Economic Planning and the Secretary of Natural Resources.

The execution of the Project had the financial support and the assistance of the Regional Office for Central American and Panamá (ROCAP).

The main objective of the project is to contribute to the improvement in the food consumption/nutrition status of the nutritionally vulnerable segments of developing countries population. The project had two basic purposes: (1) To modify and refine the agricultural planning methods which have been developed so that they can be used to analyze the impact of government policies on the food consumption patterns of various socio-economic groups, and (2) To demonstrate the utility of these methods by using them for policy analysis of the Central American region's planning systems.

To guarantee that the methodology developed be really proven valid and

utilized within the context of political decision the majority of the resources assigned to this work were addressed to one of the Central American countries. Honduras was selected for the study for several reasons, for instance: (1) the country is poor and there is evidence that population suffers from malnutrition; (2) the government admits that malnutrition is a serious problem and is willing to adopt certain measures to reduce its implications; (3) a great part of the information required is available or would be available during the execution of the Project; and (4) complementary activities proposed, such as gathering of statistical information and activities of agricultural and nutritional planning, were to be financed by ROCAP, AID Mission, and the Government of Honduras.

The results of the survey would be disseminated in the Central American Region.

The results to be obtained of the Project were: (a) a description of income and expenditure patterns in Honduras, by socio-economic groups and by regions; (b) a description of food consumption patterns and implied nutrient intake in Honduras by socio-economic groups and by regions; (c) calculation of demand relationships and income and price elasticities; (d) detailed computer models of the agricultural sector. Originally, the project considered the construction of detailed computarized models for three sub-regions in Honduras, and an agrregated model for the other four regions and a national model to

relate the sub-regional models. During the evaluations of the Project, taking into account personnel limitations and the small usefulness of sub-regional models, this objetive was modified to the construction of linear programming models at farm level and a national model for production of basic grains; (e) Analysis of the impact of selected agricultural policies on food consumption patterns of various socio-economic groups in Honduras; (f) computer software for data handling and model construction; (g) interim reports, technical notes, and published articles, and (h) seminars for training technicians and informing planners and policy makers about the nature and results of the project.

The project was based on already existing Honduran data, such as (a) Survey on Income Expenditures 1977-79; (b) National agricultural census, 1974; (c) Agricultural Survey of 1980; (d) Cost of production surveys conducted from 1975 to 1979 by the office of sector planning of the Ministry of Natural Resources; (e) Survey of small farmers conducted by USAID/Honduras and the Ministry of Natural Resources on June, 1976 and June, 1977; and (f) Study of income and employment in the poor rural sector of Honduras, prepared by the Firm Inversiones y Estudios Económicos, S. de R. L. (INVEST).

The Project's activities were initiated on January 1981 and originally it was estimated that completion of the entire Project would require 24 months from the effective day of initiation of work. Difficulties

in contracting the main researcher during the first year of work and lately in the employment of other qualified personnel made it necessary to extend the duration of the Project and postponed the effective termination date. For several circumstances out of the control of the Project's administration, it was not possible to assemble all the multidisciplinary team considered necessary to carry out the work required by the study. The counterpart of the Honduran government did not assign all the associate researchers and neither was it possible to hire during the execution of the work the main researcher that would take care of the demand and agricultural model analysis. During the first year of activities the project team was composed by the undersigned, Director of the Project; Mr. Daniel Salcedo, main researcher on agricultural models; three associate researchers (Ing. Ronald Avelar; Lic. Gladys Tablada and Lic. Janeth Abadie); two programmers, Margarita Rojas de Rápalo and Manuel E. Lepe; two secretaries, Ivonne Navas Funes and Sagrario Zúñiga Montes. By the end of 1981, Lic. Magdalena García was contracted as main research on demand analysis, but Dr. Daniel Salcedo reduced its participation to half-time, and finally left the project during 1982. Also Ing. Ronald Avelar from CONSUPLANE and Lic. Gladys Tablada from the Ministry of Natural Resources left the project, and she was substituted by Lic. Armando Valenzuela.

Facing the difficulties of finding an expert in agricultural models willing to move to Honduras for a short term, the staff was reorganized giving Lic. Magdalena García the responsibilites of main researcher

on demand and agricultural model analysis, with Lic. Carlos A. Vásquez and Lic. Jorge A. Reyes P. as her assistants.

The results of the project are presented in documents that have been distributed to governmental, regional and international organizations interested in this type of work. Annex No. 5 presents a lists of the documents prepared, indicating in capital letters those considered of most interest to the Project objectives.

II. CONCEPTUAL VIEW OF THE NATIONAL MODEL OF AGRICULTURAL PROGRAMMING.

1. Model Characteristics.

The analytical instrument used to simulate the behaviour of the agricultural sector of Honduras is a model of linear programming, originally developed by the Center for Development Research of the World Bank, in collaboration with the Secretary of the Presidency of México. The methodology was used to develop a model named CHAC.

The model is based on microeconomic theory (even though its coverage may be national) since the basic unity of analysis is a "representative farm". In this way, the results of the model represent the addition of requirements of inputs and production levels of "representative farms" for a given region.

The model simulates a market of perfect competition within a framework of general equlibrium. Product prices and amounts produced are determined endogenously as part of the model solution process.

2. Theoretical aspects.

2.1 Objective Function

The objective function of the model is based on the approach proposed by Samuelson that simulates a competitive market in

which the equilibrium price equals the marginal cost. This criterion consist in the maximization of producers and consumers surplus.

Given a demand structure as

(1) $P = A - B\,Q$

The corresponding area under demand curve that represents total profit is given by

(2) $U = \int_{Q}^{Q} (A - B\,Q)\, d\,Q = Q' \,(A - 0.5\,B\,Q)$

and if

(3) $C\,(\,Q\,)$

is a vector of cost coefficients, that is the area under the supply curves generated by the model, then

(4) $G = Q' \,(A - 0.5\,B\,Q) - C\,(\,Q\,)$

is the objective function that represents producers and consumers surplus, which means that the area between the curves of demand and supply and its maximization requires that price equals marginal cost.

Demonstration

$$G = Q' (A - 0.5 B Q) - C (Q)$$

$$DG = (A - B Q) - C' (Q) = 0$$

$$A - B Q = C' (Q)$$

$$P = C' (Q)$$

The objective function, as expressed in equation (4) is quadratic, and consequently to use it in a linear programming model requires a linear procedure. In this case, the methodology used was that proposed by Dulay and Norton, which consist in segmentation of demand functions in sections. This procedure is represented graphycally in Figures 1 and 2.

Figure No. 1

Demand Curve

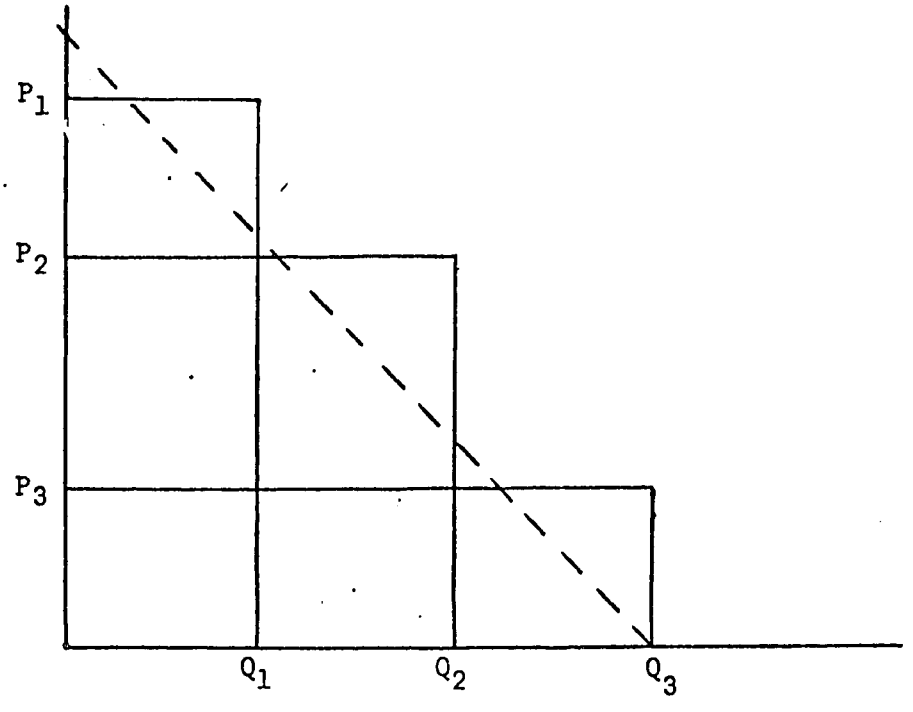


Figure No. 2

Function of Total Profit

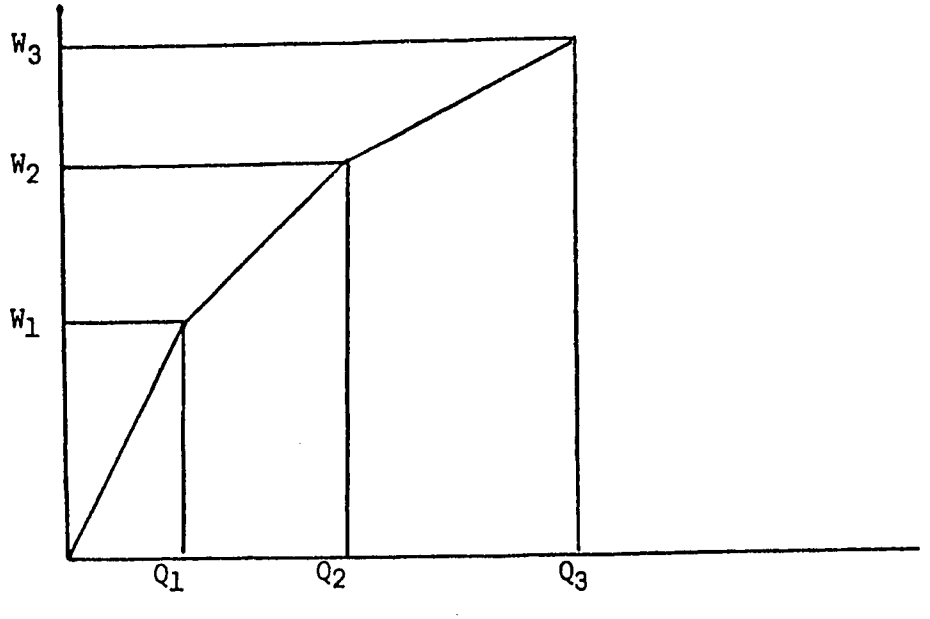


Figure No. 2 represents the area under the demand curve that has been segmented where Wi represents the area under the demand curve between 0 and q_i

Being $$W_1 = P_1 \; q_1$$

$$W_2 = W_1 + P_2(q_2 - q_1)$$

Each segment of the demand function constitute a column in the model sale sector, but all segments will require only one row which represents the balance between production and sales.

Given that W_j represents the area under the demand curve between oy q_u, in the case of perfect competition it results that:

$$Q_j \; (A - 0.5 \; B \; Q_j) = W_j$$

Being W_j a concave quadratic function of Q.

Therefore W_j may be approximated by a series of linear segments. Duloy and Norton introduce some activities as measured segments $Wij0 \leq Wij \leq 1 \; i=1,K$, for each W_j, assigning a superior limit to each segment (q_{ij}) and allowing a sole value W_{ij} approach to W_j. They recommend that the part of the problem corresponding to: Maximize Q' (A - 0.5 B Q) subject to Q= WX; be replaced by the following layout:

$$\text{MAX} \quad \sum_{i=1}^{k} \sum_{j=1}^{n} d_{ij} \quad w_{ij}$$

$$\text{Subject to} \quad a\, x_i \; m_j - \sum q_{ij} \; W_{ij} \geq 0$$

$$\sum W_{ij} \leq 1$$

This method adds only two rows by product, but allows to increase as many activities W_{ij} as necessary to obtain the desired precision.

Table No. 1 illustrates the previous procedure for one product. In this table CI is the production cost of the crop 1, Y1 is the yield, Qj (j = 1, --h) are the amounts sold in the segment j of the demand function, W_j is the area under the demand curve on step j. The last equation guarantees that only one or at the most two adjacent steps will be in the solution.

Table No. 1

Rows \ Columns	Production XI	Sales	RHS
Objective Function	- C1	W1 W2 W3 ----W_n	MAX
Prod. Balance	- Y1	Q1 Q2 Q3 ----Q_n	0
Convexity		1 1 1 1	1

3. The Risk Factor

During recent years special attention has been given to the risk factor in agricultural sector models. Hazell and Scandizzo developed a methodology that allows to simulate in a linear programming model the market equilibrium in the agricultural sector, characterized by its competitivity and risk. In this way, it tries to comprehend the farmers behaviour, who take their decissions on the base of expected income - variable income (E - V) and that seek to maximize its profits.

To ignore farmers aversion towards risk activities may conduct to significant overvaluations of such activities, resulting in an excessive estimation of returns on some investment programs.

The use of (E - V) criterion was proposed initially by Markoviits in 1952, for quadratic programming models, but the use of this criterion requires a considerable amount of statistical information and results in programs that are hard to manage. To overcome these difficulties Hazell and Scandizzo propose a cirterion that selects based on expected income and the average of the absolute of income deviations (E - D)

The risk factor considered by this method modifies the classic rules of balance in a competitive market. Without considering the risk factor the market balance occurs when prices equal

marginal production costs. Introducing the risk factor would imply that expected marginal cost would include marginal cost in itself plus a marginal risk factor, plus the opportunity costs expected.

The "risk" factor as defined is just a new cost, that is, the additional expected return that farmers would demand as compensation for accepting the "risk".

The risk factor as defined previously, may be incorporated in the Dulay and Norton Model in the following way:

$$\text{MAX} \quad U = E - \phi V$$

E = expected income

V = Income variations

ϕ = Risk aversion coefficient

That is $\text{MX} \quad U = X'Y\,(A - 0.5\,BXY) - \{C'X + \phi(X'\Gamma X)^{\frac{1}{2}}\}$

subject to. $b\,X \leq D$

Where $X'Y(A-0.5BQ)$ is the area under the demand curve

$C'X+\phi\,(X'\Gamma X)^{\frac{1}{2}}$ is the area under the supply curve including the risk component.

Given X = Production activities

Γ = Variance matrix - income covariance

The income standard deviation as a function of absolute media deviation is estimated by the following equation:

$$(X^{1} P X)\ 1/2 = \frac{\Delta^{\frac{1}{2}}}{} \sum \left[\sum (\gamma_{jT} - \gamma_j) x_j \right]$$

Where $\Delta = T\ \pi/2\ (T - 1)$

This formulation may be introduced in the objective function according to the procedure presented by Hazell and Scandizzo defining variables

$$Z_T \geq 0$$

And laying out the problem as follows:

$$\text{MAX} \quad U = \sum E\ (Y_i) - \phi \hat{S}$$

$$\text{subject to} \quad \sum (\gamma_{jt} - \bar{\gamma}_j)\ X_j + Z_t \geq 0$$

$$2 \sum Z_t - \frac{\hat{S}\ T}{2\sqrt{\Delta}} = 0$$

Variables Z_i account for negative deviations of average gross income $(\bar{\gamma}_i)$, consequently $2 \sum Z_t$ is the total sum of deviations.

The following table shows in a schematic way the incorporation

of an average absolute deviations matrix (as an estimate of a standard deviation matrix) and of a risk aversion coefficient in a linear programming model:

RISK FACTOR INCORPORATION SCHEME

Column / Risk Factor	X_1	X_2	... X_n	Balance Z_1	Z_t	Aversion Factor Z	R H S
Deviations	d_{11}	d_{21}	... d_{n1}	1			0
	d_{12}	.....	d_{n2}		1		
	.		.				
	.		.				
	.		.				
	d_{1t}	d_{2+}	d_{nt}	.....	1		
				2....	2	-K	0
Objective Function	-c	-c	$-c_n$			-Ø	

III. MATRIX COMPONENTS BLOCK

The matrix of the Agricultural Programming National Model of Honduras contains 1317 columns or activities and 510 rows or equations, distinguishing four main sub-matrices: productin, input acquisitions and use of resources, sale of products, and risk.

The information of each sub-matrix is separated by regiona and type of producers, except the demandsub-matrix that is dealt with at a national level.

1. Production

The production sub-matrix contains a total of 224 agricultural production activities which describe the basic grains cultivation patterns (maize, beans, rice, and sorghum) for each type of producer in each of the regions, considering alternatives according to technological level and time of planting.

2. Input acquisitions and use of resources

The input and use of resources sub-matrix is formed by the contabilization of the use of inputs and resources. Seeds, fertilizers and chemicals are accounted for regionally. Labour resources (family and hired labour) and land are accounted for by group of producers.

3. Sale of products

The sales sub-matrix for agricultural production consists of demand functions for each product, aggregated at a national level, which are estimated from price elasticities, the expected prices and production quantities of base year. In the case of maize and beans demand for first(spring) and second (post-spring) cycles were incorporated.

4. Risks

The risk sub-matrix, as its name indicates, contains the risks of the crops included in the model. Such information is incorporated by period of planting, and regionally through a deviation matrix of annual gross income with respect to average annual income, calculated from the product yields and annual average prices paid to the producer in an eight year series (1974-1981).

1.1 Description of production sub-matrix

1.1.1 Crops

Agricultural production activities cover the following annual crops:

Maize and beans with two cropping cycles (spring and post-spring), and three levels of technology (no technology, intermediate technology, and advanced technology), sorghum with one cropping cycle and two levels of technology (intermediate technology and advanced technology) and the combination maize-sorghum and maize-beans with one cropping cycle and two levels of technology (no technology and intermediate technology)

The combination of production technologies (no technology

and semi-technology, or semi-technology and technology) are related to the size of the farm and production activities.

1.1.2 Technologies

There are different technological levels in agricultural production. The National Model specifies two technologies for each group of farms and for each productive activity. Crops with no technology or with traditional technology prevail on small and medium farms and it characterized by a deficient soil preparation and no utilization of inputs or animal or mechanical traction.

Intermediate technology practices are found in three sizes of farms and it is characterized by moderate use of inputs, the utilization of animal traction and some mechanical traction, and the use of improved seeds. The variables considered within the semi-technified system are: traction without inputs, inputs without traction, and inputs with traction.

Advanced technology practices prevail on large agricultural units that are commercially oriented, uses capital intensively resulting in the utilization of inputs adequate to its necessities, plus mechanical traction and

genetically improved seeds. In general, farmers that utilize technified systems of production receive technical and financial assistance.

1.1.3 Technical Coefficients

Technical coefficients measure input requirements per unit of area which in the Model are measured by manzanas (.697 hectareas), including requirements of seeds, (home grown and improved), fertilizers, chemicals, traction, (mechanical and animal), labor, and other variable costs. Seed is measured by pounds, utilizing home grown seed on sole, traditional technology crops, and associate, on traditional and intermediate technology crops and improved seed on intermediate and advanced technology crops, with the exception of sorghum.

In fertilizers and chemicals formulas or brands are not specified, meassuring them in hundredweight and their costs in lempiras, respectively.

Mechanical and animal traction is calculated in tractor-hours and yoke-days utilized in different agricultural activities such as: plowing, harrowing, cultivation and earthing up.

Labor requirements are measured in terms of man-days with an eight-hour working day used to carry out different tasks within the production process, such as: land preparation, initial processing and product drying. The coefficient for other variable costs include all expenses not included in previous costs, such as transportation, packaging, storage and others.

2.1 Description of input acquisitions and use of resources sub-matrix

The utilization of inputs (seeds, chemicals and fertilizers) and of mechanical and animal traction define technological levels of the different cultivation strata considered in the Model. It is important to note that in 1974 investment in chemicals and in fertilizers were concentrated on medium sized and large farms, with approximately 12% and 85% of the total, respectively. With respect to mechanical and animal traction these same groups had 94% of the tractors and 74% of the oxen.

2.1.1 Labour

It has been differentiated between two types of labor supplies: Family and hired labour. The first is constituted by the farmer and some members of its family and the second by peasants that have no land.

The availibility of family and hired labour by farm size and region has been estimated as the percentage of economically active population in agriculture multiplied by the total number of houses that results in the number of families with and without land that earn its living from agriculture. By multiplying each of them by their respective economically active population, the result is family labour and hired labour.

Demand on labour has also been broken up by farm size and by region, distinguishing as determining elements of its behaviour productive activities and systems of production (technologies) used.

Figure No. 1: Labour market

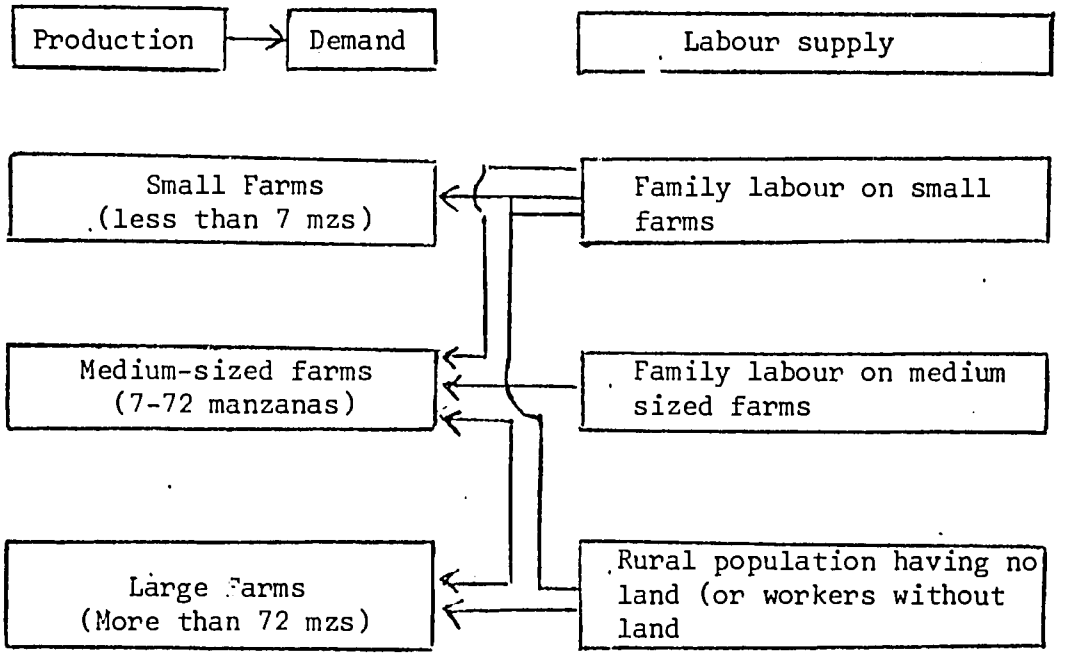


Figure No. 1 outlines the approach given to the labour market, in which it may be noted that large farms depend on hired labour and this may come from family labour in small farms from rural population having no land, and from producers in small farms. Finally, small farms depend exclusively on its own family labour and also may work as hired workers in the other two groups.

One characteristic of large farms is that its owners do not work directly on agricultural labours, nor they sell their services to the agricultural sector of the

region. On the other side, small farms are conditioned by land limitations and family composition and size, to production to subsistence levels, specially maize and beans.

2.1.2 Land

This resource has been specified biannualy considering different crop cycles as production alternatives. To specify land restrictions,it has been used the cultivated area of annual crops of basic grains (maize, beans, rice,and soghum) by region and farm size for the base year (1974).

Land rental does not conform as a part of production costs, and hence of the objective function. Neverthcless, when this factor is restrictive according to the Model production pattern, the real value of land rental comes in the dual solution.

2.1.3 Seed

Two types of seed are distinguished (home grown and improved) and for the case of Honduras its supply is considered unlimited. The first is defined as the seed produced

for its later use in the farm without any genetic improvement, and the second may also be produced internally or bought in the market but implies some genetic improvement.

Prices of home grown and improved seeds for basic grains used in the National Model for the year 1974 are presented in the following table:

Table No. 1

Basic Grain	Home Grown (Lempiras/hw)	Improved Seed (Lempiras/ hw)
Maize	10.00	16.50
Beans	25.95	32.00
Sorghum	8.00	13.68
Rice	-.-	40.00

2.1.4 Mechanical traction

The mechanical traction available is determined by the number of existing tractors in each Region. Agricultural machinery (tractors) rental is estimated in Lps.10.00 per tractor-hour.

2.1.5 Animal traction

Animal traction is given by the number of oxen in each Region. Anual cost of a yoke of oxen (1 yoke = 2 oxen) is Lps. 4.00 per day, not including payment of the worker.

For purposes of the model it is considered that oxen is the only source of animal traction for agricultural activities.

2.1.6 Fertilizers

Fertilizers most commonly used are urea 46% and some components or formulas as 12-24-12 for maize, rice and sorghum; 18-46-0 for beans, rice and sorghum; 16-20-0 for maize and sorghum, and 20-20-0 for beans. Nevertheless, considering the great variety of these products, the National Model does not specify formula or brand, using physical units at a uniform market price of Lps. 25.30 per humdredwwight, suppossing a perfectly elastic supply.

2.1.7 Chemicals

Chemical Products are expressed on the basis of invested value in lempiras per manzana. The classification of

chemicals include insecticides, fungicides and herbicides. The insecticides most commonly used are Folidol M-480, Lorsban, and Temaron 600; The herbicides include Gramaxone, 2.4. D, and Gesaprim 80%. Some fungicides utilized in bean crops are Antrocol and Blue Cupravit; for rice Kasumin and Benalte are utilized. As in the fertilizers case, the National Model does not specify chemical brands and it is supposed that the supply is perfectly elastic.

3.1 Description of the sale of products sub-matrix

3.1.1 Demand at a national level

The aggregated demand of basic grains at a national level is determined by consumers preferences, income levels and population. The national market results from adding up the seven regional markets, (Southern, Middle-Western, Northern, Atlantic Coast, North-Eastern, Middle-Eastern and West), forming a competitive market, where none of the markets by itself have the capacity to determine price, either as producers or as consumers.

With respect to destination of basic grains production, three are distinguished: holdings for self - consumption at the farm, market sales, and other

uses that include animal feeding or utilization as seeds. For different grains there are different destinations; for instance all rice production goes to the market (100% marketable), sorghum is not included in self-consumption, and in beans other uses are excluded.

3.1.2 Demand Functions

Demand functions representing "sale" activities in the National Model are estimated based on price elasticities, base price, and the quantities of product sold in the country.

The demand function is segmented in (n) equal intervals along the axis that represents product price, between two price limits. The upper limit is established by the equivalent to 1.5 times the base price or the intercept, if this was less, and as lower limit the equivalent to 0.5 times the base price. Base prices, consumption quantities and elasticities used for the generation of demand functions are indicated in the following table:

Table No. 2

INFORMATION USED FOR GENERATING DEMAND FUNCTIONS

Product	Cycle	Quantities (hws.)	Expected Price (Lps./hws)	Elasticity
Maize	First	6.886.770	7.00	-0.20
Maize	Second	731.962	7.00	-0.20
Beans	First	386.320	18.50	-0.16
Beans	Second	325.336	18.50	-0.16
Sorghum		892.144	6.25	-0.26
Rice		398.287	23.25	-0.29

First - spring
Second - post spring

3.1.3 Price sources

Sale prices of basic grains correspond to census year (1974) and were obtained from historical series of average prices to producers published by the Economic Studies Department of the Central Bank of Honduras.

3.1.4 Estimation of Elasticities

Using the information of the Income and Expenditure Survey 1977-1979 for the Republic of Honduras, prepared jointly by the Consejo Superior de Planificación Económica (CONSUPLANE), the Dirección General de Estadística y Censos (DGEC), the Universidad Nacional

Autonóma de Honduras (UNAH), and the Banco Central de Honduras (BCH), it was possible to estimate price elasticities of the demand for basic grains (maize, beans and rice). In the case of sorghum, the income elasticity estimated and published by FAO/SIECA 1/ was used and by means of the Frish methodology the price elasticity of sorghum was calculated.

4.1 Description of the risk sub-matrix

4.1.1 Methodology used to incorporate the risk component

To grasp in a certain way the behaviour of basic grains producers in Honduras, estimations were made of the risks involved in the production of different crops at a regional level and by cropping season.

Risk is an important element in annual production variations and may be attributed to either climatic factor or phytosanitary problems affecting yields,or to market price variations that affect seriously the producer income level. For these reasons, income variations (yield x price), which take into account both risk sources,were utilized for measuring risk.

1/ Study "Perspectivas para el Desarrollo y la Integración de la Agricultura en Centroamérica". Guatemala, May, 1984.

In the National Model risk is incorporated through deviations of expected average income by unit area harvested with respect to average income in an eight year series from 1974 to 1981.

Introducing the risk factor in the National Model allows for the determination of cropp planning that does not overestimate the more risky ones or underestimate crops that present lesser income variations.

An useful risk measure is the income standard deviation. Table No. 3 gives estimated values that meassure the risk level of different activities.

Table No. 3

INCOME STANDARD DEVIATIONS OF BASIC GRAINS BY REGION

Crops	REGIONS						
	Southern	Middle Western	Northern	Atlantic Coast	North Eastern	Middle Eastern	Western
Maize First	54.22	65.55	60.09	68.55	103.88	76.39	45.43
Maize Second	46.33	-.-	61.90	61.54	-.-	-.-	42.48
Beans First	-.-	123.56	73.91	119.09	143.99	92.41	74.22
Beans Second	43.37	48.88	74.07	62.54	54.25	37.41	85.11
Maize-Beans	75.27	76.31	115.31	-.-	-.-	92.08	107.15
Rice	388.44	166.22	322.87	170.00	261.04	-.-	260.16
Sorghum	45.82	45.52	-.-	-.-	-.-	55.54	38.95
Maize-Sorghum	84.93	75.86	-.-	-.-	-.-	55.78	82.03

First- spring
Second- post-spring

The previous table indicates that rice cultivation is

subject to significant variations in yield and prices; therefore, it is considered as a highly risky crop. On the contrary, sorghum is considered as a low rentability crop and presents lesser variations in yield and prices, indicating a lesser degree of risk than other crops.

To appreciate producers attitude toward risk, solutions of the National Model with different values of the aversion coefficient were obtained (Ø), with the purpose of simulating better the actual producers behaviour. In the case of Honduras, risk aversion coefficient variations correspond to the following values: 0.0, 0.5, 1.0, 1.5, and 2.0

A cero risk aversion coefficient indicates that producers are indifferent toward risk, and in this case they can assume a highly risky attitude. Values greater than cero indicate that farmers prefer more security, and in these cases producers will cultivate greater areas with fewer risks avoiding more risky crops.

IV. VALIDATION AND RESULTS OF THE MODEL

Since the model has been designed to simulate the situation of the agricultural sector for a given period, it is necessary to validate the results obtained, comparing them with values observed during the same period, thus determining the validity of the model used. There are a great number of variables against which the model may be validated, but there are not available values observed for all of them; therefore, the model has been validated against those variables considered most relevant and for which there is information available, such as cultivated area, production and prices.

During the validation process and through the analysis of the results some restrictions that reflect behaviour patterns of the agricultural sector were introduced, and also it was evident the necessity to identify and incorporate others. For instance, in the model the aversion risk coefficient is dealt with at a national level; nevertheless, there are indications about regional differences regarding attitudes toward risk (different coefficients of risk aversion), and to incorporate new restrictions would allow to improve the results, in particular at producers type level.

To validate the model, tests with different values for risk aversion coefficient were conducted, resulting that the value

that gives best results is -1.

Table No. 10 shows values obtained at a national level,as results of the model,for cultivated area, production and equilibriun prices for basic grains, as well as values observed and error estimations. In this table it may be observed that error estimations in these variables is less or equal to 10%, except with sorghum price which has an error estimation of 17%.

Table No. 4

PRODUCTION, AREA AND PRICES

National Level

Product	MODEL			OBSERVED			ERROR (%)		
	Production hws.	Area (Mz)	Price Lps/hw.	Production hws.	Area (Mz)	Price Lps/hw	Production	Area	Price
Maize I	6.788,345	302,513	7.34	6.855,770	308,947	7.00	-1	- 2	5
Beans I	381,905	27,874	19.24	386,320	27,735	18.50	-1	0	4
Rice	406,537	20,290	21.21	398,288	19,379	23.25	2	5	-10
Sorghum	925,286	9,264	5.17	892,144	8,473	6.25	4	9	-17
Maize II	731,962	39,927	6.83	731,962	43,298	7.00	0	- 8	- 2
Beans II	329,054	32,708	17.45	325,336	36,516	18.50	1	-10	- 6

I = First (spring)

II = Second (post-spring)

Tables Nos. 4 and 5 show the results obtained at a regional level for maize and beans (first cycle); noticing that predictions of cultivated area and production of these products have errors of less than 20%.

The less accurate estimation for a product at a regional level, was the estimation for rice, which is a consequence of the small areas cultivated by producers; in general each type of producer cultivates less than 1000 manzanas per region.

Table No. 5

(MAIZE (First or Spring Cycle)
(Sole and associated)

Regional Level

Region	MODEL		OBSERVED		ERRORS	
	Area (mz)	Production (hws)	Area (Mz)	Production (hws)	Area	Production
Southern	50,938	462,046	61,778	519,159	-18	11
Middle-Western	69,480	776,092	60,293	623,942	15	25
Northern	85,319	1992,412	82,949	1728,342	3	11
Atlantic Coast	15,422	386,990	25,640	632,478	-40	-39
North-Western	28,954	891,291	38,639	1091,222	-25	-18
Middle-Eastern	58,493	881,284	67,305	864,248	-13	2
Western	70,219	1464,280	71,584	1427,382	- 2	3

Table No. 6

BEANS (First or Spring Cycle)

Region	MODEL Area (Mz)	MODEL Production (hws)	OBSERVED Area (Mz)	OBSERVED Production (hws)	ERRORS (%) Area	ERRORS (%) Production
Southern	0	0	903	15,488	0	0
Middle Western	1,320	44,144	1,615	50,776	-18	-13
Northern	8.072	110,811	7,206	102,300	12	8
Atlantic Coast	3,209	46,393	3,232	44,748	- 1	4
North-Western	6,027	64,485	4,987	55,748	21	16
Middle-Eastern	5,223	57,836	6,124	66,176	-15	-13
Western	4,025	58,236	3,668	51,084	10	14

At the type of producers level, estimations have even greater errors than estimations at regional and national levels, finding greater error in rice and sorghum. The following table shows some of the results obtained at producers level. The group of larger producers is the one that shows greater error resulting from its minor participation in basic grains production.

Table No. 7

RESULTS AT THE PRODUCERS LEVEL

Cultivated Area (Mz)

	Region 3			Region 6			
	MAIZE I			BEANS II		MAIZE I	
	Group 1	Group 2	Group 3	Group 1	Group 2	Group 1	Group 3
Model	27,132	31,180	18,981	6,138	6,088	22,810	23,684
Observed	30,224	33,486	16,389	6,371	5,636	21,637	22,145
Error (%)	- 10	- 7	16	- 4	8	5	7

I - first (spring)

II - second (post-spring)

Resources

The dual solution of the model gives the opportunity costs of limiting resources, and for unproductive resources the opportunity cost is zero. In this model, by reasons of size, land and labour resources were distinguished by cycle, that is first and second crop, thus limiting the analysis of the seasonal use of these resources; nevertheless its opportunity costs vary between regions and group of producers.

Land resources during the first cycle have an opportunity cost which varies between L.40.00 and L.50.00 for small groups and middle-sized producers from the Northern, Atlantic Coast, North-Eastern, Middle Eastern and Western Regions. In the same way, the

opportunity cost of land during the second cycles is much more lower, between L.15.00 and L.20.00 per manzana, resulting from the restrictive use of land during this cycle, as a consequence of cultural practices, considering that maize cultivation lasts the whole year, but while in the first cycle cultivation covers 120.000 manzanas, during the second cycle only 20.000 manzanas are cultivated.

In general, labour is not considered a limiting factor; on the contrary, there exists iddle labour, considering unemployment and the seasonal characteristics of labour in rural areas. Nevertheless, labour has an opportunity cost between L.3.00 and L.5.00 in the Atlantic Coast and North-Eastern regions, where rural population is more scanty than in other regions, and there is approximately 50% less availibility of family labour.

Income

The gross income of the agricultural sector generated by the sale of basic grains results in the order of 83 million lempiras, of which 67% come from beans, 11% from rice and 6% from sorghum. Regional distribution of income is proportional to each region's participation in production; 28% of the income is generated by the Northern region which is one of the most extensive and populated

and 18% of the income is generated by the Western region. This is a high percentage considering that this is a poor region but has an explanation in the fact that it is the most populated region of the country.

Olancho and the Middle-Eastern region generate 14% of the income. The region that generates lesser income is the Southern Region, 7% of the total, and it is considered one of the poorest regions in the country.

In the model, the amount of credit utilized to obtain production is 7 million lempiras, very near to the real amount, considering information given by the Banco de Fomento for 1974 for approved loans for basic grains,production was approximately of 9 million lempiras, which were not totally paid-up.

V. MODEL APPLICATIONS

1. Introduction

During the last decade the Government of Honduras has introduced several policies addressed to promote basic grains production to reach self-sufficiency. In particular, price, credit and technical assistance policies have been promoted.

The main difficulty found in formulating these policies is the lack of information available on producers response to changes in prices or to other incentives, and also the lack of instruments or mechanisms to evaluate the impact of adopted policies andto determine which group of the population is affected by these policies.

The agricultural sector linear programming model for basic grains described in this document, is an instrument that allows the evaluation of the impact of policies on prices, credits, input subsidies, export development, risk, etc., at national, regional and producer levels. Also, the cost of these policies may be determined by cost-effectiveness analysis.

For instance: a price policy directed to increase production may have two responses; one, that producers increase the cultivated area, generally reducing other crops, and the other,

increasing productivity through the adoption of more advanced technologies (greater use of fertilizers, chemicals, etc). These effects may be meassured if the supply characteristics are known, that is, if the supply elasticities, direct or crossed, are known.

One application of the model may be the "production response curves" from which supply elasticities may be derived as well as the possible effects on production technologies.

1.1 Effects of changes in maize prices.

In the case of maize (Table No. 12), in the same way that price increases, productions increases from 6.8 million hundredweights at a 7.34 Lps/hws. price to 9 millions for a 9.48 Lps/hws. rate.

Graph No. 2 indicates that there are different responses in maize production to different price ranges, being elastic in the L.7.34 Lps/hws.range. From there on, it becomes inelastic, in particular for prices over 9.50 Lps/hws.

Changes on prices for maize (first cycle) affect mainly sorghum and maize (second cycle) production, with a

reduction of 16500 and 20916 hws, respectively, when there occurs a change in the price for maize between 7.34 and 8.00 Lps/hws. Impact on beans and rice production is reflected on prices higher than 8.00 Lps/hws.

1.2 Changes in beans prices

Changes in beans prices do not affect the production of other grains, Graph No. 3 shows that production response to price modifications is more or less constant for a price range between 19.2 Lps/hws. and 23.00 Lps/hws. (Table No. 13)

1.3 Supply elasticities estimation

The information and graphics presented in the above sections were used to estimate direct and crossed supply elasticities. In the case of changes in maize price, the results obtained are presented in the following table.

2. Production Response Curves

Production response curves give the production levels that

result from a price change in a product when a simultaneous adjustment occurs in the prices of other products. These curves may be generated varying demand curves in such a way that the model determines the new balance points of prices and supply quantities.

Graphic Nos. 2 and 3 present response curves of direct production for maize(first cycle) and beans (first cycle). Points indicated in the graphic correspond to equilibriun conditions that result from moving to the right demand curves for each product, at intervals of 5% for maize and of 10% for beans, mantaining, in each case, demand curves for other products in their initial positions. Graphic No. 1 shows the tendency of such curve.

Graphic No. 1

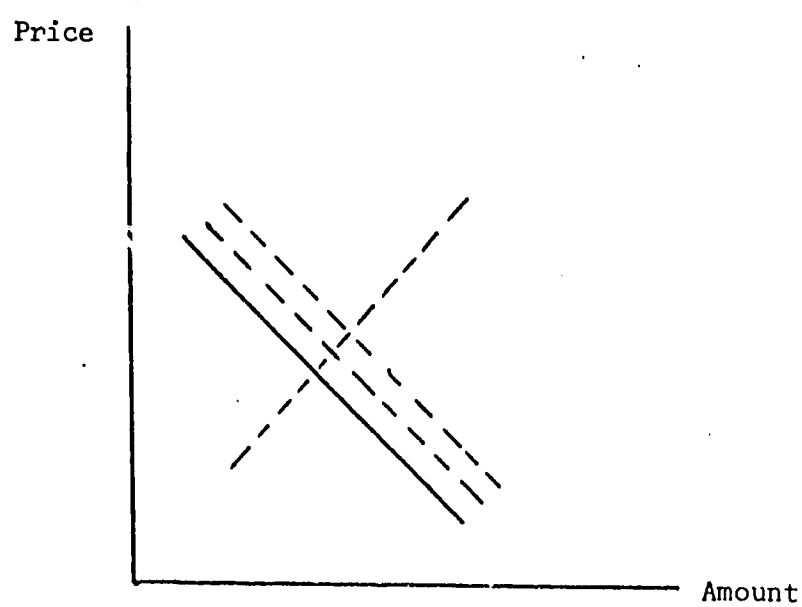


Table No. 8

SUPPLY ELASTICITIES WITH RESPECT TO PRICE OF MAIZE

Price Rank	Maize	Beans	Rice	Sorghum	Maize Second or post-spring	Beans Second or post-spring
7.3 - 8.0	1. 8	1. 2	0	- 2	-3	- 1.1
8.0 - 9.5	.68	- .12	-.11	- .10	0	0
9.5 - 13.0	0.08	- .09	-.06	- .15	0	0

The estimated values for direct elasticities are positive, according to the economic theory. It is observed that as maize price increases it becomes more inelastic, 0.68 for the range between 8.00 and 9.50 Lps/hws, and 0.08 for the rank between 9.5 and 13.00 Lps/hws. Beans are more elastic, 4.2 for the range between 20.00 and 23.00 Lps/hws. Cross elasticities are negative to zero indicating that products are substitutes or independent.

3. Credit demand

Table No. 9 and Graph No. 4 show the credit demand curves It may be observed that at an annual interest rate of between 9% and 14% the amount of credit remains constant, increasing in

L.300.000.00 when interest rates drop from 9% to 3%. This low credit response to a reduction in interest rates is explained to a large extent, by the low technological levels of production alternatives of small and medium-sized producers that the model contains and by the fact that these producers represent approximately 75% of total production of maize and beans. Considering these two aspects, they have a low credit necessity for the production of basic grains, since credit is mainly directed to rice production and it is obtained by large producers, whose participation in basic grains production is the least.

Table No. 9

Credit Demand

Interes rate (%)	14	12	10	9	6	3	2	1	0
Credit (Million Lempiras)	6.9	6.9	6.9	6.9	7.1	7.2	7.2	7.2	7.7

4. Impact of different policies at the producers level

The model permits the evaluation of the impact of different policies at the producers and regional levels. Table No. 11 shows the impact of several policies on maize (first cycle) production

in the Northern Region. It shows, for instance, that a credit policy does not have any impact on maize production from small producers, but determines an increase of 43461 hws. of maize (first cycle) in the group of middle-sized producers. However, in this same group a reduction of 41370 hws. of maize appears during the second cycle production. On the other hand, an increase in the price of maize (first cycle) has a strong impact in production of both groups, obtaining an increase of 96752 hws. in first cycle production and of 85622 hws. in the second cycle production from small producers.

This increase represents one million lempiras more in the income of these producers. The middle-sized group has a net increment of 58227 hws. in maize production, which means an increase of approximately half a million lempiras in their income.

Table No. 10

MODEL RESULTS

	MODEL		OBSERVED		ERROR	
	Maize I hws.	Maize II hws.	Maize I hws.	Maize II hws.	Maize I hws.	Maize II hws.
Small	735886	147689	702550	173712	5	-15
Medium-size	636076	192040	715418	154550	-11	24

I - first of spring

II - Second of postspring

Table No. 11

IMPACT OF DIFFERENT POLICIES ON MAIZE PRODUCTION

	Interest=0%		Maize Price=9.00		Different Prices According Produc.		Beans Price = 22.00	
Small	0	0	96752	85622	0	0	0	0
Medium-Size	43461	-41370	-85155	143382	57989	-52531	-353902	260378

Table No. 12

MODEL RESULTS: PRICE POLICIES

AREA AND PRODUCTION OF BASIC GRAINS DEPENDING ON DIFFERENT PRICES FOR MAIZE

	Maize (1st.Cycle)		Beans (1st.Cycle)		Rice		Sorghum		Maize (2nd.Cycle)		Beans (2nd.Cycle)	
Maize Price	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
7.34	366,828	6,788,345	35,900	381,905	20,290	406,537	75,554	925,286	39,925	731,962	32,708	329,054
7.64	377,266	7,127,762	28,218	386,320	20,290	406,537	75,246	925,286	31,198	721,504	25,802	329,054
7.75	387,103	7,441,935	35,694	386,320	20,290	406,537	73,425	908,715	29,053	721,504	35,677	329,054
7.98	395,158	7,693.407	37,961	386,320	20,290	406,537	72,312	908,715	30,627	711,046	31,855	325,336
8.00	409,805	8,027,903	36,096	386,320	20,290	406,537	76,235	908,715	22,296	711,046	31,736	325,336
9.00	421,277	8,441,990	38,058	377,490	19,802	398,287	78,033	892,144	30,011	711,046	24,789	325,336
9.48	431,764	8,952,502	36,404	377,490	19,802	398,287	75,311	892,144	29,603	711,046	18,421	325,336

Note: Area in Manzanas and production in hundredweights.

Table No. 13

MODEL RESULTS: PRICE POLICIES

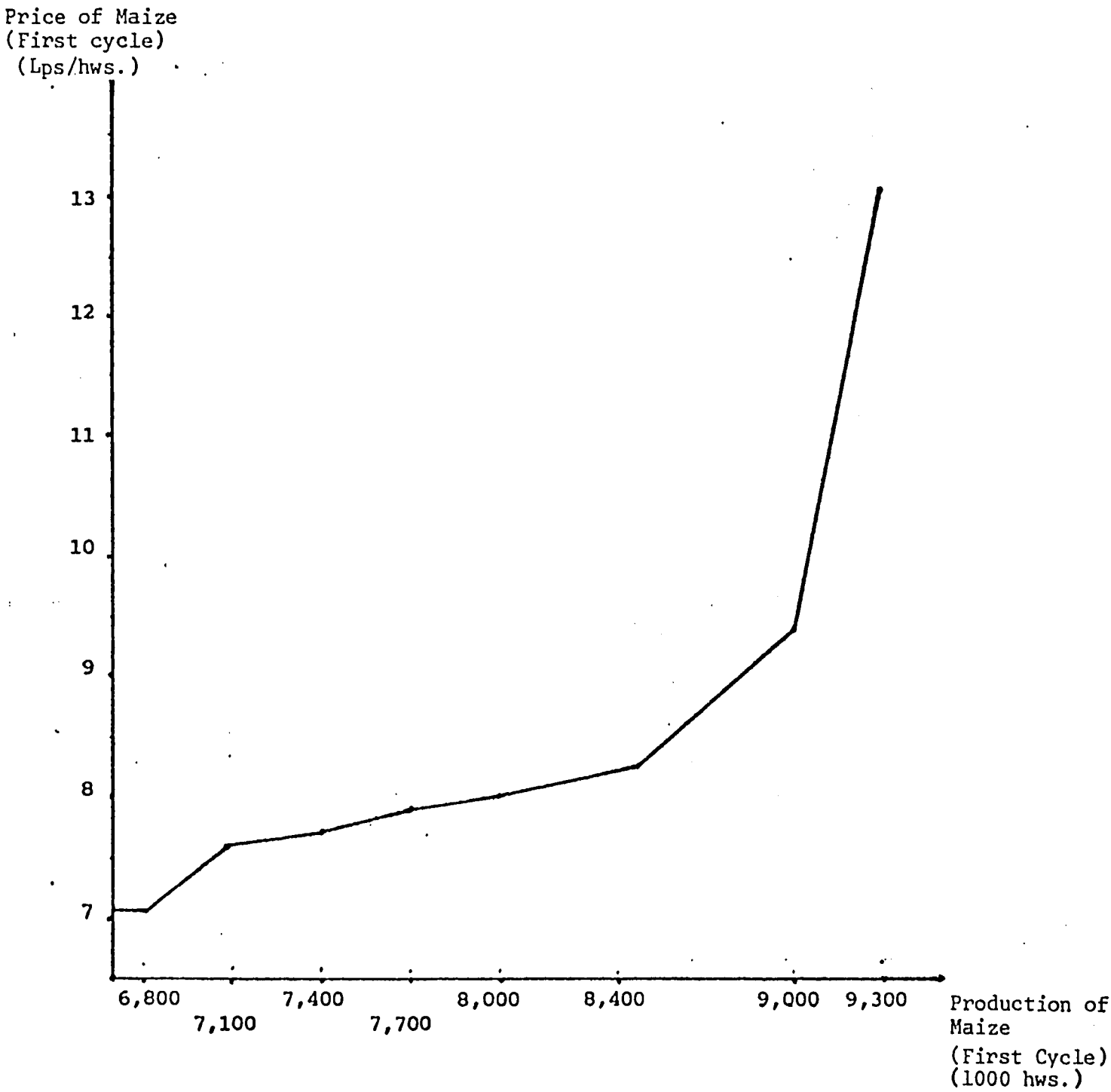
AREA AND PRODUCTION OF BASIC GRAINS DEPENDING ON DIFFERENT PRICES FOR BEANS

Beans Price	Maize (1st.Cycle)		Beans (1st.Cycle)		Rice		Sorghum		Maize (2nd.Cycle)		Beans (2nd.Cycle)	
	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
19.24	366,828	6,788,345	35,900	381,905	20,290	406,537	75,554	925,286	39,925	731,962	32,708	329,054
19.30	339,448	6,788,345	45,828	496,476	20,290	406,537	76,664	925,286	38,225	731,962	32,705	329,054
19.30	368,046	6,788,345	48,488	534,667	20,290	406,537	76,685	925,286	38,131	731,962	32,660	329,054
20.15	367,241	6,788,345	54,578	572,857	20,281	406,537	75,074	925,286	39,050	742,420	32,660	329,054
21.93	344.658	6,788,345	68,378	746,149	20,290	406,537	75,247	925,286	38,696	742,420	31,948	329,054
23.12	369.774	6,689,920	90,138	932,686	20,290	406,537	87,570	925,286	40,097	742,420	32,758	329,054

Note: Area in Manzanas and production in hundredweights.

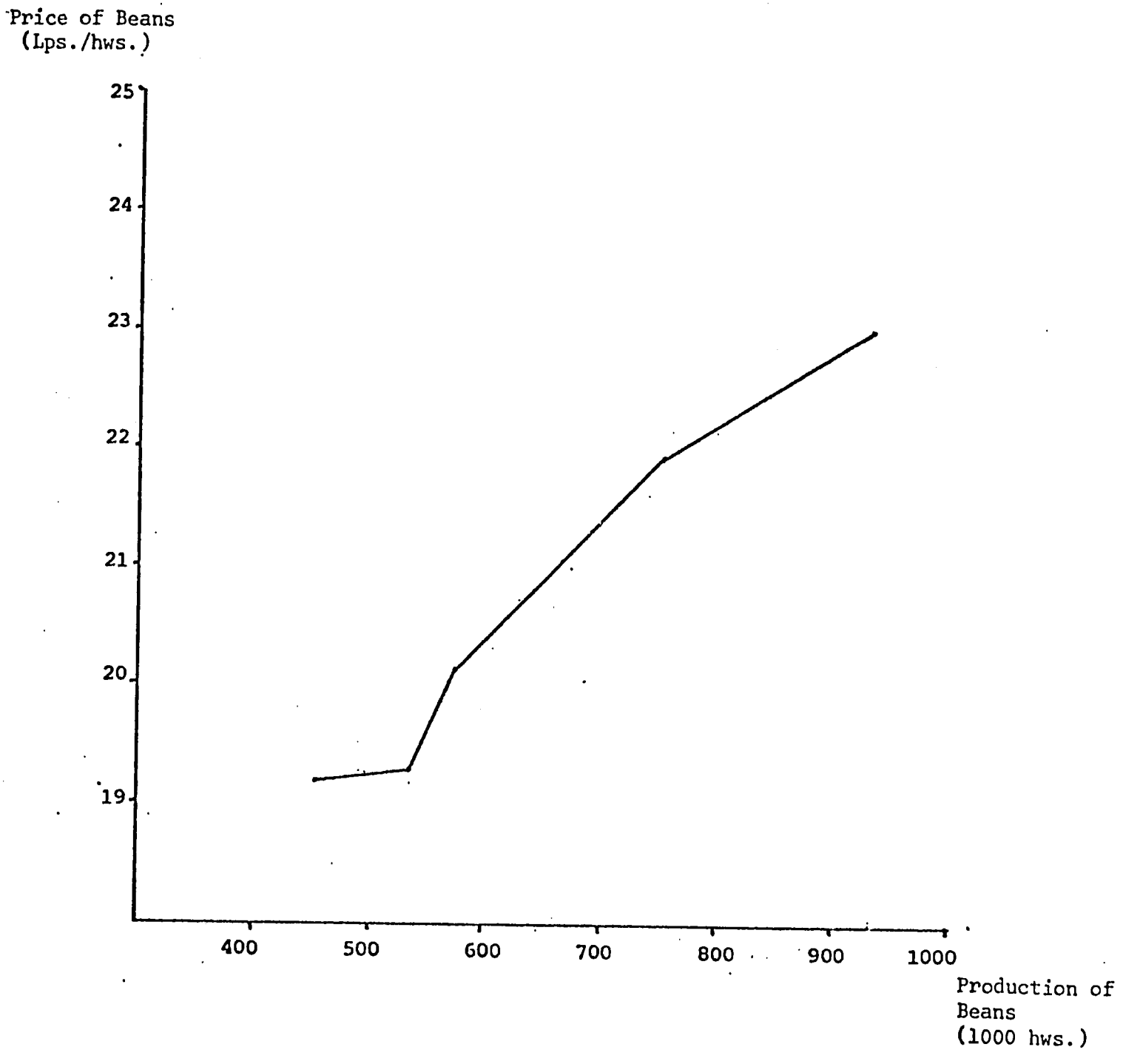
Graphic No. 2

RESPONSES OF MAIZE PRODUCTION AND VARIATIONS IN THE PRICE FOR MAIZE



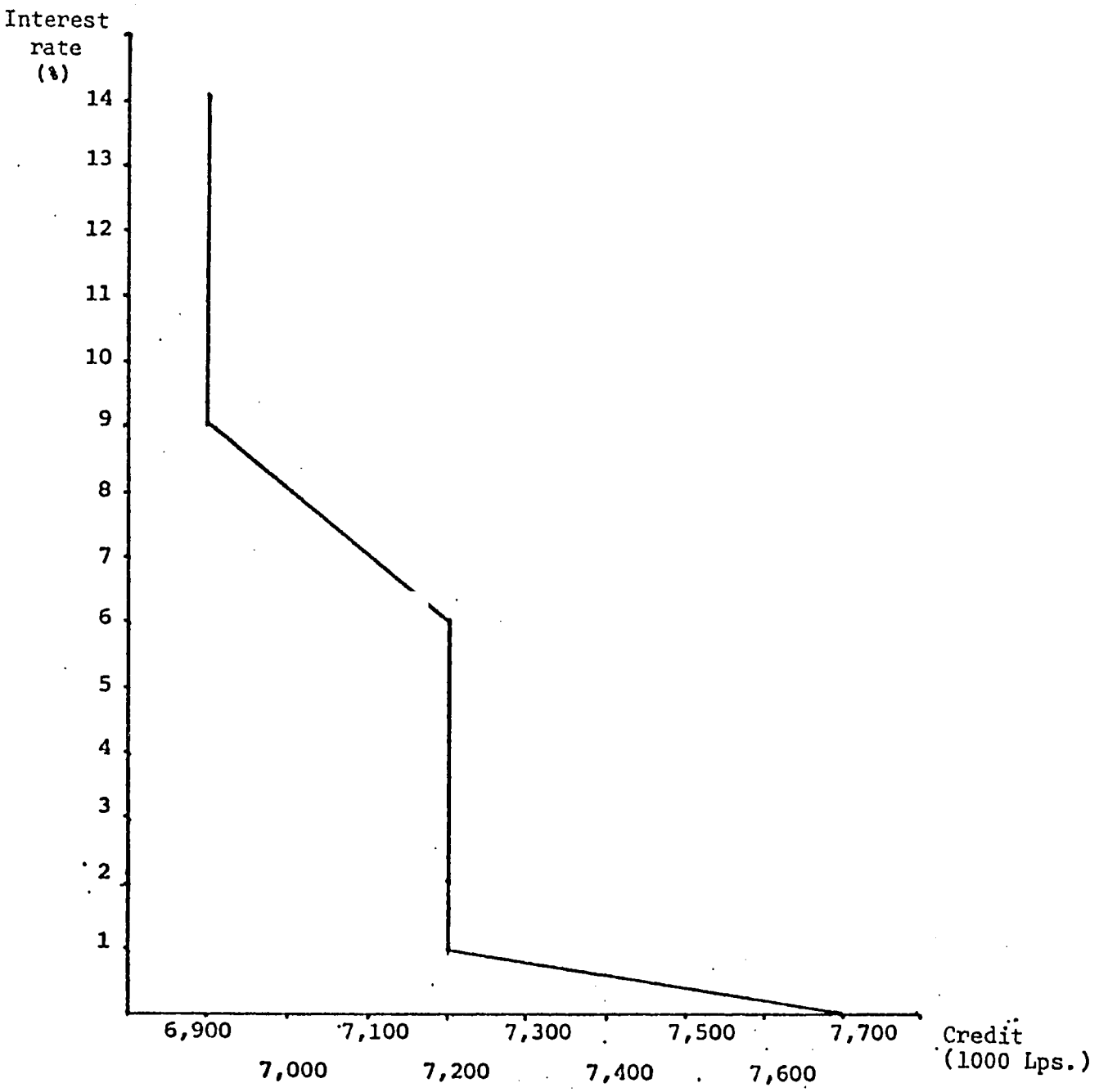
Graphic No. 3

RESPONSES OF BEANS PRODUCTION AND VARIATIONS IN THE PRICE OF BEANS.



Graphic No. 4

CREDIT DEMAND



A N N E X NO. 1

I. GENERAL DESCRIPTION OF HONDURAS

Honduras is one of the five Centralamerican republics. It has an extension of 112.000 square kilometers and is located in the middle of Central America. It limits to the north with the Caribbean Sea, to the South with Nicaragua, to the South-West with El Salvador,and to the North-West with Guatemala.

Two important mountain chains divide the Honduran territory from North-West to the South-East, with low tropical lands along both coastal zones. Between the mountain foothills there are several valleys and plains which are relatively fertile. Climate varies from mild in the mountainous region of the country to tropical in the low lands. Dry season lasts from November to May in the South-West and interior regions of the country. Along the north Coast and in the Eastern part of the country heavy rains fall from October to March. The rain system determines agricultural exploitation in first cycle cultivations in a period that covers from May to September, and second cycle cultivations that go from September to January.

Although the country has about 11.2 million hectares, it is estimated that only 35% of them have agricultural potential as cultivation or grazing lands. Best lands for agriculture are located in the North Coast and South plains and in the main river

valleys. It is estimated that more than 2.5 million hectares may be utilized ofr the production of annual and permanent crops but a large part of this land is not accesible due to hte lack of an adequate infrastructure.

Actual population is estimated in 4.2 million inhabitants wich are distributed in 60% rural (2.5 millions) and 40% urban (1.7 millions). The larger demographic concentration is found in the mild eastern and southern areas of the Republic. This results in a high population density in places where land is less adequate for agricultural exploitation due to topographic conditions or to fertility of soils. Therefore, a subsistence agriculture is practiced in lands that normally should be kept as forest area reservations.

Urban population is concentrated mainly in nine cities with more than 20.000 inhabitants; more than 50% of the urban population is found in Tegucigalpa, the capital of Honduras, located in the central part of the territory and in the city of San Pedro Sula located at the Sula Valley in the North Western coastal plain.

Honduras has been considered as one of the poorest countries in Latin America. Illiteracy is calculated in 60%, with a rate of 81% in rural areas and 40% in urban areas. The great majority of primary schools offer less than six years of education. The

average educational level for all the country is less than two years of schooling.

Studies carried out by AID show that in 1980, 55% of the total honduran population did not have access to health services outside of household medicine, 28% had access to Ministry of Health professionals and 17% were covered by social security and private specialists. Mortality and morbidity statistics show that lack of environmental sanitary conditions is the most serious specific health problem in the country.

Malnutrition is a serious problem, prevailing proteinic, caloric and Vitamin A deficiencies. Investigations carried out by the Consejo Superior de Planificación Económica show that about 600.000 children under five years of age suffer proteinic/caloric malnutrition, of which 250.000 are moderate to severe cases; also more than half a million school-aged children are in similar situation and a large majority of adults are under-nourished. Endemic goiter, hipovitaminosis "A", and iron deficiency in pregnant women are still serious problems. The problem is attributed to insufficient food availibility, low income levels, inadequate biological use of food, and institutional deficiencies of the State in matters of nutrition.

1. Agricultural Situation

Agriculture is the most important sector in the honduran economy; it generates approximately 30% of the gross internal product. The economically active population in the agricultural sector varies from 600.000 to 650.000. It is estimated that about 21% of the total are unemployed and that 75% are underemployed, as a result of lack of full-time job opportunities and to earning insufficient income to have adequate diets for theselves and their families. Nearly 45% of the labor force works for a salary and the difference is self-employed or in family work.

Considering that the majority of the population is concentrated in the rural sector, where the greater degree of unemployment and sub-employment occurs, and that the population with greater deficiencies in health and education is found among rural population, the reasons for the high degree of existing malnutrition in this segment are obvious and the solution of the problem lies, to a large extent, in looking after the needs of the rural population.

There exists in Honduras a dichotomy in agricultural exploitation. Production of most important food products for the population (basic grains) originate in thousand of small productive units in which characteristics of subsistence agriculture prevalis.

Export production has the characteristics of commercial agriculture. Some crops are grown in large farms; other products, like coffee, are cultivated in small units but with more advanced cultural practices.

1.1 Cultivations for internal consumption

1.1.1 Basic Grains

Basic grains are the most important crops for internal consumption. The denomination "basic grains" cover maize, beans, rice and sorghum. The first three are used mainly for human consumption, and, in fact, maize and beans constitute the basic diet for the population. Sorghum is for animal consumption, but is also used for human consumption.

1.1.1.1 Maize

Maize is the most extensive crop in the country. The last agricultural census (1974) show a cultivated area of 459.250 manzanas (320.213 hectares). Approximately 89% are first cycle or spring crops and 11% are

second or post spring cycle crops. Total production was of 7.665.658 hundredweights (352.600 metric tons) which gives an average yield of 0.97 M.T. per hectare. During 1980 an agricultural survey was conducted that showed that no significant changes have occurred in the internal supply of this product, however, it may be observed a reduction in yields and in total production. Results of the survey show an increase in cultivated area to 502.840 manzanas (350.607 hectares) and a reduction in production to 7.602.806 hundredweights (349.715 M.T.). Production quantities recorded for the decade 1973/74 - 1982/83, according to the agricultural census of 1974, the agricultural survey of 1980 and crops forecasts, shows that annual production of maize has been mantained between 7.6 and 8.5 million hundredweights (349.6 and 391.0 thousand M.T.), except for two years where production increased considerably over the quantities mentioned above due to favorable climatic conditions. As the rate of production increase has been lower than the demand rate generated by demographic growth and industrial use, deficits

in the domestic demand have resulted which have been covered partially by imports.

Maize is cultivated by thousand of producers mainly in farms not larger than 72 manzanas (50 hectares). Grouping three stratas of information from the 1974 Agricultural Census results in the following data: The country had 194.300 farms with maize, 64% of the total in properties not larger than 7 manzanas (5 hectares), occupying 40% of cultivated area and generating 41% of total production. The average cultivated unit was of 1.5 manzanas (1.03 hectares). Farms included in the 7 to 72 manzanas strata represented 31% of the total number of farms; 43% of the cultivated area and 42% of production. The average cultivated area for maize was 2.3 hectares. Theses two strata constitute 96% of farms cultivated with maize , 83% of cultivated area and 83% of production. 6.7 thousand farms in the strata of more than 72 manzanas (50 hectares) were recorded, producting 17% of the total and 17% of the

maize cultivated area. Average cultivated area in this stratum is 11 manzanas (7.6 hectares). More recent information on how maize production is actually distributed, is not available, but if the small impact of the agrarian reform on small producers and the demographic increase in total areas as well as the result of surveys are taken into account, it may be concluded that the situation remains the same or with a greater degree of fragmentation.

Besides, if the roughness of the land of the country is taken into account and the fact that to a great extent, small producers have been displaced to mountainsides and plateaus, it may be concluded that a high proportion of maize production comes from mountain ranges and mountainsides with low soil fertility that are not suitable for agricultural cultivations. The application of the agrarian reform in the country during the decade of the seventies has resulted in the production of maize in plain and fertile lands and the use of more advanced cultural practices, which is having a positive

impact on modernization of agriculture for domestic use.

Information from the agricultural survey of 1980 on production distribution, shows that 57% of the production is retained in farms for family consumption, animal consumption and other uses, and 43% is sold, mainly through private marketing channels. Grain retained in the farms as well as grain for sale is used mainly for human consumption in a nonprocessed form.

1.1.1.2 Red Beans

Red beans are second in importance after maize, in cultivated area as well as a component of the population basic diet. During 1974, there were registered 68.219 farm units with this crop. Like maize it is grown during a first (spring) and second (post-spring) cycles, but with a more balanced distribution (59% in first cycle and 41% in second cycle). In general terms, beans production during the 1974-1983 decennial has been fluctuating around 30 to 35 thousand M.T.

In 1974, according to forecasts, crop reached 34.1 thousand M.T., and for 1982-83 abount 30.6 thousand M.T. For intermediate years, production quantities have been between these two parameters, yield by hectare is low, with an average of 0.50 M.T. per hectare.

This crop also in the hands of small producers. During 1974 about 39 thousand farms smaller than 7 manzanas (5 hectares) were recorded, with 40.133 Manzanas of beans cultivation, which gives an average of one manzana per farm (.69 hectares). In the following strata form 7 to 72 manzanas, the number reaches 26.3 thousand with a cultivated area of 44.800 manzanas which means that the average cultivated area of beans correspond to 1.7 manzanas (1.17 hectares)- These two strata produced 78% of the 1973-74 crop, in 84% of total cultivated area. Difference came from farms larger than 72 manzanas (50 hectares) with an average of 5.4 manzanas (3.8 hectares) cultivated with this

crop. In general unit yields are very low, but they tend to increase in farms with larger cultivation areas, showing more advanced cultural practices. Nevertheless, this is a form of agricultural exploitation with traditional cultivation characteristics, if it is measured by the size of cultivated area, low yield, locations and limited technical assistance given to this crop. Beans are the second basic food for honduran population and its main source of protein. About 55% of production is retained in farms for family consumption, seeds and other uses. The reamining 45% is sold, mainly through private marketing channels.

1.1.1.3 Sorghum.

This crop is grown by peasants in the poorest soils in the country. In 1974 more than 40.000 cultivations were registed, covering an area of 84.6 thousand manzanas (59.0 thousand hectares). At present,cultivated area remains in the order of 80.0 thousand manzanas (55.8

thousand hectares). To a large extent, it is cultivated in association with maize. More than 50% of total cultivation is concentrated in the Southern Region of Honduras, following in importante by the Middle-Eastern and Middle-Western Regions. Cropping takes place in low fertility soils with rough topography, using traditional cultural practices, hence, hield per hectare is low, with a declining tendency due to soil exhaustion. At the beginning of the seventies the average yield was 1.2 metric tons per hectare, while the average for the last five years results in .93 metric tons per hectare.

Results of the 1980 agricultural survey show that 76% of the crop is retained in farms for human and animal consumption and for other uses. The difference, that is 24% of the crop, is sold through private marketing channels, almost totally for agro-industrial purposes. An interesting fact about sorghum is that 51% of the production retained in ther farm is used for human consumption, but the part that goes through marketing channels is used, almos totally, in agro-industry for animal consumption. The

income and expenditure survey analysis confirms this statement, since purchase of sorghum does not appear as an item in food expenditures.

1.1.1.4 Rice

This product has relatively minor importance within the "basic grains" group. The Agricultural Census for 1974 shows a total of 16093 rice exploitations, with a cultivated area of 20870 manzanas (14.553 hectares). Like the other three products mentioned above, the great majority of producers are in small and medium-sized farms (0 to 72 manzanas) (94% of farm units and 76% of cultivated area). Average area cultivated by farm results in 1.3 manzanas (.91 hectares). Cultural practices are traditional, prevailing the type known as "dry farming". Yield is low (1.5 M.T. paley rice per hectare). The analysis of the development of this crop during the decade of the seventies shows a considerable increase in cultivated area as

well as an increase in yield per hectare. During the decade's first five years (1970-71 to 1974-75) average cultivated area was 18.126 manzanas (12.638 hectares) with an average yield of 1.4 M.T. per hectare. However, during the last five years the average cultivated area rises to 26.300 manzanas (18.338 hectares). Also, there is an increase in average yields to 1.7 M.T. per hectare.

Several factors have caused the increase in cultivateda area and yields in rice, but three are considered most important: First, the increase in credit for this cultivation. The Banco Nacional de Desarrollo Agrícola has increased the number and amount of credits for this activity. Between 1979 and 1983 the amount destined to rice cultivation has doubled, from Lps. 3.7 millions in 1979 to 8.7 million in 1983.[1/] Another factor, resulting from credit policies is the

1/ One Lempira = US$ 0.50

intensification of more advanced cultural practices, such as cultivation of "flooding rice" in lands benefitted from the agrarian reform and in individual farms, and finally, guarantee prices to producers from the Instituto Hondureño de Mercadeo Agrícola (IHMA) have been increased.

Rice is an important component of food consumption in Honduras, even though it does not have the same importance as maize and beans. 79% of paley rice production is channelled to the national market and 21% is retained in farms for human and animal consumption and other uses.

1.1.2 Basic grains marketing circuits and flows.

Analysis of marketing channels of national production of basic grains shows that, in general, the great majority of internal supply is sold through private entities. For maize and beans the market supply of unprocessed grain is channelled by producers through truckers and merchants, to wholesalers and retailers'

TABLE NO. 1

NUMBER OR FARMS, CULTIVATED AREA AND NATIONAL PRODUCTION OF BASIC GRAINS

1 9 7 4

Farm Size	Cultivations	Cultivated Area (Manzanas)	Production (hws.)	Cultivations	Cultivated Area (Manzanas)	Production (Hws.)
	Maize First Cycle (Sole + Associated)			Maize Second Cycle (Sole + Associated)		
TOTALS	168,565	408,188	6.886,779	25,769	48,673	1.024,221
Less than 7 manzanas	107,766	163,704	2.776,400	17,064	22,132	338,997
From 7 to 72 manzanas	54,873	175,577	2.914,912	7,881	19,330	293,260
More than 72 manzanas	5,926	68,907	1.195,458	824	7,211	391,964
	Beans first cycle (Sole + Associated)			Beans second cycle (Sole + Associated)		
TOTALS	39,714	58,853	386,320	28,505	40,062	325,336
Less than 7 manzanas	21,807	22,153	148,104	17,302	17,585	147,202
From 7 to 72 manzanas	16,204	27,702	182,622	10,105	16,516	133,430
More than 72 manzanas	1,703	8,998	55,594	1,098	5,961	44,704
	Rice			Sorghum (Sole + Associated)		
TOTALS	16,093	19,379	398,288	40,256	84,369	892,144
Less than 7 manzanas	7,469	5,001	99,440	26,348	38,025	421,696
From 7 to 72 manzanas	7,685	9,431	185,306	13,066	36,536	358,006
More than 72 manzanas	939	4,947	113,542	842	9,808	112,442

SOURCE: National Agricultural Census, 1974

TABLE NO. 2

CULTIVATED AREA AND NATIONAL PRODUCTION OF BASIC GRAINS

1 9 8 0

Farm Size	Cultivated Area (Mzs)	Production (Hws.)	Cultivations	Cultivated Area (Mzs)	Production (Hws.)
	MAIZE FIRST CYCLE			MAIZE SECOND CYCLE	
TOTALS	398,523	5.966,021	2,501	104,371	1.636,785
Less than 10 manzanas	234,248	2.942.496	1,928	55,995	789,387
From 10 to 50 Manzanas	94,127	1.472,480	344	22,632	416,208
More than 50 manzanas	70,148	1.551,045	229	25,690	431,190
	BEANS FIRST CYCLE			BEANS SECOND CYCLE	
TOTALS	42,906	311,250	1,539	42,507	316,336
Less than 10 Manzanas	27,146	182,569	1,120	26,703	190,494
From 10 to 50 Manzanas	9,968	72,277	287	9,374	62,722
More than 50 manzanas	5,792	56,404	132	6,430	63,120
	SORGHUM			RICE	
TOTALS	73,823	834,160	770	28,992	536,384
Less than 10 Manzanas	52,344	570,093	421	11,340	172,308
From 10 to 50 Manzanas	14,330	158,539	183	6,515	130,835
More than 50 manzanas	7,149	105,704	166	11,137	233,241

SOURCE: Agricultural Survey for 1980. Agency for International Development (AID)

market supply of sorghum is used almos totally for animal consumption going from truckers and merchants to animal feed production plants. The part of the supply destined for human consumption follows the same marketing channels as maize and beans.

Producers sell paley rice to truckers and merchants, and these, in turn, sell it to rice processing plants or process the grain themselves for sale to retailers and consumers.

Since many years ago the government has tried to stabilize the price of basic grains through market intervention with minimum price guarantee.

Originally a government development bank carried out these functions, but in 1978 the Instituto Hondureño de Mercadeo Agrícola (IHMA) was established, with the purpose of promoting the improvement of marketing systems of basic grains assuring price stabilization in the national market through direct intervention in the purchase-sale process of these products, in domestic and foreign markets, to guarantee an orderly and balanced marketing to producers and an adequate supply to consumers.

Government intervention does not have an important impact on internal marketing channels of basic grains, as may be noted in Graph No. 1 to No. 4, showing market circuits and flows for the four products. In these graphs it may be observed that the volume of purchases of IHMA are low and that the grain is purchased from truckers and merchants who thus take advantage of the guarantee prices offered to producers. As is to be expected, amounts of grain purchased by IHMA vary according to the magnitude of the crop.

The contrary happens with grain's imports and exports, Foreign trade is controlled by tariffs, quotas and prohibitions, and IHMA is the only agency authorized to carry out and control these operations, by means of government exemtions when it is considered necessary, either by shortage of supply or by surplus in production. However, under certain circumstances, the private sector is authorized free exportation or is granted special import permits with tariff exemptions.
(Surplus in production or severe shortage of grains).

An analysis of foreign trade of basic grains in Honduras during the 70"s shows that the country has become

a net importer of these products. During the sixties the country was maize exporter, and the product was an important item in foreign trade. This situation reverses during the seventies when the country changes to be a net importer of maize.

The same happened with beans. Honduras was an important exporter of beans during the sixties; during the seventies it continued to be a net exporter but in amounts relatively low in comparison with previous years and not steadily, since frequently crops resulted insufficient to cover national demand requirements.

Sorghum imports or exports have not been important. International transactions of this product have been small during the two decades in value and in volume.

The country has been deficitary in domestic supply of rice. Cropping is low, and although rice consumption is also low, it becomes necessary to import this product to satisfy domestic demand.

1.1.3 African Palm

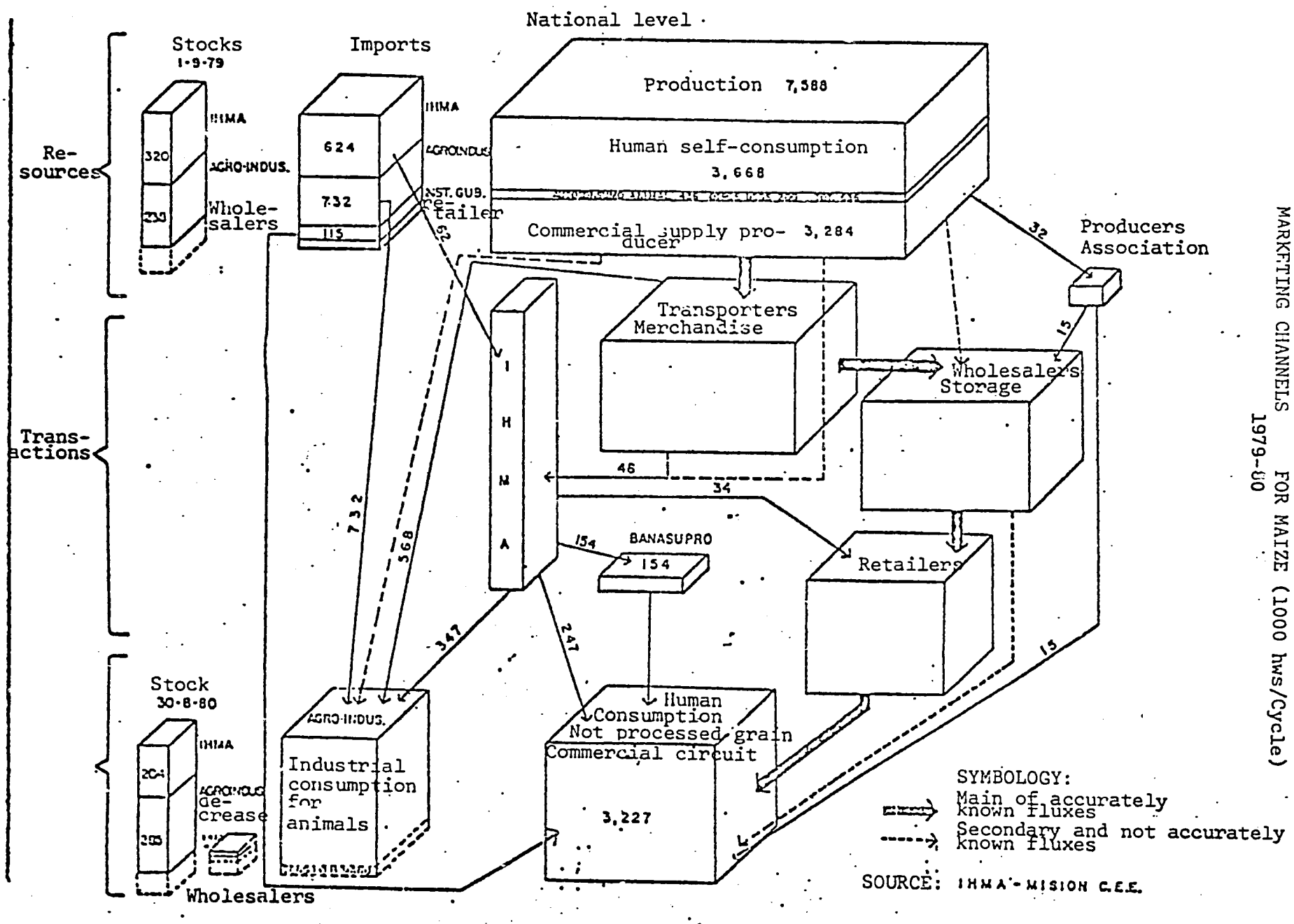
This cultivation was introduced in the North Coast of Honduras by the United Fruit Company, in the fourties,

in San Alejo, Department of Atlántida. At the beginning of the sixties, there were plantations in an area of 2.855 manzanas (1.991 hectares), and by the end of the decade they had increased to 4515 manzanas (3.148 hectares), producing 30.210 M.T. of palm oil.

As agrarian reform measures were intensified at the beginning of the seventies, the Instituto Nacional Agrario promoted african palm cultivation and the installation of processing plants by rural cooperatives, initially at the Bajo Aguán Valley, in the Department of Colón, and later on the Guaymas area in the Sula Valley, to such extent that this crop has become one of the most important in the country.

GRAPHIC NO. 1

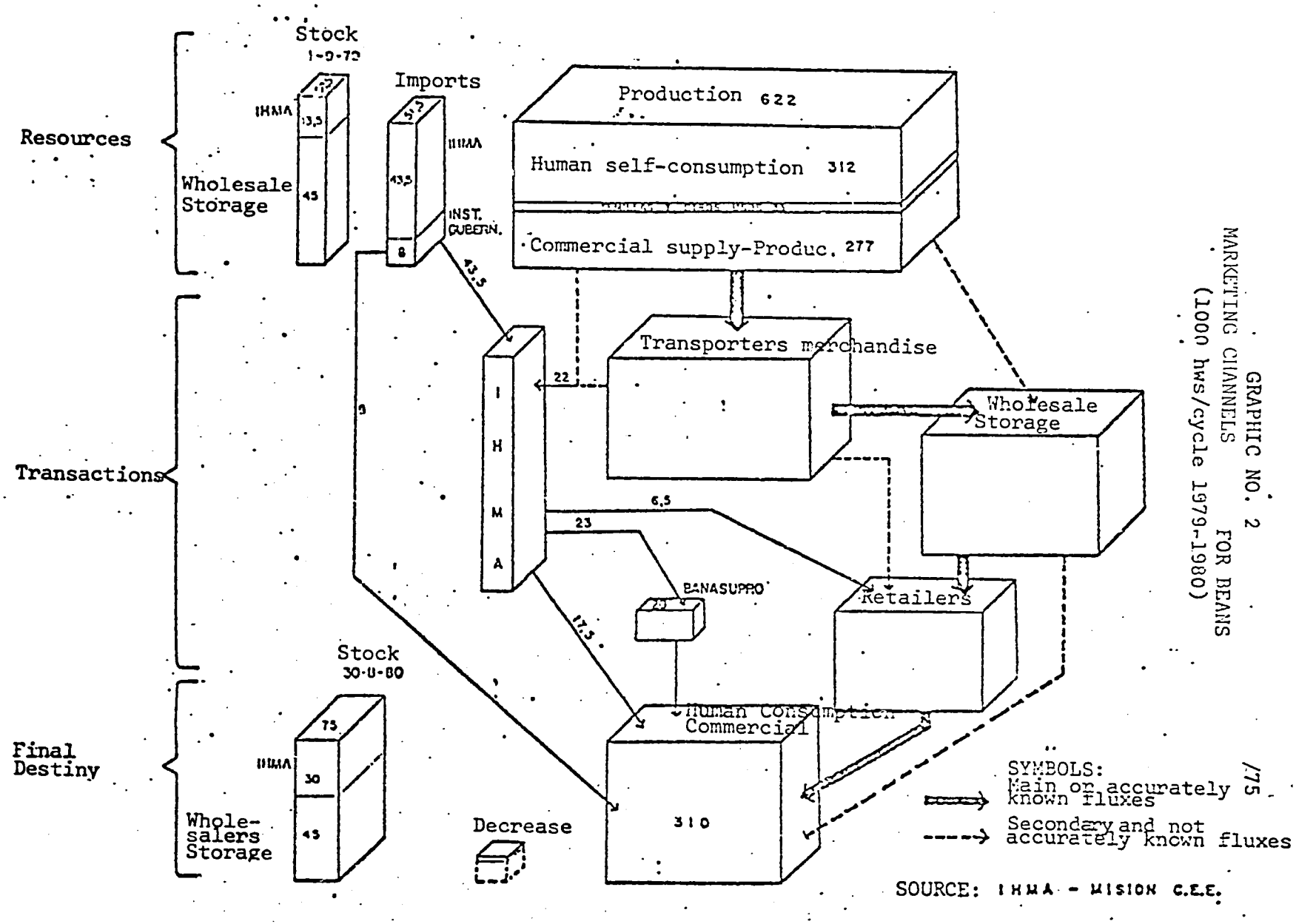
MARKETING CHANNELS FOR MAIZE (1000 hws/Cycle)
1979-80



GRAPHIC NO. 2

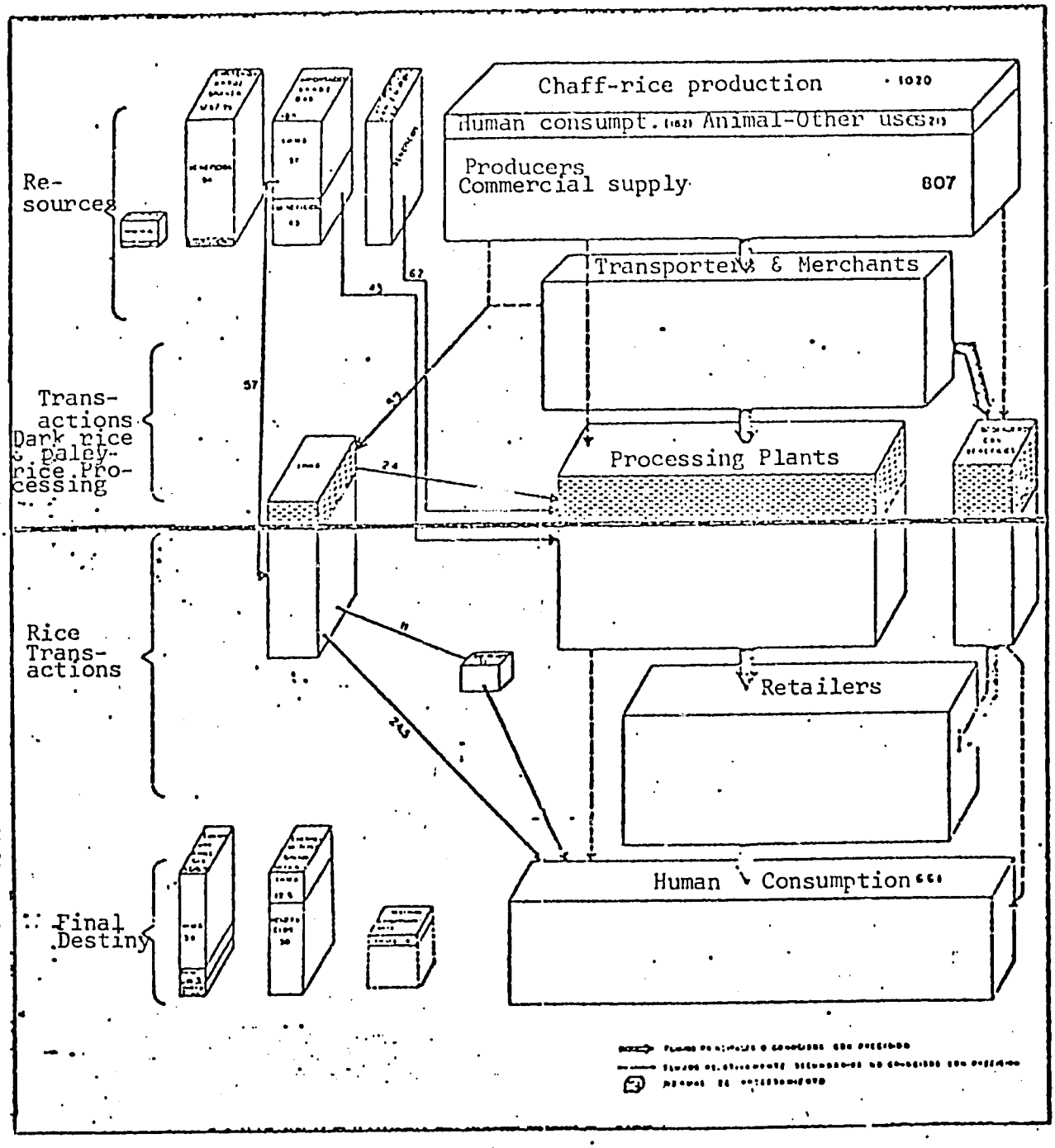
MARKETING CHANNELS FOR BEANS

(1000 hws/cycle 1979-1980)



SOURCE: IHMA - MISION C.E.E.

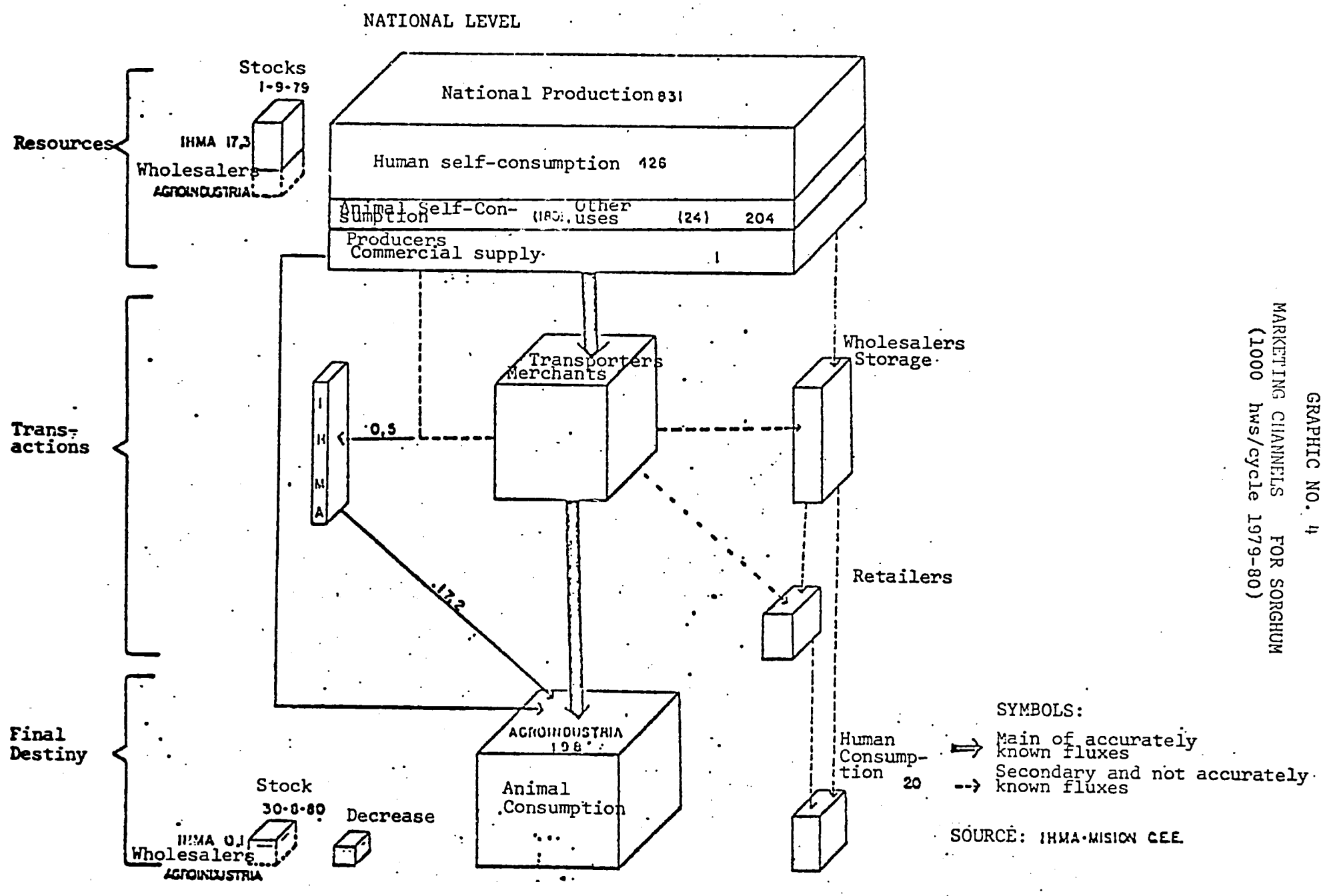
GRAPHIC NO. 3 MARKETING CHANNELS FOR RICE (1000 hws/cycle 1979-80)



SOURCE: IHMA-MISION C.E.E.

GRAPHIC NO. 4

MARKETING CHANNELS FOR SORGHUM
(1000 hws/cycle 1979-80)



The agricultural survey of 1980 gives an area of 26.130 manzanas (18030 hectares) distributed as follows: 12.346 manzanas (8.519 hectares) in the Sula Valley and 13.748 Manzanas (9.510 hectares) in the Aguan Valley, both located in the Nort Coast of the country. Palm oil production amounts to 80.369 M.T. This amount tends to increas as new plantations enter the production stage. Due to the nature of the crop, plantations have their own oil processing plants.

All of the palm oil production is processed in the country for domestic and other Central American countries consumption in the form of cooking oil, margarine, soap, etc. However, the increase in production is resulting in surplus that is being exported out of the Centrl American region.

2.2 Export Crops

2.2.1 Coffee

Coffee is considered the most important agricultural export crop and the most significant for the county's economy. A coffee census made by the Instituto Hondureño del Café (IHCAFE) shows that more than 40.000 producers and their

families earn their living directly from this activity. In addition, it is estimated that nearly 160.000 people earn their living from activities depending on coffee production; such as picking, processing, marketing and transportation. Therefore, it may be asserted that 20% of the economically active population depends directly from this product.

Another fact that makes coffee production an activity of particular interst for the country is that it is grown on geographic zones that have a very irregular topography with high slopes, and its cultivation contributes to preserve the ecology and avoid erosion.

Information gathered from IHCAFE in the "Censo Cafetalero for 1979-80" confirms the existence of 40.000 producers in an area of 175.696 manzanas (122.500 hectares). Annual production reaches 1.6 million hundredweights (72.4 thousand Metric Tons).

Cultivation is spread all over the country. (See Table No. 3), but 63% of the cultivated area is concentrat-

ed in five departments, which are the main producers (69% of production). 1/

TABLE No. 3

NUMBER OF PRODUCERS AND CULTIVATED AREA FOR COFFEE BY DEPARTMENT, 1980/1981

Department	Number of Producers	%	Cultivated Area Manzanas 2/	%
Santa Bárbara	8.040	20.1	44.978.0	25.6
El Paraíso	4.760	11.9	24.246.4	13.8
Comayagua	3.640	9.1	18.097.0	10.3
Cortés	2.120	5.3	10.190.0	5.8
Copán	4.320	10.8	14.056.0	8.0
La Paz	1.960	4.9	5.974.0	3.4
Olancho	3.640	9.1	15.813.0	9.0
Lempira	3.480	8.7	7.731.0	4.4
Yoro	2.080	5.3	11.420.0	6.5
Ocotepeque	2.040	5.0	3.338.0	1.9
Francisco Morazán	1.840	4.6	13.177.0	7.5
Intibucá	1.600	4.0	3.162.0	1.8
Choluteca	240	0.6	3.338.0	0.9
Atlántida	240	0.6	176.0	0.1

2/ 1 Manzana - .69 hectares.

SOURCE: Planning Unit, Instituto Hondureño del Café (INCAFE)

1/ Santa Bárbara, El Paraíso, Comayagua, Cortés and Copán.

Coffee cultivation is an important source of income for thousand of small producers. Ranking small producers by farm sizes results in the following table:

Size of Farm	Producers	%	Cultivated Area Manzanas	%	Production (hws.)	%
From 0 to 5 Mz.	30.600	76.5	53.588	30.5	480.176	30.5
From 5 to 50 Mz.	9.160	22.9	97.511	55.5	637.611	40.5
From 50 Mz. and more	240	0.6	24.598	14.0	456.562	29.0
TOTAL....	40.000	100	175.697	100	1574.349	100

SOURCE: Planning Unit, IHCAFE. Annual Operations Plan 1983. IHCAFE.

Therefore, it results that coffee is produced mainly in small farms with a low degree of technification and consequently, with very low productivity

Technological improvements are more evident in farms with a higher level of productivity, and in this way, large producers which represent 0.6% of the total and have 14% of the cultivated area, produce 29% of the total crop.

Almost all the production is retained for export, retaining for domestic consumption low quality coffee that represents between 6% and 8% of total production. Bananas and coffee are the two most important export products in Honduras. In recent years, they have represented from 50% to 58% total exports. Export sales of coffee may be larger than those from banana exports, depending on prices in international markets.

This product generates a considerable amount of foreign exchange and income to the government in the form of export permits and taxes.

Its foreign sale is controlled by the International Coffeee Agreement. During 1981/1982, 1.187.439 bags of 46 kilograms each were exported to member countries of the International Coffe Agreement (ICA). Main purchasers are the United States of America, Japan and Wester Germany, buying more than 68% of total exports. A small amount of retained coffee is sold to non member countries of the ICA.

The Instituto Hondureño del Café (IHCAFE) was established in 1970, as an autonomous organization, that exerts export

control, quota retentions, prices, quality control and other matters related with external and domestic coffee marketing and the execution of the International Coffe Agreement regulations. However, trade transactions are carried out by export companies and coffee cooperatives.

2.2.2 Sugar Cane

Two different cultural practices are used in sugar cane cultivation. One is the traditional form with low technology, used mainly by small producers and spread all over the country in small areas and in all types of soils and topographies. Nearly 60% of the area used for this type of cultivation is located in properties smaller than 20 manzanas (14 hectares). Yields are low and the crop is processed in a rudimentary way to produce "panela",used in rural areas instead of sugar. Information from the Agricultural survey for 1980 shows a cultivated area of 8.274 manzanas (5.700 hectares) with this form of cultivation with an average yield of 1.4 metric tons per manzana.

Commercial crops of sugar cane provide the requirements for sugar mills. There are eight sugar mills in the country, five of which are located in the northern region of Honduras; one in the middle region and two in the south. They have capacity to process 3.6 millions tons of sugar cane per year. At presente about 2.6 millions tons of sugar cane are being processed, which represent 71% of installed capacity.

Sugar cane as raw material for sugar mills is cultivated in plain and fertile soils, using more advanced cultural practices (fertilization, irrigation, adequate mechanization, etc.). In summary, commercial sugar cane crops are grown in 48.670 manzanas (33.935 hectares), of which 18.100 manzanas (12.600 hectares) are owned by the sugar mills and 30.573 (21.317 hectares) correspond to private individuals, mainly cooperative associations and "asentamientos campesinos" but there are also individual producers. The average yield is 76.5 M.T. per hectare.

Two different types of sugar are produced, partially refined sugar sold in the domestic market and unrefined sugar for export. In recente years, sugar production

shows an upward trend. For the agricultural year 1983/84 a production of 4.7 million hundredweights is expected (216.2 thousand Metric Tons). Approximately 50% of this production in the form of white sugar is used in the domestic market. Unrefined sugar is exported to the preferential market of the United States and to world markets. It is estimated that during 1983/84 export sales will reach 1.2 to 1.3 million hundredweights, respectively (55.2 and 59.8 thousand of M.T.)

There is a Sugar Producers Association, formed by the sugar mills in the country. This Association has among its objectives te allocation of sucar produced by the mills between the domestic market which has higher price and the export market. In this way the Association makes a fair distribution of the market amog all producers.

2.2.3 Banana

As in the case of sugar cane, there are two different cultural practices for bananas. One using traditional methods, characterized by lack of technology and low

yield and practiced throughout the country. This type of cultivation is carried out in small properties and the product is sold for domestic consumption in the internal market. The other form is cultivation for exports, which uses modern production practices.

For many years, banana has been the main export product of Honduras. In the past this activity was under exclusive control of two transnational companies: Tela Railroad Co. and Standard Fruit Co. The first is a subsidiary of United Brands Co., and the second, a subsidiary of Castle and Cook. However, from the sixties to present, these companies have followed policies to diversify producers, keeping the marketing of the fruit under their control. In this way now the banana export production is distributed among transnational companies, rural cooperatives and independent producers.

Plantations are located in the Atlantic Coast, at the Sula and Bajo Aguán Valleys. The plantations cover 17.659 hectares, distributed as follows:

Transnational Companies	7503 Hectares
Independent Producers	5152 "
Honduran Banana Corporation	2620 "
Farmers Cooperatives	2384 "
	17659 Hectares

Honduras is one of the main banana exporters of the world. During 1982, export production measured in 40 pounds boxes totalled 35.2 thousand boxes. About 75% of exports were shipped to the United States of American and 25% to european countreis and the rest of the world.

This fruit contributes in more than 30% to the total income of the country's exports and traditionally it has been the main product of external trade, even though in some years it has been surpassed by coffee.

2.2.4 Cotton

In the past, this crop has had great importance among export products from Honduras, however, during the seventies, the area under cultivation has suffered ups and downsas prices rise or fall

in the international market, with a strong declining tendency in the medium term. In 1982/83, only 6.276 manzanas (4.375 hectares) were sown.

Crops are grown with modern technology by groups of farmers thant have benefitted from agrarian reform projects, and by individual producers at the southern, nort-eastern and middle-eastern regions.

During the 1982/83 agricultural year, a production of 13.408 bales was obtained, from which 12.658 were exported and 750 were retained for domestic consumption. Cotton seed is sold to the oil industry in the country and the flock is sold locally to matress manufacturers.

All cotton sales are channelled thorugh the Cooperativa Algodonera del Sur.,Ltda. This association has as its main objectives giving logistic support to all producers in matters like agricultural credit; technical assistance; industrialization and marketing of their products; improvement of

land cultivation and expansion of cotton production, for the economic, social and cultural improvement of its associates. Main purchasers of honduran cotton are the United States and Japan.

2.2.5 Tobacco

Traditionally, tobacco cultivation has been practiced in a rudimentary way for the production of cigars in the Western region of Honduras, particularly, in the Department of Copán, where this crop was introduced by the end of last century.

With the establishment at the beginning of 1928, of the cigarettes manufacturing company, Tabacalera Hondureña, S.A. (TAHSA), cultivation of tobacco for cigarettes, for domestic consumption and for exports, was promoted, with technical and financial assistance from the Company. More recently, during the sixties with the arrival to Honduras of cuban refugees, new varieties and advanced techniques were introduced in tobacco cultivation for cigars, resulting in an intensification and propagation

of this cultivation in several regions of the country. In this way,tobacco leavesand manufactured products --cigars and cigarettes- have become important export products. This importance is confirmed by the fact that for the period from 1972 to 1982, export values of tobacco have increased from Lps. 4.4 millions ($2.2 millions) to Lps. 21.5 millions ($10.8 millions)

For the agricultural year 1981-82, cultivated area was estimated in 13.872 manzanas (9.672 hectares) with a production of 7.498 metric tons. The Western region continues to be the main producer of tobacco but the middle-western and northern regions, which are new in this cultivation, are increasing their share.

2.3 Less important crops

Other products are also cultivated in the country, but they are less important than the ones already mentioned. Table No. 4 contains cultivated area and estimated production for these other products, as recorded in agricultural census and surveys.

Pineapple is cultivated to a large extent, by Tela Railroad Co., as an export product.

Grapefruit is also cultivated for export by rural cooperatives in Bajo Aguan; these cooperatives have been organized as a result of the agrarian reform process. A similar situation occurs with cashew , whose cultivation has been promoted by the Instituto Nacional Agrario in rural settlings at the sourthern region. The product has been planted and is beginning to produce.

TABLE NO. 4

AREA AND PRODUCTION OF SECONDARY PRODUCTS IN HONDURAS.

1980/1981

Cultivation	Area (Hectares)	Production (Metric tons)
Sesame	3.200	2.400
Plantain	6.107	92.600
Coconuts	3.500	14.200
Tomatoes	3.800	35.200
Watermelon	1.300	8.891
Chile	228	936
Onion	500	2.400
Cabagge	420	3.355
Cassava	1.363	7.086
Potatoes	600	8.100
Melon	1.000	4.100
Pineapple	3.200	41.500
Orange	3.037	11.550
Grapefruit	910	7.524
Cucumber	67	1.207
Cshew	1.229	Planted
Other Citrus	110	163

SOURCE: Encuesta Agrícola 1980 and Compendio Estadístico Agropecuario (Unpublished document). Ministry of Natural Resources.

3. Animal Husbandry and Poultry Farming

3.1 Livestock

The project "Study of the Effects of Agricultural Development Policies on Food Consumption of Central American Population" does not analyze matters related to production, marketing or industrialization of animal husbandry and its by-products in Honduras, except in those aspects that deal with the average consumption tendency of meat, milk and cheese in terms of monthly expenditures per family in the main cities other urban areas and rural areas, and its representativiness in food consumption and nutrient intake meassured in terms of units of calories and grams or protein per capita.

However, cattle raising is an important item in the honduran economy, not only in terms of economic benefits to the country, but also in terms of its significance in the improvement of the population alimentary situation; therefore, it has been considered appropriate to include in this study a summary of this activity.

Recently, (March, 1984) it has been delivered to the Ministry of Natural Resources a study on the situation of cattle

breeding in Honduras, prepared by the firm "Latino Consult, S.A." The conclussions of the study are the results of a livestock survey carried out at the beginning of 1983 and from other surveys carried out by the same company, the study may be considered as the most complete work on this subject prepared in Honduras.

The following concepts have been excerpted from the analysis of the Livestock situation (Volume I) presented by the firm.

The Livestock Survey shows that there are in Honduras nearly 90.250 cattle farms, occupying a total area of about 3.150.000 hectares, which gives an average size of 35 hectares per cattle farm and 30 heads per farm.

Within this average, there is a large amount of small-sized cattle farms, a regular strata of medium-sized cattle farms, and a small number of large ones. For instance, at one end of the scale there are cattle farms with less than 20 hectares, representing about 63% of the total with less than 15% of the total area, and about 22% of cattle heads.

At the other end of the scale, cattle farms with 400 hectares or more represent 0.9% of the total, concentrate 19% of the areaand 12% of cattle heads. Table No. 5 shows stratif-

ication of cattle farms according to strata.

The Survey carried out during the months from February to May, 1983, gives a total of about 2.695.000 heads of cattle, which means an increase of 5% with respect to the figures given by the Censo Nacional Agropecuario of 1974. Livestock is distributed all over the country, with the exception of the Department of Gracias a Dios and Islas de la Bahía, where cattle breeding is not important. About 56% of the total cattle population concentrates in six of the eighteen Departments of the country. Olancho (11%) and Yoro, Comayagua, Choluteca, Francisco Morazán and Cortés with approximately 9% of the total inventory each. These Departments cover 48% of the total area of Honduras. (See table No. 6 about livestock distribution).

About 88% of honduran livestock growers attend their own cattle farms, even though this characteristic is more noticeable in cattle-farms with less than 20 Hectares (more than 90%), in comparison with larger-sized farms, where the proportion who attend their own farm is reduced as the area increases reaching a minimum of 52% in farms with more than 1000 hectares.

Small herds are closely related to subsistence economies, with a small contribution to marketable production and

strictly speaking it is questionable to idendity these farms with stockbreeding activity.

Among the main conclussion reached in the livestock study mentioned above, are the following:

-- Cattle-raising in Honduras shows a low productivity that basically is originated by: Low levels in procreation indexes (55%); high rate of calve mortality (10%); low weight of animals for slaughtering (about 300 kg. in packing companies, which handle the best cattle), and low dairy production --about two liters-- per milking cow.

One of the reasons for this situation is the slow adoption of technologies easily available and known in the country, although there are sectors which are already using it, and obtaining above average results.

-- The cattle raising sector --meaning those farms that have livestock-- is widely dispersed, and nearly three fourths of the properties have more than one fourth of all cattle heads.

-- Pastures handling --that appears to be abundant in

amounts, at least-- is not efficient, which results in a low level of utilization in amounts as well as in quality.

-- Lack of infrastructure for managing pasture fields, lack of installations for milking and lack of pens, etc., conspire against the adoption of good managing practices.

-- Raw materials to produce meat --calves-- obtained on these conditions are of low quality and do not allow the obtainance in a short term of an animal of adequate weight.

Milk production under these conditions is also of a poor quality, and, in general, it is obtained in deficient sanitary conditions, causing grave risks to consumers health.

These are only a few of the conclusions arrived at in the livestock survey of Honduras, which also includes recommendations to correct these deficiencies, which are not important for the purpose of this report.

It is interesting to mention the conclusions of the study on livestock and meat marketing, since they are a determining factor of the small use of these products in the benefit of

the country's population.

-- Marketing systems in Honduras of livestock and meat are characterized by great deficiencies in the market structures that result in imperfect competition, with a low degree of transparency, barriers to participants, and a notorious lack of state intervention in the different marketing stages and functions.

-- One typical element in the marketing system of live livestock is the lack of availibility of local or regional markets to concentrate cattle physically, where producers and suppliers concur to sell and purchase animals in public auctions, with known weights and prices.

-- The above mentioned elements and the lack of state intervention in regulation, registration and dissemination of market information, show clearly the structural deficiencies in the markets.

-- Widely scattered supply consitute an important limitation to the improvement of barganing position of producers; therefore a more developed institutional structure, with enclosures for cattle concentration and with state participation directly towards the

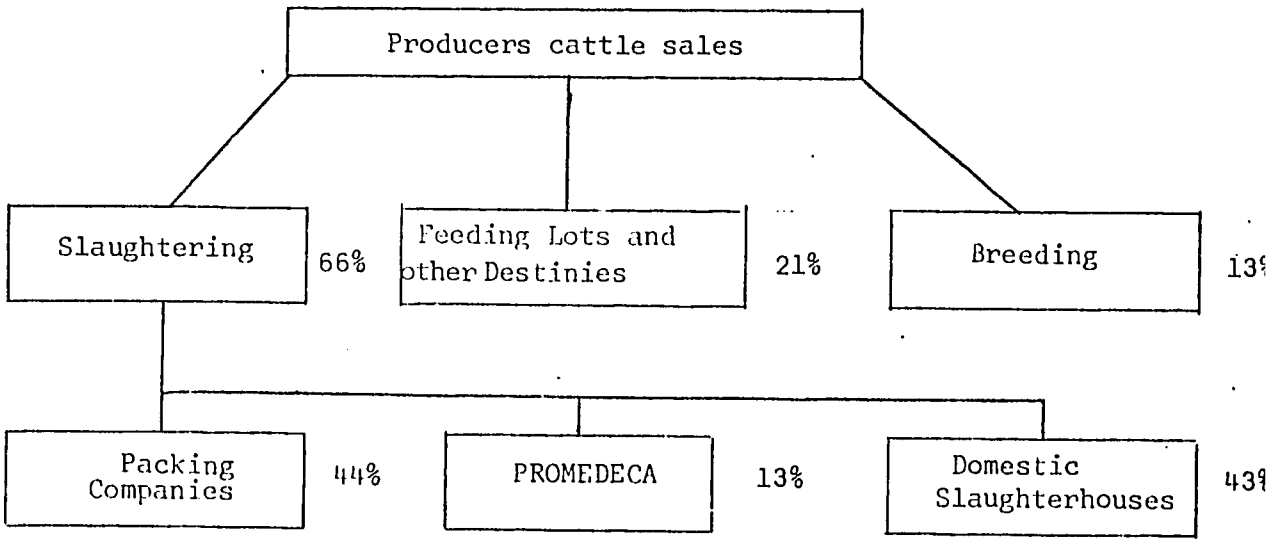
assurance of transferences of the same, will surely contribute to improve the system.

-- The supply and demand structure of meat market for large cities also present deficiencies, resulting in high marketing margins and in unfulfilled basic functions, specially in aggregated value and quality of the product.

-- The meat market structure is characterized by (a) a reduced number of suppliers, and (b) a high degree of vertical integration and packing concentration in export and import activities in the United States.

According to the Livestock Survey and to the Dirección General de Estadística y Censos, during 1982, the marketing channels of livestock were as follows:

MARKETING CHANNEL OF LIVESTOCK (1982)



SOURCE: Encuesta Ganadera y Dirección General de Estadística y Censos. Diagnóstico de la Ganadería en Honduras. Tomo I -. LATINOCONSULT, S.A. Marzo, 1984.

TABLE NO. 5
STRATIFICATION OF LIVESTOCK FARMS ACCORDING TO SIZE

Strata (Hs)	Livestock Amount	Farms %	Area Amount (hs)	%	Livestock Heads Amount	%	Ha/Livestock farm	Heads/ Livestock farm
Less than 5	20.854	23.1	59.883	1.9	132.372	4.9	2.9	6.3
5 to less than 10	16.298	18.1	118.823	3.8	158.332	5.9	7.3	9.7
10 to less than 20	19.685	21.8	282.547	8.9	313.751	11.6	14.4	15.9
20 to less than 50	19.131	21.2	510.082	19.3	546.884	10.3	31.9	28.6
50 to less than 100	7.954	8.8	545.129	17.3	471.859	17.5	68.5	59.3
100 to less than 200	4.005	4.4	538.972	17.0	420.541	15.6	134.6	105.0
200 to less than 400	1.542	1.7	404.061	12.8	404.061	12.2	262.0	213.6
400 to less than 600	438	0.5	204.511	6.5	204.511	5.2	466.9	319.3
600 to less than 1000	173	0.2	131.719	4.2	131.719	3.0	761.4	473.9
1000 and more	170	0.2	261.779	8.3	261.779	3.7	1.539.9	587.9
TOTAL	90.250	100.0	3.157.505	100.0	2.694.796	100.0	35.0	29.9

SOURCE: Encuesta Ganadera. Diagnóstico de la Ganadería en Honduras, LATINOCONSULT, S.A. Marzo, 1984.

TABLE NO. 6

DISTRIBUTION OF CATTLE STOCK

Department	Total Heads Amount	%	Area (Km.2) Total	%	Livestock Density Heads/Km2
Atlántida	113.963	4.3	4.251.2	3.8	26.8
Colón	99.693	3.7	8.874.8	7.9	11.2
Comayagua	246.734	9.2	5.196.4	4.7	47.5
Copán	141.957	5.3	3.203.0	2.9	44.3
Cortés	228.346	8.5	3.954.0	3.5	57.8
Choluteca	236.046	8.8	4.211.0	3.8	56.1
El Paraíso	192.544	7.1	7.218.1	6.5	26.7
Francisco Morazán	233.777	8.6	7.496.2	6.7	31.2
Gracias a Dios	7.785	0.3	16.630.0	14.9	0.47
Intibucá	84.229	3.1	3.072.2	2.8	27.4
Islas	8.342	0.3	260.6	0.2	32.1
La Paz	85.198	3.2	2.330.6	2.1	36.6
Lempira	113.597	4.2	4.289.7	3.8	26.5
Ocotepeque	67.855	2.5	1.680.2	1.5	40.4
Olancho	304.598	11.3	24.350.9	21.8	12.5
Santa Bárbara	207.388	7.7	5.115.3	4.6	40.5
Valle	71.068	2.6	1.564.6	1.4	45.4
Yoro	251.675	9.3	7.939.2	7.1	31.7
TOTAL	2.694.797	100.0	111.638.0	100.0	24.1

SOURCE: Encuesta Ganadera. Diagnóstico de la Ganadería en Honduras. LATINOCONSULT, S.A. Marzo, 1984.

Beef exports is an important item in Honduras foreign trade, however, due to several circumstances, export volume has decreased considerably during recent years. For instance: During 1980,26.6 thousand tons of meat were exported, representing to the country an income of 115.8 million Lempiras (US$57.9 millions). In contrast, for 1982, the export volumes of this product decreased to 16.6 million tons, with a value of LPs. 67.4 millions ($33.7 millions).

Beef, pork and chicken meats are important nutrition components in Honduras. Beef is consummed in larger amounts, but per-capita intake is low, if it is compared with balancedbiological demand requirements estimated by nutritionists. Also, there are important differences in consumption between urban and rural sectors. Urban consumption is estimated in 37.6 grams per-capita daily, and in rural area in 10.23 grams. 1/ On this basis, and taking into account actual population (1984), urban and rural, it is estimated that national beef consumption reaches about 31.800 metric tons.

1/ Information from the Project "Estudio de los Efectos de Desarrollo Agrícola en el Consumo de Alimentos de la Población Centroamericana" Encuesta de Ingresos y Gastos 1978-79, carried out by CONSUPLANE, MRN, BCH and DGEC.

Milk and its byproducts also form part of the family food basket, and as with beef, its consumption is very low, if it is compared with average basic diet requirements. Average dairy products consumption, in terms of liquid milk, is of about 65.66 grams per capita daily, in urban areas and 25.8 grams in rural areas.

3.2 Hog production

Hog production is not widely practiced in the country. There are some farms with intermediate technology, but the great majority of pork come from small producers, for whom pig breeding constitutes a complementary income, and practice this activity in a rudimentary way. According to estimates of the Central Bank of Honduras, during 1982 hog population amounted to 711.221 heads. The Dirección General de Estadística y Censos gives for the same year a total of 340.312 heads slaughtered, of which 160.000 heads were slaughtered thru legal channels and some 180.312 heads thru clandestine ways. It is estimated that a total of 10.9 million metric tons of carcass meat were obtained, figures that are in accordance with other estimations made by other means, on pork consumption in the country. In effect, according to estimates from the Survey on Income and Expenditures for 1978/79, daily per capita consumption

in urban areas is 12.8 grams per day, and in rural zones of 5.26 grams. Based on this, and taking into account urban and rural population, pork consumption during 1982 may have been in the order of 11.5 thousand metric tons, amount that is not far from the figures on pigs slaughtering registered by the Dirección General de Estadística y Censos.

3.3 Poultry

Poultry meat and eggs are important components in the population's diet. At present, production concentrates in poultry farms, even though raising chicken continues to be an income and nutritional complement in small farms.

During 1982, a Poultry Census was conducted on production in poultry farms, which are called the "Modern Sector". According to this Census, there were at that time in the country 98 poultry farms engaged in breeding, raising and fattening activities for commercial purposes that had a minimum 1000 fowl. At the moment the survey was conducted there were a total of 2.7 million fowl; egg production in 1981 was in the order of 623.2 million boxes with 360 units each, and 10.2 thousand metric tons from discarded animals.

Daily per capita egg consumption in urban and rural areas is of 19.9 and 14.11 grams, respectively. Daily per capita poultry consumption is estimated at 12.1 and 1.95 grams, for urban and rural areas. However, it is considered that eggs and poultry consumption in rural areas is possibly higher as a consequence of consumption of domestic production in small farms, not registered in the Survey on Income and Expenditures.

II NUTRITIONAL ASPECTS

Malnutrition in the population constitutes a great social problem in Honduras. It is a complicated problem and it is attributed to several causes. The Consejo Superior de Planificación Económica (CONSUPLANE) identifies the following:

Low availibility of food for human consumption, resulting from poor domestic productive capacity to cover alimentary requirements of the population.

Inefficient marketing systems. Low food consumption due to the low purchasing power of the population, to the constant increase in food prices, and to the influence of inadecuate cultural practices.

Improper physical utilization of foods consumed due to the presence of infecto-contagious diseases, deficient environmental sanitary conditions, and low coverage of the health measures. Institutional weakness of the Government to cope with the situation as a result of not recognizing nutritional problems, low political priorities, lack of financial, physical and human resources.

Studies prepared by the Sistema de Análisis y Planificación de la Alimentación y Nutrición (SAPLAN) in CONSUPLANE indicate

the degree of malnutrition and sub-nutrition suffered by the population of Honduras as well as the diseases and deficiencies caused by it. The magnitude of the problem is mentioned at the beginning of this report.

The Consejo Superior de Planificación Económica has prepared a strategy to cope with the nutritional and alimentary problem for the period 1982-1986, which is based mainly in eliminating the causes that originate this problem, in medium and long-run terms. Consequently, it tends to look for self-sufficiency in satisfying the family requirements, specially alimentary needs, this would involve the improvement of income distribution, access to basic social services and alimentary security. It is a multisectorial approach to the problem, which, in synthesis, is directed towards the following areas:

Health: Take advantage to the maximum of installed capacity, make necessary adjustments to increase coverage of treatment, detection and control of undernourished children; as well as the reduction and control of diseases associated to malnutrition.

Agricultural production: Increasing basic grains production and productivity, emphasizing the use of simple techo'ogies to allow for greater employment. It would be necessary

to consider the organization of producers, training and technical assistance; credit and crop insurance, price guarantee, infrastructure, and control of external consumption.

Education: To offer the population an adequate education to foster desirable alimentary practices and to discourage harmful practices.

Commerce: Improve marketing of basic grains in order to supply adequately and sistematically the food requirements of the population at reasonable prices.

Industry: To utilize total installed capacity in the food industry, developing new techniques to improve nutritional quality and reduce costs.

Social and organizational promotion: Organizations involved in this matter would emphazise their efforts to prepare human resources, to implement rapidily and efficiently the development process.

The aforementioned covers some of the factors that affect malnutrition, showing the complexity of the problem and its solutions, and demanding the formulation of a plan for action involving a number of inter-related activities or projects to conforme a solution to the nutritional problem in the country. In this respect, the "strategy on the alimentary and nutritional plan for Honduras

for the period 1982-1986" of CONSUPLANE, constitutes only a formulation of measures to be taken in several activities, without going deeper into all components that have to be taken into account to succeed in the objective of presenting a concrete working program to be put into practice either by the public sector or by the private sector, as the point of departure to solve the nutritional problem in the country,

Some advances have been made in several studies carried out on nutritional aspects and in other fields related to food consumption. Furthermore, studies for an integral analysis of alimentary problems in the country have been outlined; consequently, it is advisable to compile existing information, investigate what is missing, and once the whole picture of the alimentary situation is obtained, prepare working plans or projects to find solutions to the problem.

To this respect, the exhaustive analysis of the "Income and Expenditures Survey in Honduras Households 1977-78" in our Project has contributed substantially in aspects concerning the patterns of food expenditures and consumption in Honduran households; the elasticities on consumption expenditures; food consumption and nutrients intake by socio-economic groups, and price and income elasticities of the principal food commodities

in Honduras. The results of this analysis is described in four documents (See Annex No. 5). These documents contain information on income levels; expenditures and consumption patterns, as well as the comparison of nutritional results of the survey with the contents of an average minimum diet at a minimum cost, estimated by the Nutrition Department from CONSUPLANE, and with the cost of the basic food basked for a prototype family. This comparison and analysis are presented by region, occupation, income level, and years of occupation, for families in the main cities of the country, and in rural and other urban areas. In this way the publications constitute a significan contribution with considerable detail to the nutritional problem of the country.

III DESCRIPTION AND GENERAL CHARACTERISTICS OF REGIONS INCLUDED IN THE NATIONAL MODEL FOR AGRICULTURAL PROGRAMMING.

In the construction of the national model the country's regional distribution established by the Ministry of Natural Resources was used. This regionalization establishes seven regions, whose main characteristics are described as follows: (See tables in Annex No. 2).

1. Southern Region

1.1 Location and area

The Southern Region of Honduras is located between 13° oo' and 13° 48' North latitude; and 86° 45' and 87° 49' West longitude. It has an extension of approximately 6.894 km^2, representing 6.2% of the country's area.

It comprises the Departments of Choluteca and Valle, which are divided into 16 and 9 municipalities, respectively. Besides, it includes the municipalities of Alubarén, Curarén, San Miguelito and La Libertad, from the Department of Francisco Morazán; the municipalities of Soledad, Liure, Texiguat, Vado Ancho and Yauyupe, from the Department of El

Paraíso; and the municipalities of Lauterique and San Antonio del Norte, form the Department of La Paz.

1.2 Soils, topography and climate

The soils structure in this region is characterized by moderate drained land, with medium to high fertility. Soils are of poor depth, and of a limus - loam texture, in the subsoil as well as in the surface. These characteristics correspond to Categories IV and VI of agrological classifications of soils in Honduras.

The region has a wavy and hilly topography. The Pacific slope has to a large extent, gradients from 15 to 25%, reaching 60% in higher locations, Valley gradients go from 0 to 5%, or more. The latitude above sea level ranges from 500 to 800 meters.

The representative climate for most parts of the region is tropical dry-humid. Seasons are well defined, dry from November to April, with an average rainfall of 105 mm., and rainy, from May to October, with a precipitation that varies from 1675 to 2000 mm. rainfall in the higher locations.

Average annual temperature is of 27.7°C'. (81.86°F).

1.3 Road Infrastructure

In 1977 the region had a total of 650.5 Kms. in roads (9.3% of the nations' total), from which 243.5 Kms. are asphalted roads (16.8% of the total), 362.0 Kms. are gravel roads (9.21% of the total) and 45 Kms. are dirt roads.

On dirt roads information is not complete, since it does not include approach roads bult by the Instituto Nacional Agrario and the Corporación Hondureña de Desarrollo Forestal.

1.4 Demographical aspects.

The 1974 census show that the Southern region had the greatest population density per square kilometer (48.5 inhabitants /Kms.^{2}). With relation to the total population of the country, this region represented 12.6% of the total. Of the 334.138 inhabitants ,15% is considered urban, predominating rural population that represents 84.6% of the

total. Of the economically active population, 62.326 people were dedicated to agricultural activities, representing 18.6% of the reion's total population; 67% of the total were landowners, and 33% were considered farm labourers.

1.5 Land Use

According to estimates of the "Censo Nacional Agropecuario de 1974", total area for the country adds up to 16.1 million manzanas (11.2 million hectares) from which 3.8 million manzanas (2.6 million hectares) are adequate for several agricultural production activities. Land is divided into the following categories: annual crops fallow land, perennial crops, unimproved pastures, improved pastures, mountain forest, and others. The Southern Region covers 13% of the country's land that is, 489.347 manzanas (341.198 hectares), from which cultivated pastures represent 40%, natural pastures 18%, annual crops 17%, and perennial crops 3%.

The most important valleys of the Southern Region are the Choluteca Valley (973.1 Km.^{2}), located in the Department of Choluteca and the Nacaome Valley (322.5 Km.^{2}), in the department of Valle. As a whole, they represent 18.8% of the Region's area.

1.6 Producers Stratification

During 1974, the Southern Regionaccounted for 16% of the country's total farms, but only represented 14% of the total area, under different forms of possession.

There were in the region 30.708 farms, from these, 20.936 (68%)were parcels smaller than 7 manzanas, occupying 11% of the region's area. Medium-sized farmers, with 29% of the region's farms had 36% of the land, and the remaining 3% representing the large farms had 52% of the land.

Production of maize, beans, rice and sorghum contributed with 7.8%, 4.3%, 9.9% and 53.3%, respectively, to the national total, for the census year (1974).

The following table shows in a schematic way, the relative importance of the three strata of producers on basic grains production for the Southern Region

TABLE No. 7

Percentual participation in regional production of basic granin by group of producers.

Producers Stratum	BASIC GRAINS			
	Sorghum	Maize	Beans	Rice
Small (less than 7 Mz.)	49.53	48.33	40.31	8.28
Medium-Size (7-72 Mz.)	42.75	39.87	46.63	17.07
Large (More than 72 Mz.)	7.72	11.80	13.05	74.65

From the above table it may be concluded that with the exception of rice, basic grains are mainly produced by small and medium-sized producers, and in a lesser proportion by the large producers group.

1.7 Main products and markets

In the Southern Region maize, sorghum and rice cultivations are most important followed by cotton, watermelon, melon, sesame and beans, From a total area in annual crops of 85.681 manzanas registered in the census of 1974, 61.960 manzanas were cultivated with maize and 2.924 with sorghum; which are the equivalent of 75% of total land available for annual crops.

During 1974, 51% of cotton grown the country (4.561 manzanas) was located in this Region and represented an important item of cultivation in the area.

Sugar cane cultivation ranks second in the country, with 17%, and within the region, is the most important perennial crops representing 45% of the total area destined to perennial crops.

The most important trade and consumption markets of the Southern Region are the City of Choluteca, in the Department of the same name, and San Lorenzo, in the Department of Valle. Of lesser importance are: San Marcos de Colón (Choluteca) and Nacaome (Valle)

2. Middle-Western Region.

2.1 Location and Area.

Geographically, this Region is located between 13°51' and 15° 02' North latitude, and 87° 30' and 88° 20' West longitude. It has an area of 10.178.3 square kilometers, equivalent to 1.5 million manzanas (1.0 million hectares), representing 9.1% of the total area of the country.

The region includes the Department of Intibucá, with 16 municipalities, the Department of Comayagua (except for the municipalities of Minas de Oro and San José del Potrero), the Department of La Paz (except the municipality of San Antonio del Norte), and the municipality of Erandique, in the Department of Lempira.

2.2 Soils, topography and climate

The predominating soils in this Region are from moderate to rapid internal drainage type, with a sandy loam texture, and some places, an clayey texture, corresponding to types IV and VI of soil classification by agrological capacity. There are some lands with serious limitation or risks for agricultural use, due to steep slopes. The Region has a variable topography; it has hilly or escarped profiles, with solopes greater than 30 to 60 per cent. Slopes at valleys have between 0 and 5% gradients, and there are mountains from 800 to 1600 meters of altitude above sea level.

The climate of the Region is classified as subtropical dry forest, with average annual temperatures of 18° to 24°C; biotemperatures of 22.7 - 24°; with an average rainfall of 1017 to 1279 mm.

The city with the lowest tempearature of the country, La Esperanza, is located in this region, reaching 10°C temperatures.

2.3 Road infrastructure

In 1977 the region had a total of 738 Kms. in roads (11%

of the nations' total), from which 143 Kms.were paved roads (9.8% of the total and 19% of the Region). Gravel roads totalled 466 Kms., representing 63% of the road network of the Region, and 129 Kms. of country roads for dry season transit.

2.4 Demographical aspects

In 1974 the Middle-Western Region had a population of 227.974 inhabitants, representing 10.4% of the country. Considering the region's total extension, population density was of 27.2 inhabitants per square kilometer.

In that year, 15% was considered urban population and 85% rural, estimating an economically active population of 58.954 people, dedicated to agricultural activities, that is, 21.3% of the Regions' total. It is estimated that 30% of labour force were land-less labourers that usually work as day labourers.

2.5 Land Use

Only 12% of this Region is adequate for agriculture. Forests

and woodland represent 28%, there are about 170.834 manzanas of unimproved and improved pastures (119.1 thousand hectares) representing 39% of total area; and the remaining 107.392 Manzanas (25%) are destined to annual and perennial crops, and unproductive land.

There are two Valleys in this Region: Comayagua Valley, in the Department of Comayagua, with a total area of 533.8 square kilometers, and Jesús de Otoro Valley, in the Department of Intibucá, with a total area of 85.6 square kilometers. Part of the Comayagua Valley has irrigation from the Coyolar and Taladro Dams.

2.6 Producers stratification

Total farms in the Region (1974 Census) amounted to 30.768 units; 64% were small producers; 33% medium-sized producers, and 3% large producers, the area occupied by farms had an inverted proportion: 12%, 43% and 45%, respectively. Average farm size was 2.9, 19.4 and 47.5 manzanas for small, medium and large producers.

Maize production is the main agricultural activity of the

Middle-Western Region, and this product is the alimentary basis of the population.

With the exception of rice, where medium-sized producers (farms fr 7 to 72 manzanas), ranked first; in the cases of maize, beans and sorghum, small producers (farms with less than 7 Manzanas) generated most production during 1974. Therefore, small producers represented for these three products, 51%, 44% and 46% of the Region's production. In maize, medium-sized producers represented 45% of regional production. For the four basic grain crops, the so called "landowners" (with farms larger than 72 manzanas) contributed little to production; as a percentage of the total they produced 9.4% of sorghum, 10.7% of maize, 9.5% of beans, and 27.7% of rice.

2.7 Main products and markets

In 1974 there were 69.653 Manzanas (48.6 thousand hectares) dedicated to annual crops; 87% cultivated with maize, being the first (or spring) cycle crop the most important. Rice, beans and sorghum followed in importance, representing as a whole 7% of the area destined to annual crops. There are two main markets in the Region: the cities of Comayagua and Siguatepeque, where the greater part

of agricultural production converges. Besides, these two cities constitute important intermediate marketing channels to San Pedro Sula and Tegucigalpa. The cities of Intibucá and La Esperanza, which form a single market and the cities of La Paz and Marcala, are the most important secondary markets.

3. Northern Region

3.1 Location and area

As its name indicates, it is localted at the North of Honduras, limiting with the Atlantic Ocean and forming part of the border with the Republic of Guatemala. It is located between 14° 38' and 15° 52' North Latitude, and 87° 08' and 88° 33' West longitude. It has an area of 16.383 square kilometers, thar represents 14.62% of the nation's territory.

The Region includes all municipalities of the Department of Cortés (11) the Department of Santa Bárbara (26), excluding only the municipality of Naranjito; eight municipalities of the Department of Yoro, with the exception of Jocón, Arenal and Olanchito; it also includes Tela and Esparta, in the Department of Atlántida.

3.2 Soils, topography and climate.

In this region, soils are classified in the VIII category, with characteristics varying from shallow depth to very deep, generally well drained, even though there are extensions with moderate to imperfect drainage. Fertility is moderate in some places, and high in great extensions. Soils are of a limus-loamy texture, with clayey areas in the top soils. The sub-soil is mainly of a clayey-loam texture.

The Region has a hilly and scarped topography, with slopes from 20 to 60 per cent gradients; and in low lands, formed by valleys, with 0 to 5% or more, gradients.

In this Region there are altitudes that go from 500 to 1500 meters above sea level, even though there are some areas, near to the coast, with 5 meters of altitude above sea level.

Climate is considered as sub-tropical-humid-forest, with an average annual temperature of 18 to 26C (64.4 - 78.8°F), biotemperatures of 18 - 24°C, (64.4-75°F), and an average rainfall of 1000 to 2000 mm.

3.3 Road Infrastructure

In 1977 this Region had a total of 1.641 kilometers of roads, having the higher percentage of the nation's total (23.5%). It had 470.0 Kms. of asphalted roads (32.4% of the country's total); 641 Kms. of gravel roads, and 530 Kms. of dirt roads, representing 16.3 and 32.9% of the national total,respectively.

3.4 Demographical aspects

The 1974 Census shows for the Northern Region a population 762.928 inhabitants, representing 28.7% of the nation's total. It ranks second, after the Southern Region, in population density, w ith 46.6 inhabitants per square kilometer.

Rural population was estimated at 60.2%, and the economically active population dedicated to agriculture was estimated at 14.6% of the Region's total population.
This Region had the greater availibility of labour, which is commensurate with the greater availibility of land suitable for agriculture. It is estimated that 109.900 people were available in rural areas for agricultural labours, from which

49% were day labourers. About 32% of family labour concentrates in small properties (less than 7 manzanas), 17% in medium-sized farms, and only 2% in farms larger than 72 manzanas.

3.5 Land Use

The Northern Region has the largest potential and utilization of land resources. It has an area of 978.568 manzanas (682.3 thousand hectares), suitable for agriculture, that is 26% of national disposable land. In perennial crops and fallow land it had 282.617 Mzs., representing 29% of the region's total. Most of the land, 51% (503.329 Mzs.) is destined to unimproved and improved pastures, and the difference of 20% are forests and land for other uses.

Valleys represent approximately 17.4% of the total area of the Region. The valley of Sula (second largest in the country), Cuyamel and Naco are located at the Department of Cortés. Also, there are the Valley of León, and the coastal plains of Tela, in the Department of Atlántida; the Valley of Quimistán, in the Department of Santa Bárbara; and Cuyampa, in the Department of Yoro.

3.6 Producers Stratification

The number of small properties in this region is equivalent to 21% of the nation's total, and its area represents 26%. The area relationships for small, medium, and large producers were equivalent to 6.7, 30.4 and 62.9%, respectively; however, the relationship on the number of farms were equivalent to 62.3, 32.3 and 5.4%, in the same order, which means that 6.7% of the area was occupied by 62.3% small farmers; and that 62.9% of the area was in hands of 5.4% producers (large land-owners).

3.7 Main products and markets

According to figures from the Censo Nacional Agropecuario, for the year 1974, there were 108.959 Manzanas (76.0 thousand hectares), used in annual crops, from which 83.193 were cultivated with maize, representing 78% of the land in annual crops. The area cultivated with beans totalled only 7.227 manzanas. . Rice ranked third in importance, with 4.012 farms, in an area of 5.533 manzanas. The three basic grains (maize, beans, rice) are considered the main annual crops. However, it is the region with the largest area cultivated with perennial crops. In relation to the nation's

total it has 57% of bananas, 38% of coffee, 41% of sugar cane, 68% of platains and 98% of african palm cultivations.

The region has one of the main markets of the country, San Pedro Sula, where buyers and sellers come from all over the country. In 1974, San Pedro Sula had a population of 200.881 inhabitant , and it is the second city in importance, after Tegucigalpa. Also the cities of Puerto Cortés, el Progreso and Tela are considered important markets; and the cities of Choloma, Santa Bárbara and Yoro are considered secondary markets.

4. Atlantic Coast Region

4.1 Location and area

As its name indicates, this Region limits with the Atlántic Ocean in the Departaments of Atlántida and Colón, and it also includes Islas de la Bahía, which are located in the Atlantic Ocean itself.

Geographically, it is located between 15° 18' and 16° 28' North latitude; and 85° 00' and 87° 06' West Longitude. The Atlantic Coast Region has the largest area in the

contry, with an extension of 30.509 Km.^{2}, representing 27.22% of the nation's territory. It is formed by the Departments of Islas de la Bahía and Colón, and by the Department of Atlántida, except the municipalities of Tela and Esparta; it also includes municipalities of Jocón, Arenal, and Olanchito belonging to the Department of Yoro.

4.2 Soils, topography and climate

Most of the soils in this region are classified in the VII category, according to the agrological classification of the country, but the valleys are considered in the II category, of the same classification. Soils have shalow depths, with moderate to high fertility, with top soil with limous-loamy or clayey-loam textures. The sub-soil has mainly a clayey-loam texture. Drainage is from moderate to good.

The region has a hilly topography, with steep slpes with gradients from 20 to 60% in the higher parts, and from 2 to 5% in the lower parts. Altitudes vary from two meters bove sea level on coastal zones to 2.500 meters on the higher locations.

Climate is tropical with heavy rainfall.

The dry season is not well defined, since it rains all year-round, altrhough some months have a greater precipitation than others. Average annual rainfall is 2.861 mm.

In May, which is the driest month, average rainfall is 96 mm. Average annual temperature is 26.6° C (79.88°F).

4.3 Road infrastructure

In 1977, road infrastructure had a total of 1.071.0 Kms. of highways (15.3% of the nation,s total); 710.0 kilometers were gravel road, and 309 kilimeters were dirt roads, there were only 52 kilometers of asphalt roads.

4.4 Demographical aspects

In 1974, the Atlantic Coast Region had a population of 240.860 inhabitant, that is, 9.1% of the country's population. Density was 7.9 inhabitant per Km.^{2}, second lowest in the country. Rural population was estimated in 185648 people, and economically active

population in agricultural activities was estimated in 34.784 people, equivalent to 14.4% of the population. Land owning families had 15.600 economically active people (46% of the total). The difference were day labourers; therefore, this was the region where labourers without land outnumbered family labour with land.

4.5 Land Use

The Atlantic Coast utilizes about 382.683 manzanas for agricultural purposes (266.8 thousand hectares); from these, in 1974, 11% was used in annual crops; 14% was fallow land and perennial crops; and 51.2% was in unimproved and improved pastures, and the rest was in forest-mountains, and in other uses.

In this Region are the valleys of El Aguán, with an area of 2.291 Kms.^{2}, located in the Departments of Colón and Yoro; the valley of La Masica, with an area of 388 Kms;^{2}, and the Papaloteca and Cangrejal plains, located in the Department of Atlántida.

4.6 Producers stratification

In 1974, the number of farms in this Region were less than 6%, and the land in farms 9%, in relation to the country's total.

Small producers had 5% of the area; farms from 7 to 72 manzanas (medium-size) represented 31%, and large farms, with more than 72 manzanas, 64%. The relationship number to size of farms was as follows: 55.6, 37.9 and 6.5% respectively; showing the same relationship as in other regions; few farms hold the largest extension of land.

Medium-size producers (7 to 72 manzanas) are the most important ones; since they represent 49.3% in maize, 54.8% in beans, and 56.5% in rice production for the region. Small producers contribute with 33%, 27% and 26% of maize, beans and rice production, respectively.

4.7 Main products and markets

As in other regions, basic grains are the prevailing annual crops, maize with 61%, beans with 8%, and rice with 10% of the cultivated area. As a total, the three crops occupy 33.056 manzanas (23.048 hectares), equivalent to 78%

of cultivated area in annual crops.

Cassava has also great importance. In 1974, there were 1.300 manzanas cultivated, with a production of 65.340 hundredweights.

Bananas and coffee are the most important perennial crops representing 34% and 7% of the cultivated area of the region. About 40% of bananas for export was produced in the Atlantic Coast Region.

The city of La Ceiba constitutes the main domestic market. As secondary markets there are the cities of Olanchito, Trujillo and Tocoa. The last two cities are growing rapidily as a consequence of agricultural development projects that are being carried out in the zone.

5. North-Eastern Region

5.1 Location and area

It is located in the interior of the country, between 14° 02' and 15°34' North latitude, and 85°00' and 86°58' West longitude. This region includes the Department

of Olancho, with its 22 municipalities, with an extension of 24.531 square kilimeters, representing 21.7% of the nation's territory.

5.2 Soils, topography and climate

Soils of this Region are included in categories IV and VII, according to soil classification by agrological capacity. Drainage is from good to moderate, soils are from shallow depths to very deep, with moderate fertility, existing areas with high fertility and variable textures. The most common soils are from limous-loam or limous-clayey texture in top soils, and of clayey-loam textures in subsoils. The topography of the region presents slopes of 20 to 60% in the higher parts, and gradients of 0 to 5% in the valleys Altitudes go from 200 to 2000 meters above sea level.

The climate of the North-Eastern Region is classified as tropical dry forest, with average annual temperatures ranging from 22.7 to 26° C (72.86° F - 78.8° F), biotemperatures 22.7-24° C (72.86° F - 75.2° F), and an average annual rainfall of 1017 to 1279 mm. The climate is also classified as sub-tropical humid forest, with average annual temperatures of 18 - 24° C (64.4° F - 75.2° F) , biotemperature 18 - 24°C, and

rainfall of 1000 to 2000 mm.

5.3 Road infrastructure

In 1977, the road system of the Region had a total of 587.0 kilometers (8.4% of the nation's total). There were 506 Kms. of gravel roads, representing 86% of the region's roads and 12.9% of the nation's total, and dirt roads totalled 81 Kms.

5.4 Demographical aspects

The North-Eastern Region is the most uninhabited. In 1974, it had 151.436 inhabitants, 5.7% of the country's total. Density per square kilometer was 6.2 inhabitants, the lowest of all regions. Rural population was estimated in 84.3% and urban in 15.7%. It was estimated that 21.3% of total population is economically active and dedicated to agricultural activities, that is some 32.230 people, which constitute the agricultural labour force. They are classified in families with land (family labour) with 58% of the total, and families without land (land less labour), with 42% of the total.

5.5 Land Use

Estimations of the land useful for agricultural activities amounted to 329.196 manzanas (229.533 hectares), that is, 9% of nation's total disposable land. About 27% of this area is used in annual and perennial crops and in fallow land; 182.855 manzanas (127.496 hectares) are destined to unimproved and improved pastures, equivalent to 56% of the total, therefore, there is a prevalence of land utilization for cattle raising.

The Valleys of Guayape, Agalta, Salamá, Lepaguare, Telica and Alto Patuca are all located in this Region, with a total extension of 2.245 square kilometers, which makes this Region one of the most adequate for agricultural purposes.

5.6 Producers stratification

The Region has an area of 333.617 Manzanas (232.615 Hectares), 9% of the nation's total. In 1974 large farms, with more than 72 manzanas, had 56% of the area; medium-sized farms, 34%, and small farms, 8%. There were 13.716 farms from which 55% were small parcels, 39% medium-sized farms, and

5% large farms.

Maize is the main product among annual crops, medium-sized producers (farms from 7 to 72 manzanas) had first place in importance, with 48%, followed by small producers (farms smaller than 7 manzanas), with 31%. In the production of beans the small and medium-sized producers groups have the same importance. For rice, which is third in annual crops, medium-sized producers are in first place, followed by small and large producers groups, with a participation of 23.7 and 28.2%, respectively.

5.7 Main products and markets

Maize is the main product among annual crops. In the census year 1974, 38.754 manzanas were occupied with this crop, representing 73% of total land used in annual crops. Beans ranked second with 9%, rice with 4%, and cotton with 7%. It is important to mention that in 1974. the area cultivated with cotton in this Region ranked second in the country, after the Southern Region; and as mentioned before, cotton is grown mainly in these two regions; cattle raising ranks first as an agricultural activity. Olancho has two important markets: Juticalpa

and Catacamas. However, most part of production is destined to Tegucigalpa and San Pedro Sula.

6. Middle-Eastern Region

6.1 Location and area

The middle-Eastern region is located between 13°49' and 14° 46' North latitude and 85°33' an 87° 22' West longitude. It has an area of 14.756.6 square kilometers (13.17% of the nation's territory). It includes the Department of El Paraíso, (with the exception of the municipalities of Yauyupe, Liure, Soledad, Vado Ancho and Texiguat); the Department of Francisco Morazán (excluding the municipalities of Alubarén, Curarén, San Miguelito and La Libertad); and the municipalities of Minas de Oro an San José del Potrero, in the Department of Comayagua.

6.2 Soils, topography and climate

Soils have mainly, from good to moderate drainage, with shallow depth to deep degrees, and moderate fertility. Soils

are of limous-loam textures to a large extent, even though there are limous and sandy-loam texture soils in top soils, with clayey-loam textured soils in the sub-soil. In general. soils are classified in the IV and VIII categories, according to soil classification by agrological capacity.

The topography presents hilly and scraped conditions, with gradients that go from 20 to 50% in higher locations, and 0 to 5% in lower locations. The altitudes range between 500 to 2300 meters above sea level.

The climate is classified as subtropical humid forest, with perennial tree vegetation, average annual temperatures of 23.1°C (73.58°F), with variations of 20.2° C (68.36° F) in January to 25.1° C (77.18° F) From may to september.

Average rainfall is from 1000 to 2000 mm.

6.3 Road infrastructure

In 1977, the Region had 359 kilometers of paved roads (24.7 of nation's total), 768 kilometers of gravel roads (19.5 of the nation's total), and 419 kilometers of dirt

roads, for a total of 1546 kilometers, representing 22.1% of the country's road system.

6.4 Demographical aspects

In 1974 the Region had 560.241 inhabitants; Tegucigalpa, with the higher demographic density of the country (305.607 inhabitants, equivalent to 11.5% of total population); is located in this Region; it is the third region in population density, with 38 people per square kilometer.

Rural population has been estimated in 44.7%, the lowest among all regions, as a consequence of the urgan population in Tegucigalpa. The economically active population dedicated to agricultural activities was estimated in 64.610 signifying that 11.4% of the Region's population is dedicated to agricultural activities, 40.5% are hired labourers and 59.5% is considered family labour that own the land.

6.5 Land Use

The agricultural land is estimated in 588.837 manzanas (410.6

thousand hectares), about 16% of the nation's availibility. In 1974, annual and permanent crops and fallow-land were estimated in 131.872 Manzanas (91.948 hectares); unimproved and improved pastures were estimated in 290.129 Manzanas (49%), and 28% were in forests and in other uses, that is 166.836 Manzanas.

The valleys of Jamastrán, Danlí, El Paraíso, Talanga, Siria Guaimaca, El Zamorano and San Juan de Flores, totalling 1.568 square kilometers, are located in this Region.

Labour availibility totalled 64.394 people, 60% coming from families with land, and 40% from hired labourers.

6.6 Producers stratification

In 1974 the Middle-Eastern Region had 14% of the total number of farms in the country, and 16% of the land under different property forms.

Small producers, by number of farms, represented 66%, and by area only 9%, intermediate farms (7-72 Manzanas) represented 30% in relation to number of farms, and 29% to area, large farms, with 4% of the total number

of farms represented 62% of the area under cultivation.

The main agricultural product of the Region is maize, and its production share is as follows: 38% from small producers; 36% from medium-sized producers; and 26% from large producers.

In the production of beans, second in importance, small producers rank first with 41%; intermediate farms with 37%, and large farms with 21% of the regional production. Large producers have the larger area in sorghum production. (49% of the area cultivated with this product).

6.7 Main products and markets.

The most important crop of the Region is maize (67.503 Manzanas); beans (6.143 Manzanas), and sorghum (2.932 Manzanas).

In 1974, theses three products utilized a total of 76.578 Manzanas, equivalent to 59% of the land of the Region assigned to annual and perennial crops and fallow land. The perennial crops are coffee (60%), sugar cane (12%), with the largest total area with perennial crops. This region includes Tegucigalpa, the most

important market of the country, which also requires part of the production from other Regions. Second in importance as a regional market is Danlí. El Paraíso, Talanga and Guaimaca are considered as secondary markets.

7. Western Region

7.1 Location and area.

As its name indicates, it is located to the West of the country, and it limits with the Republics of Guatemala and El Salvador. Geographically, it is located between 14° 00 and 15° 16' parallels North latitude, and 88° 25' and 89° 21' meridians West Longitude. This Region is one of the smallest in area, it only has 9.016.1 square kilometers, representing 8% of the total area of the country.

It includes the Departments of Copán and Ocotepeque, the Department of Lempira, except the municipalities of Erandique; and the municipality of El Naranjito, from the Department of Santa Bárbara.

7.2 Soils, topography and climate

In this Region shallow depth to deep soils prevail, with good to moderate drainage. Fertility is classified from moderate to high, with limous-clayey loam texture soils. Soils are included in III, IV and VII categories of land, by agrological capacity. The topography presents steep hills and cragged conditions, with slopes from 15 to 50% in high areas, and from 0 to 5% in low locations. Altitude above sea level goes from 600 to 3000 meters.

Climate is classified as sub-tropical forest humid, with a rainy season during the months from May to October, with relatively high humidity. Dry seasons lasts from November to April, with relatively less humidity. Average annual temperature is 24° C (75.2°F). Average annual rainfall is 1.640 mm.

7.3 Road infrastructure

Information for the year 1977 indicated a road network representing 10.5% of the contry's total (that is, 761.0 Kms.), from which 184 Kms. were asphalted highways. In gravel roads there were 478.0 kilometers, and 99.0 kilometers in dirt roads.

7.4 Demographical Aspects

According to the Population Census of 1974, 12,4% of the country's total population was located in the Western Region, with a population density of 36.7 inhabitants per square kilometer.

From the 331.271 inhabitants, 89.5% was considered rural population, which is the highest percentage in the nation. About 24.6% of total population was considered economically active dedicated to agricultural activities, which is equivalent to 81.500 people. About 46% of labour was family labour with small plots and 54% was hired labour withous land.

7.5 Land use

The Western Region has 566.497 Manzanas (395 thousand hectares), adequate for agricultural utilization. Unimproved and improved pastures amount to 303.115Mzs.equivalent to 54% of the land. About 29% of the land is in agricultural activities, and 18% are forests and land for other uses. The Valleys of Sensenti, Nueva Ocotepeque, La Unión, Copán, Corquín and Florida are located in this Region, with a total area of

188.7 square kilometers, equivalent to 2% of the region.

7.6 Producers Stratification

In 1974, there were 38.533 farms in the Western Region; 66% were small farms, 37% were medium-sized farms, and 3% were large farms; while the area represented, in the same order, 11.3, 44.7 and 44%, that is an inverse relation As in other regions, the greater number of exploitations occupied less extensions of land, while larger extensions of land were in possesion of a reduced number of producers.

Maize cultivation is the main agricultural activity. In order of importance, according to the extension of land cultivated, is followed by sorghum and beans. For the three products, farms with less than 7 manzanas accounted for most of the production, with 48%, 51% and 49%, respectively. Medium-sized farms contributed with 39%, 45% and 42% of the maize, sorghum and beans production. Large farms are not significant in the production of basic grains; as in other regions, they are assigned to cattle raising.

7.7 Main products and markets

During 1974, from land assigned to annual crops, 85% was assigned to maize; 3.678 manzanas were cultivated with beans; and 3.059 manzanas with rice.

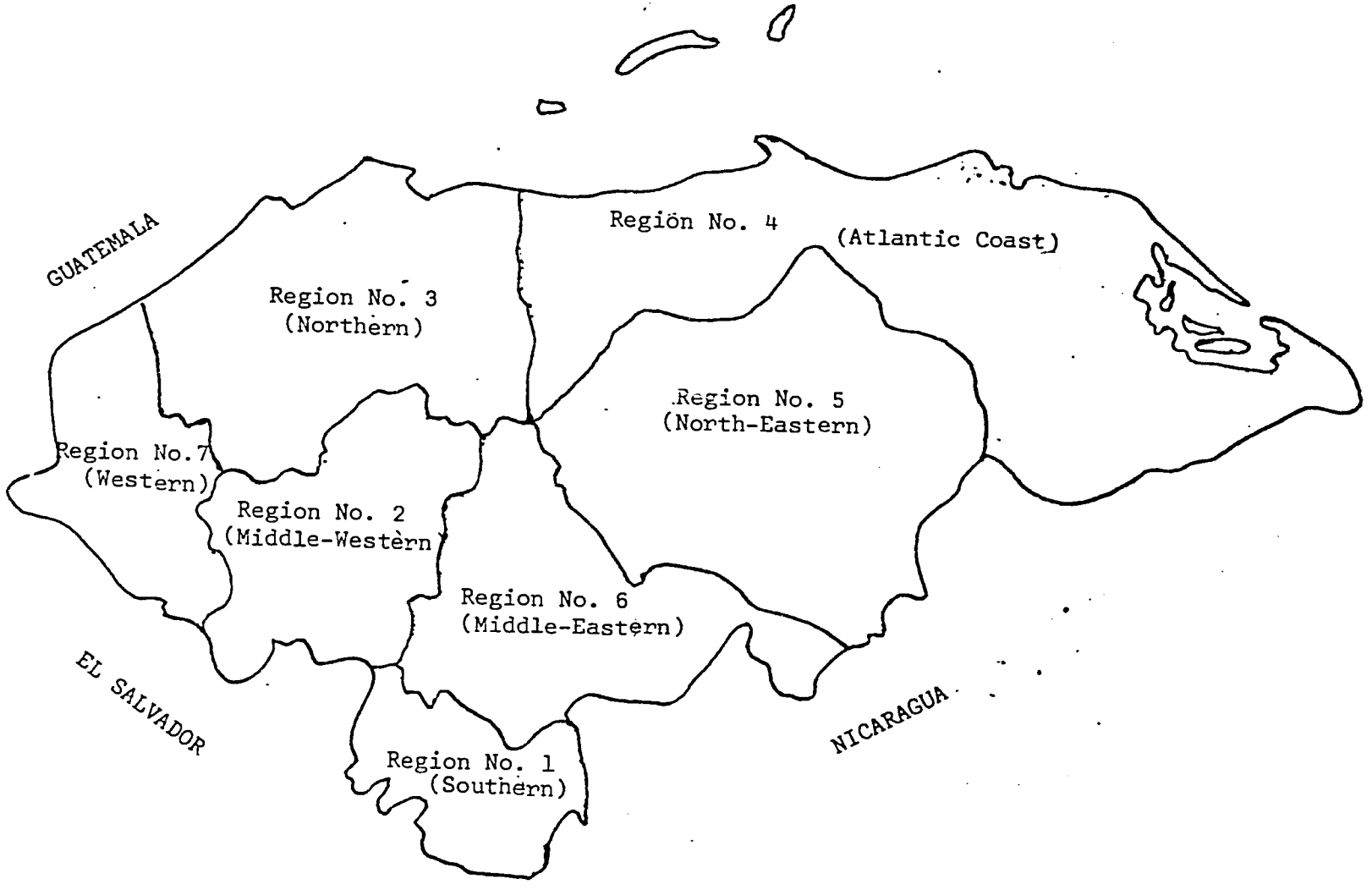
Tobacco cultivation is very important in this Region and in 1974, 2.533 manzanas were cultivated, with a production of 40.568 hundredweights, representing 61% of the country's production. Coffee is the most important perennial crop and 17% of the country's cultivated area is located in this Region, representing third place in national production.

Santa Rosa de Copán, in the Department of Copán, is the main regional market. Gracias, Ocotepeque and la Entrada are secondary markets. Its location, neighbouring the Republics of El Salvador and Guatemala, allows this Region to have close commercial relations with nearby cities in these countries. Also, a large part of the agricultural production of this Region goes to San Pedro Sula, where they obtain their semi and manufactured products.

A N N E X N O. 2

MAP NO.1

REGIONAL GEOGRAPHIC DISTRIBUTION OF THE AGRICULTURAL NATIONAL MODEL OF HONDURAS



NOTE: This map is based in the regionalization utilized by the Ministry of Natural Resources

TABLE NO. 1

REGIONAL GEOGRAPHIC DISTRIBUTION FROM THE MINISTRY OF NATURAL RESOURCES

Region	No.	Department	Municipalities
South	1	Choluteca	All.
		Valle	All.
		Francisco Morazán	Curarén, Alubarén, San Miguelito La Libertad.
		El Paraíso	Soledad, Liure, Texiguat, Vado Ancho y Yauyupe.
		La Paz	Lauterique, San Antonio del Norte.
Middle-West	2	Comayagua	All, except Minas de Oro, San José del Potrero.
		Intibucá	All.
		La Paz	All, except Lauterique, San - Antonio del Norte.
		Lempira	Erandique.
North	3	Cortés	All.
		Santa Bárbara	All, except El Naranjito.
		Yoro	All, except Jocón, Arenal, Olanchito.
		Atlántida	Tela y Esparta.
Atlantic Coast	4	Atlántida	All, except Tela, Esparta.
		Yoro	Jocón, Arenal, Olanchito.
		Colón	All.
		Islas de la Bahía	All.
		Gracias a Dios	All.
North-East	5	Olancho	All.
Middle	6	El Paraíso	All, except Yauyupe, Soledad, Liure, Texiguat, Vado Ancho.
		Francisco Morazán	All, except Curarén, Alubarén, San Miguelito, La Libertad.
		Comayagua	Minas de Oro, San José del Potrero.
West	7	Copán	All.
		Lempira	All, except Erandique.
		Ocotepeque	All
		Santa Bárbara	El Naranjito.

SOURCE: Prepared by Agricultural and Nutritional Project. (SIECA).

TABLE NO. 2

MAIN VALLEYS OF HONDURAS, BY REGION

Region	Name	Area (Kms.^{2})	Department
South	Choluteca	973.1	Choluteca
	Nacaome	322.5	Valle
Middle-West	Comayagua	533.8	Comayagua
	Jesús de Otoro	85.6	Intibucá
North	Sula	1.841.0	Cortés
	Cuyamel	103.1	Cortés
	Naco	113.8	Cortés
	León	252.0	Atlántida
	Los Planes de Tela	153.o	Atlántida
	Quimistán	204.0	Santa Bárbara
	Cuyamapa	189.0	Yoro
Atlantic Coast	Aguán	2.291.2	Colón
	La Masica	388.0	Atlántida
	Papaloteca	134.4	Atlántida
	Cangrejal	16.3	Atlántida
North-East	Guayape	1.155.6	Olancho
	Agalta	605.6	Olancho
	Salamá	131.9	Olancho
	Lepaguare	107.5	Olancho
	Telica	73.1	Olancho
	Patuca Alto	171.9	Olancho
Middle-East	Jamastrán	261.3	El Paraíso
	Danlí-Paraíso	214.4	El Paraíso
	Morocelí	115.6	El Paraíso
	Talanga	329.6	Francisco Morazán
	Siria	363.8	Francisco Morazán
	Guaimaca	118.8	Francisco Morazán
	El Zamorano	115.0	Francisco Morazán
	San Juan de Flores	50.0	Francisco Morazán
West	Sensenti	66.3	Ocotepeque
	Nueva Ocotepeque	30.0	Ocotepeque
	La Unión Copán	23.8	Copán
	Corquín	18.1	Copán
	Florida	50.0	Copán

SOURCE: Prepared by Agricultural and Nutritional Project, SIECA, taken the valley's areas from the document "Regionalización Agrícola de Honduras," Ing. Agr. Manuel Antonio Cáceres, IICA/SIECA, Honduras Government, 1970.

TABLE NO. 3

TERRITORIAL AREA, BY REGION

(Km.^{2} and Mzs.)

REGION	AREA (Km^2)	%	AREA (MZS)
Southern	6,893.9	6.15	988,762.43
Middle Western	10,178.3	9.08	1.459,829.90
Northern	16,383.0	14.62	2.349,743.20
Atlantic Coast	30,509.2	27.22	4.375,803.30
North-Eastern	24,350.9	21.72	3.492,544.80
Middle-Eastern	14,756.6	13.17	2.116,475.60
Western	9,016.1	8.04	1.293,140.40
TOTAL	112,088.0	100.00	16.076,299.00

SOURCE: Censo Nacional de Población y Vivienda, 1974.

TABLE NO. 4

HONDURAN ROAD NETWORK - 1977 BY REGION

(Kilometers & Percentages)

No.	Regions	TOTAL KM	National %	PAVED ROADS KM	PAVED ROADS %	GRAVE ROADS KM	GRAVE ROADS %	EARTH ROADS KM	EARTH ROADS %
1	Southern	650.5	9.30	243.5	16.77	362.0	9.21	45.0	2.79
2	Middle-Western	738.0	10.55	143.0	9.85	466.0	11.85	129.0	8.0
3	Northern	1,641.0	23.46	470.0	32.38	641.0	16.30	530.0	32.88
4	Atlant.Coast	1,071.0	15.31	52.0	3.58	710.0	18.06	309.0	19.17
5	North-Eastern	587.0	8.39	-	-	506.0	12.87	81.0	5.02
6	Middle-Eastern	1,546.0	22.10	359.0	24.73	768.0	19.54	419.0	25.99
7	Western	761.0	10.88	184.0	12.67	478.0	12.16	99.0	6.14
TOTAL		6,994.5	100.0	145.5	100.0	3,931.0	100.0	1,612.0	100.0

SOURCE: **PLAN NACIONAL DE DESARROLLO 1979-1983**

TABLE No. 5

POPULATION AND AREA, BY REGION

Region	Population/74 (inhabitants)	Participation (%)	Area (Km^2)	Participation (%)	Population Density (People/$Km.^2$)
Southern	334,138	12.6	6,893.9	6.2	48.5
Middle-Western	277,074	10.4	10,178.3	9.1	27.2
Northern	762,928	28.7	16,383.0	14.6	46.6
Atlantic Coast	240,860	9.1	30,509.2	27.2	7.9
North-Eastern	151,436	5.7	24,350.9	21.7	6.2
Middle-Eastern	560,241	21.1	14,756.6	13.2	38.0
Western	331,271	12.4	9,016.1	8.0	36.7
	2.656,948	100.0	112,088.0	100.0	23.7

SOURCE: **Censo Nacional de Población 1974**

TABLE NO. 6

TOTAL POPULATION, URBAN AND RURAL AND ECONOMICALLY ACTIVE IN AGRICULTURE, BY REGION

Region	TOTAL POPULATION Amount	(%)	URBAN POPULATION Amount	(%)	RURAL POPULATION Amount	(%)	Population economically active in Agriculture Amount	(%)
Southern	334.138	100.0	51.174	15.3	282.964	84.7	62.326	18.6
Middle-Western	277.074	100.0	41.617	15.0	232.457	85.0	58.954	21.3
Northern	762.928	100.0	303.912	39.8	459.016	60.2	111.322	14.6
Atlantic Coast	240.860	100.0	55.212	22.9	185.648	77.1	34.784	14.4
North-Eastern	151.436	100.0	23.778	15.7	127.658	84.3	32.233	21.3
Middle-Eastern	560.241	100.0	310.161	55.4	250.080	44.6	64.160	11.4
Western	331.271	100.0	34.869	10.5	296.402	89.5	81.497	24.6
TOTAL	2.656.948	100.0	820.723	30.9	1.873.225	69.1	445.276	16.7

SOURCE: **Censo Nacional de Población 1974.**

TABLE NO. 7

LAND USE, BY REGION

(Area in Manzanas)

	TOTAL	SOUTH	MIDDLE WEST	NORTH	ATLANTIC COAST	NORTH EAST	MIDDLE EAST	WEST
Total exploitations	195.341	30.733	30.774	39.923	14.017	13.733	27.617	38.544
Total area	3.771.746	489.347	436.618	978.568	382.683	329.196	588.837	566.491
Annual cops	525.412	85.681	69.653	108.954	42.328	52.931	81.669	84.196
Perennial crops	304.064	14.130	37.739	126.078	30.425	23.188	34.736	37.768
Fallow land	201.206	30.283	31.753	47.585	24.584	11.475	15.467	40.059
Unimproved Pastures	674.233	89.046	70.514	164.857	65.208	58.507	118.419	107.682
Improved Pastures	1.258.749	197.602	100.320	338.472	130.864	124.348	171.710	195.433
Mountains and Forests	764.495	65.725	121.939	182.685	84.181	56.869	160.578	92.518
Others	43.588	6.880	4.700	9.937	5.093	1.879	6.258	8.841

SOURCE: **Censo Nacional Agropecuario 1974**

(1 manzana = .7 hectares)

TABLE No. 8

NUMBER AND AREA OF FARMS, BY REGION

REGION	Size of Farm		TOTAL Number of Farms	TOTAL Area (Mzs)	Average sizes of Exploitations (Mzs.)
SOUTHERN	Small	(< 7 Mzs)	20,936	55,961	2.7
	Medium	(7 - 72 Mzs)	8,882	177,449	20.0
	Large	(> 72 Mzs)	890	255,335	286.9
			30,708	488,745	15.9
MIDDLE-WESTERN	Small	(< 7 Mzs)	19,712	58,000	2.9
	Medium	(7 - 72 Mzs)	10,224	197,944	19.4
	Large	(> 72 Mzs)	831	205,647	247.5
			30,767	461,591	15.0
NORTHERN	Small	(< 7 Mzs)	24,853	65.322	2.6
	Medium	(7 - 72 Mzs)	12,913	297,325	23.0
	Large	(> 72 Mzs)	2,154	615,769	285.9
			39,920	978,416	24.5
ATLANTIC COAST	Small	(< 7 Mzs)	6,525	17,896	2.7
	Medium	(7 - 72 Mzs)	4,445	107,480	24.2
	Large	(> 72 Mzs)	759	221,829	292.3
			11,729	347,205	29.6
NORTH-EASTERN	Small	(< 7 Mzs)	7,560	25,085	3.3
	Medium	(7 - 72 Mzs)	5,406	114,884	21.2
	Large	(> 72 Mzs)	750	193,648	258.2
			13,716	333,617	24.3

Table No. 8

NUMBER AND AREA OF FARMS, BY REGION

REGION	Size of farm		TOTAL Number of Farms	TOTAL Area (Mzs.)	Average sizes of Exploitations (Mzs.)
MIDDLE-EASTERN	Small	(< 7 Mzs)	18,204	51,928	2.8
	Medium	(7 - 72 Mzs)	8,185	172,270	21.0
	Large	(> 72 Mzs)	1,243	372,658	299.8
			27,632	596,856	21.6
WESTERN	Small	(< 7 Mzs)	25,471	63,965	2.5
	Medium	(7 - 72 Mzs)	11,834	253,073	21.4
	Large	(> 72 Mzs)	1,228	249,119	202.9
			38,533	566,157	14.7

SOURCE: Censo Nacional Agropecuario 1974.

TABLE NO. 9

CULTIVATED AREA OF MAIN ANNUAL PRODUCTS, BY REGION

(Manzanas)

CROP	SOUTHERN	MIDDLE WESTERN	NORTHERN	ATLANTIC COAST	NORTH EASTERN	MIDDLE EASTERN	WESTERN
Maize-sole - Fist Cycle	17,420	36,883	80,335	25,041	38,041	56,236	55,899
Maize associated *	44,539	23,587	2,858	674	713	11,267	15,893
TOTAL MAIZE	61,959	60,470	83,193	25,715	38,754	67,503	71,792
Sorghum-sole	2,924	1,133	73	19	50	2,932	1,368
Beans-sole	967	1,619	7,227	3,241	5,001	6,143	3,678
Rice	1,935	1,790	5,533	4,100	2,184	839	3,059
Sesame	1,760	23	27	27	13	240	11
Tobacco	509	128	321	-	80	582	2,533
Cotton	4,561	-	-	-	3,845	587	-
Cassava	26	599	723	1,305	499	110	59
Potatoes	333	476	26	15	100	221	72
Others	10,707	3,415	11,831	7,906	2,405	2,512	1,624
TOTAL	85,681	69,653	108,954	42,328	52,931	81,669	84,196

* Maize associates with beans and sorghum.

SOURCE: Censo Nacional Agropecuario 1974.

TABLE NO. 10

CULTIVATED AREA OF MAIN PERENNIAL PRODUCTS, BY REGION

(Manzanas)

REGIONS	COFFEE	BANANA	SUGAR CANE	AFRICAN PALM	PLATAIN	* OTHERS	REGIONAL TOTAL
SOUTHERN	3,859	57	6,406	-	115	3,693	14,130
MIDDLE-WESTERN	25,653	393	3,505	-	219	7,969	37,739
NORTHERN	55,829	13,836	15,402	5,424	7,060	28,523	126,078
ATLANTIC COAST	2,141	10,429	968	115	1,586	15,186	30,425
NORTH-EASTERN	14,206	690	1,960	-	363	5,969	23,168
MIDDLE-EASTERN	20,939	492	4,128	-	684	8,493	34,736
WESTERN	24,347	303	4,751	-	295	8,072	37,768
NATIONAL TOTAL	146,974	26,200	37,124	5,539	10,322	77,905	304,064

* Pineapples, guineos, oranges, grapefruit, avocados, zapotes, coconut, cashew, papaya, apricot, quince, pepper, henequén (or maguey), rattan, cocoa, etc.

SOURCE: Censo Nacional Agropecuario 1974.

TABLE NO. 11

CULTIVATED AREA OF MAIN PERENNIAL PRODUCTS, BY REGION
(Manzanas)

REGIONS	COFFEE	BANANA	SUGAR CANE	AFRICAN PALM	PLATAIN	OTHERS *	REGIONAL TOTAL
Southern	3,859	57	6,406	-	115	3,693	14,130
Middle-Western	25,653	393	3,505	-	219	7,969	37,739
Northern	55,829	13,836	15,402	5,424	7,060	28,523	126,078
Atlantic Coast	2,141	10,429	968	115	1,586	15,186	30,425
North-Eastern	14,206	690	1,960	-	363	5,969	23,188
Middle-Eastern	20,939	492	4,128	-	684	8,493	34,736
Western	24,347	303	4,751	-	295	8,072	37,768
NATIONAL TOTAL	146,974	26,200	37,124	5,539	10,322	77,905	304,064

* Pineapples, guineos, oranges, grapefruit, mangos, avocados, zapotes, coconut, cashew potatoes, apricots Quince, pepper, henequen (or maguey), rattan, cocoa, etc.

SOURCE: Censo Nacional Agropecuario 1974

(1 Manzana = .7 Hectares)

TABLE NO. 12

PERCENTAGE PARTICIPATION IN REGIONAL PRODUCTION OF BASIC GRAINS BY GROUPS OF PRODUCERS

REGION	PRODUCERS GROUP	SORGHUM	MAIZE	BEANS	RICE
SOUTHERN	Small	49.53	48.33	40.31	8.28
	Medium	42.75	39.87	46.63	17.07
	Large	7.72	11.80	13.05	74.65
		100.00	100.00	100.00	100.00
MIDDLE-WESTERN	Small	50.92	44.16	46.48	27.67
	Medium	39.69	45.16	44.03	44.59
	Large	9.39	10.68	9.49	27.74
		100.00	100.00	100.00	100.00
NORTHERN	Small	32.28	41.56	37.19	29.90
	Medium	62.99	41.27	49.71	50.01
	Large	4.72	17.17	13.10	20.00
		100.00	100.00	100.00	100.00
ATLANTIC COAST	Small	33.33	33.04	27.02	26.16
	Medium	50.00	49.26	54.82	56.52
	Large	16.67	17.69	18.16	17.32
		100.00	100.00	100.00	100.00
NORTH-EASTERN	Small	40.74	30.94	45.02	23.69
	Medium	22.22	47.95	45.16	48.14
	Large	37.04	21.10	9.82	28.17
		100.00	100.00	100.00	100.00
MIDDLE-EAST	Small	28.32	38.38	41.43	8.77
	Medium	22.36	35.82	37.32	23.67
	Large	49.31	25.80	21.25	67.55
		100.00	100.00	100.00	100.00
WEST	Small	51.34	48.35	48.50	27.27
	Medium	45.39	38.70	42.37	49.12
	Large	3.27	12.94	9.12	23.61
		100.00	100.00	100.00	100.00

SOURCE: Censo Nacional Agropecuario 1974.

TABLE NO. 13

MAIN AND SECONDARY MARKETS BY REGION

REGION	Department	MARKETS Main	MARKETS Secondary
Southern	CHOLUTECA	CHOLUTECA	SAN MARCOS DE COLON
	VALLE	SAN LORENZO	NACAOME
Middle Western	INTIBUCA	*	INTIBUCA
	"		LA ESPERANZA
	COMAYAGUA	COMAYAGUA	
	"	SIGUATEPEQUE	
	LA PAZ		LA PAZ
	"		MARCALA
Northern	CORTES	SAN PEDRO SULA	CHOLOMA
	"	PUERTO CORTES	
	SANTA BARBARA		SANTA BARBARA
	YORO	EL PROGRESO	YORO
	ATLANTIDA	TELA	
Atlantic Coast	ATLANTIDA	LA CEIBA	
	YORO		OLANCHITO
	COLON		TRUJILIO
	"		TOCOA
North-Eastern	OLANCHO	JUTICALPA	
	"	CATACAMAS	
Middle Eastern	EL PARAISO	DANLI	EL PARAISO
	FCO. MORAZAN	TEGUCIGALPA	TALANGA
	"		GUAIMACA
Western	COPAN	SANTA ROSA	LA ENTRADA
	OCOTEPEQUE		OCOTEPEQUE
	LEMPIRA		GRACIAS

* Twin cities forming one market.

SOURCE: Censo Nacional de Población 1974.

TABLE NO. 14

AVERAGE PRICES OF BASIC GRAINS PAID TO PRODUCERS FOR EACH HUNDREDWEIGHT

(In Lempiras and at the farm level)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Maize	6.00	6.00	6.50	7.00	8.25	8.50	10.00	12.00	12.50	12.54	12.52
Milled rice	22.42	22.45	22.50	23.25	24.25	25.00	29.50	32.50	35.50	38.68	40.05
Sorghum	5.40	5.45	5.50	6.25	6.25	6.50	7.75	8.25	8.75	9.38	9.96
Beans	16.75	17.00	17.75	18.50	19.05	19.50	21.50	22.50	27.25	29.50	32.60

SOURCE: Departamento de Estudios Económicos, Banco Central de Honduras.

TABLE NO. 15
CULTIVATED AREA OF BASIC GRAINS BY REGION AND BY GROUP OF PRODUCERS ACCORDING TO CYCLES AND CULTIVATION PRACTICES
(Manzanas)

Group	Regions	Sorghum	Sorghum Associated	Maize I	Maize I Asso.	Maize II	Maize II Asso.	Beans I	Beans I Asso.	Beans II	Beans II Asso.	Rice
Small Producers (less 7 mz.)	Southern	646	20,583	7,528	20,925	4,646	761	347	1,360	865	315	296
	Middle Western	440	6,817	15,588	10,176	600	496	592	5,474	1,250	419	609
	North	15	34	30,224	1,058	9,131	323	2,349	879	1,597	228	1,554
	Atlantic Coast	8	24	7,382	163	1,755	445	858	111	289	10	950
	North-Eastern	20	12	11,587	280	305	24	2,031	246	3,215	32	563
	Middle-Eastern	299	3,023	21,637	4,686	438	446	1,856	1,941	6,371	470	110
	Western	480	5,624	24,841	7,629	2,588	174	1,622	2,467	2,354	170	919
	TOTAL	1,908	36,117	118,787	44,917	19,463	2,669	9,655	12,498	15,941	1,644	5,001
Medium Producers (7 to 72 mz)	Southerb	1,266	19,113	5,920	19,384	3,342	812	439	1,443	1,190	406	583
	Middle-Western	598	6,046	17,267	11,070	499	383	824	6,947	1,178	330	903
	Northern	57	63	33,486	1,304	8,363	292	3,845	1,171	1,752	194	2,826
	Atlantic Coast	10	25	12,235	262	1,989	255	1,855	189	583	31	2,234
	North-Eastern	8	34	10,227	360	586	38	2,430	325	2,716	64	1,045
	MIddle-Eastern	390	2,663	22,145	3,948	521	255	2,668	1,490	5,636	297	330
	Western	795	5,468	22,730	7,239	1,843	152	1,666	2,410	1,972	167	1,510
	TOTAL	3,124	33,412	132,010	43,567	17,143	2,187	13,727	13,975	15,027	1,489	9,431
Large Producers (More 72 mz)	Southern	1,004	3,807	3,921	4,100	931	179	117	469	292	110	1,050
	Middle-Western	91	1,171	3,920	2,272	56	72	199	1,307	337	60	271
	Northern	-	7	16,389	488	3,505	61	1,012	380	453	40	1,137
	Atlantic Coast	-	4	5,351	247	573	35	519	177	145	17	904
	North-Eastern	21	-	8,115	70	716	10	526	63	565	1	568
	Middle-Eastern	2,234	940	12,209	2,600	526	124	1,600	1,750	3,426	142	396
	Western	89	440	8,165	900	385	38	380	499	330	43	621
	TOTAL	3,439	6,369	58,150	10,757	6,692	519	4,353	4,645	5,548	413	4,947

SOURCE: Censo Nacional Agropecuario 1974.
(1 manzana = .7 hectares)

TABLE NO. 16

LAND AND LABOUR AVAILABILITY BY REGIONS

REGIONS	Land availability (Mzs).				LABOUR AVAILABILY (MEN)					
					FAMILY			TOTAL		
	Small Prod.	Medium Produc	Large Prod.	Region. Total	Small Prod.	Medium Prod.	Large Prod.	Family	Hired	Family & Hired
Southern	35,130	33,649	16,881	85,660	28,602	12,134	1,217	41,953	20,372	62,325
Middle Western	28,695	32,049	8,737	69,481	26,049	13,511	1,098	40,658	17,381	58,039
Northern	40,225	47,274	21,411	108,910	35,305	18,344	3,060	56,709	53,613	110,322
Atlantic Coast	7,986	18,818	11,131	37,935	9,067	6,176	1,055	16,298	18,549	34,847
North-Eastern	15,676	24,607	12,562	52,845	10,261	7,338	1,018	18,617	18,486	37,103
Middle-Eastern	30,036	31,283	20,301	81,620	25,149	11,308	1,717	38,174	25,986	64,160
Western	36,868	35,674	11,627	84,169	36,934	17,160	1,780	55,874	25,625	81,499
National Total	194,616	223,354	102,650	520,620	171,367	85,971	10,945	268,283	180,012	448,295

METHODOLOGY:

Land availability: Annual crop area.
Family labour availability: number of families with land X economically active population in agriculture.
Economically Hired labour availability: number of families without land X economically active population. in Agriculture.
Active population in agriculture by family: Economically active population in Agriculture ÷ total families on Agricultural labours.
Number of families with land: Number of exploitations according to the Agricultural National Census.
Number of families without land: Total number families on Agriculture minus the families with land.
Total number of families on Agriculture: Percentage of economically active population on Agriculture multiplyed by number of houses.

SOURCE: Dirección General de Estadística y Censos, Censo Nacional Agropecuario 1974, Tomo III. Censo Nacional de Población 1974, Tomo I, Censo Nacional de vivienda 1974, Tomo I.

TABLE NO. 17
BASIC GRAINS PRODUCTION BY REGION AND BY PRODUCERS GROUPS ACCORDING TO CYCLE AND CULTIVATION METHODS
(Hundredweights)

Group	Regions	Sorghum	Sorghum Associated	Maize I	Maize I Asso.	Maize II	Maize II Asso.	Beans I	Beans I Asso.	Beans II	Beans II Asso.	Rice
Small Producers (less 7 mz)	Southern	7,040	228,404	74,558	170,676	36,894	5,082	1,870	4,708	4,334	1,452	3,256
	Middle Western	4,180	70,972	178,684	94,622	6,248	4,708	4,862	18,304	10,824	2,728	8,492
	Northern	264	638	680,812	21,538	173,712	5,544	27,852	7,216	17,754	1,694	38,038
	Atlantic Coast	88	264	194,392	3,498	45,694	968	10,912	1,122	2,904	154	22,594
	North Eastern	330	154	332,904	6,930	7,766	374	21,406	1,452	31,922	264	11,616
	Middle Eastern	2,552	29,744	291,214	41,910	3,696	3,102	15,246	9,350	48,422	2,596	1,166
	Western	5,808	71,258	571,538	113,124	42,834	2,376	14,696	9,108	20,966	1,188	14,278
	TOTAL	20,262	401,434	2324,102	452,298	316,844	22,153	96,844	51,260	137,126	10,076	99,440
Medium Producers (7-72 mzs.)	Southern	10,934	192,302	57,684	151,514	22,770	4,928	2,376	4,620	5,522	1,782	6,710
	Middle Western	4,796	53,790	188,034	94,798	4,862	3,036	6,314	16,852	9,306	2,310	13,684
	Northern	1,012	748	694,386	21,032	154,550	5,324	44,242	8,734	18,524	1,364	63,624
	Atlantic Coast	154	374	310,860	4,642	48,070	1,078	22,352	1,870	5,940	462	48,818
	North Eastern	110	154	517,352	8,162	13,134	616	24,574	1,606	28,446	594	23,606
	Middle Eastern	3,718	21,780	279,158	31,790	4,576	1,672	20,724	6,490	38,742	2,156	3,146
	Western	9,790	58,344	464,486	91,014	27,126	1,518	14,146	7,722	17,160	1,122	25,718
	TOTAL	30,514	327,492	2511,960	402,952	275,088	18,172	134,728	47,894	123,640	9,790	185,306
Large Producers (More 72 mzs.)	Southern	6,952	29,744	34,826	29,898	4,224	1,166	792	1,122	1,562	528	29,348
	Middle Western	616	13,244	50,820	16,984	572	374	1,804	2,640	2,684	374	8,514
	Northern	0	132	302,918	7,656	54,712	909	11,440	2,816	4,532	418	25,564
	Atlantic Coast	0	176	114,972	4,114	11,198	682	7,106	1,386	1,452	198	14,960
	North Eastern	440	0	223,850	2,024	11,176	242	5,918	792	5,302	0	23,816
	Middle Eastern	49,764	6,468	209,022	11,154	7,128	1,188	12,210	2,156	23,408	1,012	8,976
	Western	946	3,960	172,678	14,542	6,908	1,232	3,036	2,375	2,838	396	12,364
	TOTAL	58,718	53,724	1109,086	86,372	93,918	5,786	42,306	13,288	41,778	2,926	113,542

SOURCE: Censo Nacional Agropecuario 1974.
(1 hws. = 100 pounds)

TABLE NO. 18

NATIONAL MODEL CROPS BY REGION AND BY PRODUCERS GROUP ACCORDING TO TECHNOLOGY

Region	CROP	Small Producers			Medium Producers			Large Producers		
		N T *	S T **	T ***	N T	S T	T	N T	S T	T
South	Maize I Cycle	x	x		x	x				
	Maize II Cycle	x	x		x	x			x	x
	Beans II Cycle	x	x		x	x			x	x
	Maize-Beans	x	x		x	x				
	Sorghum	x	x		x	x		x	x	
	Maize-Sorghum	x	x		x	x		x	x	
	Rice				x	x		x	x	
						x	x		x	x
Middle West	Maize I cycle	x	x		x	x				
	Beans I Cycle	x	x		x	x			x	x
	Beans II Cycle	x	x		x	x				
	Maize-Beans	x	x		x	x				
	Sorghum				x	x		x	x	
	Maize-Sorghum	x	x		x	x				
	Rice		x	x		x	x	x	x	
North	Maize I Cycle	x	x		x	x				
	Maize II Cycle	x	x		x	x			x	x
	Beans I Cycle	x	x		x	x			x	x
	Beans II Cycle	x	x		x	x			x	x
	Maize-Beans	x	x		x	x				
	Rice		x	x		x	x		x	x
Atlantic Coast	Maize I Cycle	x	x		x	x				
	Maize II Cycle	x	x		x	x			x	x
	Beans I Cycle	x	x		x	x				
	Beans II Cycle				x	x			x	x
	Rice		x	x		x	x		x	x
North-East	Maize I Cycle	x	x		x	x				
	Beans I Cycle	x	x		x	x			x	x
	Beans II Cycle	x	x		x	x				
	Rice		x	x		x	x		x	x
Middle-East	Maize I cycle	x	x		x	x				
	Beans I Cycle	x	x		x	x			x	x
	Beans II Cycle	x	x		x	x			x	x
	Maize-Beans	x	x		x	x			x	x
	Sorghum							x	x	
	Maize-Sorghum	x	x		x	x		x	x	
								x	x	
West	Maize I Cycle	x	x		x	x				
	Maize II Cycle	x	x		x	x			x	x
	Beans I Cycle	x	x		x	x				
	Beans II Cycle	x	x		x	x				
	Maize-Beans	x	x		x	x				
	Sorghum	x	x		x	x		x	x	
	Maize-Sorghum	x	x		x	x				
	Rice		x	x		x	x		x	x

* Traditional Technology
** Intermediate Technology
*** Advanced Technology

SOURCE: Prepared by the Proyecto Agrícola Nutricional SIECA.

TECHNICAL COEFFICIENTS NOMENCLATURE

Cycle	I - First	
	P - Second	
Technology	N - No or traditional technology	
	S - Intermediate technology	
	T - Advanced technology	
Group	1 - Small farms (0-7 mzs)	
	2 - Medium Size farms (7-72 mzs.)	
	3 - Large farms (More than 72 mzs.)	
Seeds and Yield	M - Maize	
	F - Beans	qq - Hundredweights
	S - Sorghum	
Labour	DH - Man-days	
Fertilizers	qq - Hundredweights	
Chemicals and other Costs	Lps - Lempiras	
Mechanical Traction	H-T - Tractor hours	
Animal Traction	D-Y - Oxen days	

TABLE NO. 19
TECHNICAL COEFFICIENTS

REGION: SOUTHERN

Crop	Cycle	Technology	Group	Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H - T)	Animal Traction (D-Y)	Other Costs (Lps)	Yield (qq)
Maize	I	N	1	.20	54.91	-	-	-	-	4.82	10.75
"	I	S	1	.25	53.00	1.00	-	-	2.00	5.60	13.25
"	I	N	2	.20	55.50	-	-	-	-	8.40	10.75
"	I	S	2	.25	50.80	1.00	4.25	-	3.40	10.60	12.00
"	I	S	3	.20	53.60	1.25	2.00	2.75	1.50	9.90	10.90
"	I	T	3	.25	50.20	2.25	5.00	4.00	-	12.75	14.80
"	P	N	1	.20	53.00	-	-	-	-	4.16	8.75
"	P	S	1	.25	55.00	1.00	-	-	2.10	5.00	13.10
"	P	N	2	.20	54.60	-	-	-	-	4.50	7.75
"	P	S	2	.22	50.86	1.00	5.20	-	4.20	7.50	10.20
"	P	S	3	.22	56.52	1.10	3.50	1.78	2.50	8.75	9.90
"	P	T	3	.25	54.68	2.20	3.64	3.20	-	10.75	12.00
Beans	P	N	1	.38	65.00	-	-	-	-	4.90	4.20
"	P	S	1	.50	67.00	1.00	-	-	-	7.80	5.01
"	P	N	2	.40	64.00	-	-	-	-	4.90	3.80
"	P	S	2	.55	61.75	1.00	5.30	-	2.00	8.50	4.64

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TABLE NO. 20
TECHNICAL COEFFICIENTS

REGION: SOUTHERN

Crop	Cycle	Technology	Group		Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H - T)	Animal Traction (D-Y)	Other Costs (Lps)		Yield (qq)
Maize-Beans	I	N	1	M	.12	68.00	-	-	-	-	7.75	M	3.10
"				F	.30	-	-	-	-	-	-	F	2.10
"	I	S	1	M	.15	68.00	1.00	-	-	2.00	9.25	M	4.10
"				F	.35	-	-	-	-	-	-	F	2.30
"	I	N	2	M	.16	65.83	-	-	-	-	7.25	M	4.50
"				F	.35	-	-	-	-	-	-	F	1.80
"	I	S	2	M	.15	60.51	.90	5.20	-	1.50	7.50	M	6.25
"				F	.40	-	-	-	-	-	-	F	2.80
"	I	N	3	M	.15	66.56	-	-	-	-	7.90	M	7.20
"				F	.35	-	-	-	-	-	-	F	4.60
"	I	S	3	M	.15	60.71	1.00	2.40	3.20	-	9.10	M	9.90
"				F	.36	-	-	-	-	-	-	F	6.10
Sorghum	I	N	1		.16	54.70	-	-	-	-	6.40		14.20
"	I	S	1		.20	57.00	.90	-	3.10	-	8.10		21.10
"	I	N	2		.19	55.50	-	-	-	1.50	6.25		7.63
"	I	S	2		.30	53.75	-	-	-	4.75	5.00		9.50
"	I	N	3		.25	54.80	-	-	-	1.00	5.10		7.00
"	I	S	3		.31	54.20	1.00	-	-	3.00	4.90		9.90

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TABLE NO. 21
TECHNICAL COEFFICIENTS

REGION: SOUTHERN

Crop	Cycle	Tech-nolo-gy	Group		Seed (qq)	Labour (D-H)	Fertil-izers (qq)	Chemi-cals (Lps)	Mechanical Traction (H - T)	Animal Traction (D-Y)	Other Costs (Lps)	Yield (qq)
Maize-Sorghum	I	N	1	M	.15	55.10	-	-	-	-	9.71	M 7.45
"				S	.15	-	-	-	-	-	-	S 10.09
"	I	S	1	M	.17	56.50	0.50	-	-	2.75	12.20	M 8.00
"				S	.17	-	-	-	-	-	-	S 11.09
"	I	N	2	M	.20	57.80	-	-	-	-	9.70	M 7.81
"				S	.15	-	-	-	-	-	-	S 10.06
"	I	S	2	M	.20	54.75	1.00	-	-	-	9.70	M 9.50
				S	.15	-	-	-	-	-	-	S 12.00
"	I	N	3	M	.14	57.00	-	-	-	-	9.70	M 7.80
"				S	.18	-	-	-	-	-	-	S 7.90
"	I	S	3	M	.15	53.00	1.00	5.75	-	2.25	12.50	M 10.40
"				S	.19	-	-	-	-	-	-	S 10.70
Rice	I	S	2		.87	87.00	-	5.40	1.50	2.10	11.60	6.50
"	I	T	2		.97	81.80	2.00	-	3.50	-	13.95	18.00
"	I	S	3		1.00	80.76	3.50	7.40	3.50	-	13.60	20.50
"	I	T	3		1.20	87.70	4.00	9.56	3.20	-	16.10	22.00

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TABLE NO. 22
TECHNICAL COEFFICIENTS

REGION: MIDDLE-WESTERN

Crop	Cycle	Technology	Group		Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H-T)	Animal Traction (D-Y)	Other Costs (Lps)		Yield (qq)
Maize	I	N	1		.22	56.01	-	-	-	-	6.20		12.50
"	I	S	1		.20	55.77	.47	-	1.23	2.92	11.80		18.50
"	I	N	2		.20	56.00	-	-	-	-	7.50		12.00
"	I	S	2		.22	46.73	-	-	2.32	1.05	8.20		12.72
"	I	S	3		.20	50.10	.80	-	2.50	1.00	10.40		15.96
"	I	T	3		.25	48.00	-	4.50	3.00	-	14.40		18.50
Beans	I	N	1		.70	66.70	-	-	-	-	3.46		7.00
"	I	S	1		.80	72.90	.50	-	-	2.50	6.90		8.21
"	I	N	2		.72	65.00	-	-	-	-	6.10		5.66
"	I	S	2		.83	65.00	-	-	1.50	-	7.50		7.66
"	P	N	1		.73	67.24	-	-	-	-	6.45		7.92
"	P	S	1		.85	62.44	.70	-	-	3.71	7.29		8.80
"	P	N	2		.70	62.00	-	-	-	-	7.70		7.90
"	P	S	2		.82	52.00	.90	-	-	2.50	9.00		8.20
Maize-Sorghum	I	N	1	M	.15	69.93	-	-	-	-	9.30	M	8.50
"				F	.51	-	-	-	-	-	-	F	3.00
"	I	S	1	M	.15	65.33	-	-	2.60	3.20	9.60	M	9.63
"				F	.57	-	-	-	-	-	-	F	3.50

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TABLE NO. 23
TECHNICAL COEFFICIENTS

REGION: MIDDLE-WESTERN

Crop	Cycle	Technology	Group		Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H-T)	Animal Traction (D-Y)	Other Costs (Lps)		Yield (qq)
Maize-Beans	I	N	2	M	.15	68.20	-	-	-	-	8.20	M	7.00
"				F	.60	-	-	-	-	-	-	F	4.00
"	I	S	2	M	.17	58.00	1.42	-	2.21	1.40	5.70	M	7.25
"				F	.64	-	-	-	-	-	-	F	4.00
"	I	N	3	M	.15	68.00	-	-	-	-	9.50	M	9.60
"				F	.50	-	-	-	-	-	-	F	3.00
"	I	S	3	M	.15	61.10	1.20	5.20	3.90	-	11.50	M	13.00
				F	.60	-	-	-	-	-	-	F	5.40
Sorghum	I	N	2		.18	55.40	-	-	-	-	6.20		16.00
"	I	S	2		.20	53.00	.50	-	-	3.50	7.10		23.40
Maize-Sorghum	I	N	1	M	.14	57.00	-	-	-	-	6.07	M	8.60
"				S	.15	-	-	-	-	-	-	S	9.10
"	I	S	1	M	.16	57.30	.95	-	1.50	3.25	5.74	M	9.50
"				S	.15	-	-	-	-	-	-	S	10.71
"	I	N	2	M	.14	52.00	-	-	-	-	7.50	M	9.25
"				S	.16	-	-	-	-	-	-	S	9.50
"	I	S	2	M	.16	51.10	1.00	-	3.15	1.73	6.10	M	11.00
"				S	.17	-	-	-	-	-	-	S	10.50

TABLE NO. 23
TECHNICAL COEFFICIENTS

REGION: MIDDLE-WESTERN

Crop	Cycle	Technology	Group		Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H-T)	Animal Traction (D-Y)	Other Costs (Lps)		Yield (qq)
Maize-Sorghum	I	N	3	M	.13	60.00	-	-	-	-	10.50	M	7.47
"				S	.15	-	-	-	-	-	-	S	8.90
"	I	S	3	M	.15	52.80	1.00	-	2.70	1.50	15.40	M	9.10
				S	.18	-	-	-	-	-	-	S	12.40
Rice	I	S	1		.77	83.60	1.00	-	-	4.00	10.66		10.37
"	I	T	1		1.03	83.01	3.60	-	2.33	3.39	14.81		17.10
"	I	S	2		.87	86.00	1.50	5.20	-	4.20	11.63		12.90
"	I	T	2		.97	78.11	3.72	2.43	3.29	2.36	13.70		17.25

TABLE NO. 24
TECHNICAL COEFFICIENTS

REGION: NORTHERN

Crop	Cycle	Technology	Group	Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H-T)	Animal Traction (D-Y)	Other Costs (Lps)	Yield (qq)
Maize	I	N	1	.19	55.4	-	-	-	-	12.10	22.30
"	I	S	1	.23	46.7	1.00	-	2.80	1.40	14.85	29.20
"	I	N	2	.20	56.2	-	-	-	-	12.50	20.40
"	I	S	2	.24	50.8	1.50	-	2.50	0.50	16.90	26.10
"	I	S	3	.20	48.1	1.75	-	2.90	1.50	17.00	23.40
"	I	T	3	.25	46.2	2.50	-	3.80	-	20.35	29.00
"	P	N	1	.23	53.2	-	-	-	-	10.40	18.40
"	P	S	1	.23	49.3	.70	-	2.30	1.00	13.00	25.20
"	P	N	2	.20	52.3	-	-	-	-	11.50	18.48
"	P	S	2	.24	47.8	-	-	3.50	-	14.40	23.60
"	P	S	3	.24	54.9	1.50	-	2.50	-	20.50	22.20
"	P	T	3	.25	53.0	2.00	4.20	3.10	-	23.00	27.00
Beans	I	N	1	.76	67.1	-	-	-	-	6.60	11.50
"	I	S	1	.78	59.0	-	4.20	-	2.50	7.00	13.00
"	I	N	2	.74	68.6	-	-	-	-	6.20	11.50
"	I	S	2	.82	60.2	1.20	6.60	1.20	2.00	9.00	15.00
"	I	S	3	.90	58.9	1.70	5.10	1.40	-	9.20	12.70
"	I	T	3	1.00	55.2	2.50	10.50	4.00	-	11.40	15.90
"	P	N	1	.75	66.7	-	-	-	-	6.00	10.50

TABLE NO. 25
TECHNICAL COEFFICIENTS

REGION: NORTHERN

Crop	Cycle	Technology	Group		Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H -T)	Animal Traction (D-Y)	Other Costs (Lps)		Yield (qq)
Beans	P	S	1		.85	58.0	0.75	-	-	3.10	7.20		12.90
"	P	N	2		.78	66.6	-	-	-	-	6.50		10.00
"	P	S	2		.86	60.0	1.20	2.90	2.00	1.00	7.70		14.00
Maize-Beans	I	N	1	M	.15	68.2	-	-	-	-	12.95	M	14.50
"				F	.60	-	-	-	-	-	-	F	5.50
"	I	S	1	M	.18	62.0	1.00	-	1.50	2.20	12.40	M	16.30
"				F	.65	-	-	-	-	-	-	F	11.90
"	I	N	2	M	.15	68.0	-	-	-	-	12.00	M	13.12
"				F	.62	-	-	-	-	-	-	F	5.95
"	I	S	2	M	.17	64.0	1.50	5.20	2.50	-	15.10	M	15.90
				F	.68	-	-	-	-	-	-	F	7.20
Rice	I	S	1		.85	83.0	1.00	-	-	2.00	5.80		15.20
"	I	T	1		1.00	79.8	2.00	-	1.70	4.50	8.00		20.10
"	I	S	2		.90	82.8	1.00	-	-	2.50	7.20		13.30
"	I	T	2		1.00	79.0	3.00	4.60	1.50	2.00	7.90		19.00
"	I	S	3		1.00	81.0	1.00	8.00	0.50	2.00	12.00		15.00
"	I	T	3		1.10	76.2	4.00	9.40	4.50	-	13.40		20.20

TABLE NO. 26
TECHNICAL COEFFICIENTS

REGION: ATLANTIC COAST

Crop	Cycle	Tech-nolo-gy	Group	Seed (qq)	Labour (D-H)	Fertil-izers (qq)	Chemi-cals (Lps)	Mechanical Traction (H - T)	Animal Traction (D-Y)	Other Costs (Lps)	Yield (qq)
Maize	I	N	1	.20	54.60	-	-	-	-	10.70	24.50
"	I	S	1	.25	52.40	.50	-	-	3.00	11.60	26.20
"	I	N	2	.22	53.10	-	-	-	-	12.00	25.40
"	I	S	2	.26	50.20	.80	1.05	1.00	2.80	13.40	13.40
"	I	S	3	.23	50.25	1.50	1.60	-	1.50	14.50	22.20
"	I	T	3	.27	49.60	2.00	3.40	2.70	-	16.70	28.50
"	P	N	1	.20	56.10	-	-	-	-	9.75	23.00
"	P	S	1	.24	53.50	.80	-	-	2.80	10.35	24.10
"	P	N	2	.23	52.30	-	-	-	-	10.25	18.00
"	P	S	2	.25	51.40	1.00	-	1.10	2.00	12.40	22.75
Beans	I	N	1	.48	61.90	-	-	-	-	6.60	10.04
"	I	S	1	.50	60.50	1.00	3.50	-	2.40	8.20	14.50
"	I	N	2	.53	63.10	-	-	-	-	8.60	9.50
"	I	S	2	.56	60.30	1.20	4.10	1.00	1.80	10.00	10.00
"	I	S	3	.61	66.40	2.00	6.40	1.20	-	9.60	13.20
"	I	T	3	.65	65.20	3.50	8.20	3.20	-	12.10	15.20
"	P	N	2	.58	63.70	-	-	-	-	5.10	10.00
"	P	S	2	.67	62.10	.70	3.10	1.90	1.00	6.80	13.00

TABLE NO. 26
TECHNICAL COEFFICIENTS

REGION: ATLANTIC COAST

Crop	Cycle	Technology	Group	Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H- T)	Animal Traction (D-Y)	Other Costs (Lps)	Yield (qq)
Rice	I	S	1	.85	87.10	.75	3.80	1.75	3.50	9.60	16.00
"	I	T	1	.90	83.50	1.00	6.15	2.50	3.00	10.60	18.10
"	I	S	2	.88	86.30	1.10	5.40	2.00	3.60	11.30	22.50
"	I	T	2	.97	88.15	1.50	7.10	3.10	2.20	13.00	26.00
"	I	S	3	.90	80.00	2.40	6.90	3.50	2.00	10.50	13.00
"	I	T	3	1.00	74.30	3.80	9.15	4.50	-	12.30	17.50

TABLE NO. 27
TECHNICAL COEFFICIENTS

REGION: NORTH-EASTERN

Crop	Cycle	Technology	Group	Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H-T)	Animal Traction (D-Y)	Other Costs (Lps)	Yield (qq)
Maize	I	N	1	.26	51.10	-	-	-	-	10.65	25.00
"	I	S	1	.26	52.60	.50	4.00	-	1.00	12.20	28.20
"	I	N	2	.27	52.80	-	-	-	-	12.30	26.20
"	I	S	2	.28	50.10	.70	4.90	.60	2.00	14.50	29.90
"	I	S	3	.28	55.00	1.80	2.30	1.00	.90	15.30	28.50
"	I	T	3	.30	53.80	2.00	3.40	3.00	1.00	17.30	32.60
Beans	I	N	1	.38	60.15	-	-	-	-	4.50	10.50
"	I	S	1	.40	62.30	.75	7.80	1.00	.50	5.80	13.50
"	I	N	2	.39	63.50	-	-	-	-	5.00	10.70
"	I	S	2	.47	62.70	1.00	11.00	3.80	-	7.60	13.25
"	P	N	1	.33	61.40	-	-	-	-	3.60	10.25
"	P	S	1	.35	60.20	.50	8.50	1.50	1.00	4.80	11.25
"	P	N	2	.34	64.00	-	-	-	-	4.00	9.92
"	P	S	2	.38	62.10	.80	10.35	2.10	1.30	5.75	11.50
Rice	I	S	1	.95	86.00	1.00	8.50	1.50	3.00	10.40	15.65
"	I	T	1	1.01	78.20	1.30	10.20	2.00	1.10	11.35	17.60
"	I	S	2	.97	80.10	1.80	9.75	2.25	1.50	12.00	19.00
"	I	T	2	1.05	80.00	2.10	11.00	3.00	1.40	13.50	21.50
"	I	S	3	1.00	80.10	2.90	12.20	3.75	.70	11.50	18.00
"	I	T	3	1.10	84.60	3.50	14.90	4.50	-	13.20	21.40

TABLE NO. 28
TECHNICAL COEFFICIENTS

REGION: MIDDLE EASTERN

Crop	Cycle	Technology	Group	Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H- T)	Animal Traction (D-Y)	Other Costs (Lps)	Yield (qq)
Maize	I	I	1	.18	52.50	-	-	-	-	5.45	13.45
"	I	S	1	.20	56.50	1.00	2.64	-	2.70	6.76	21.40
"	I	N	2	.19	51.00	-	-	-	-	5.60	16.60
"	I	S	2	.20	50.10	1.20	4.20	2.0	1.50	7.10	24.00
"	I	S	3	.20	51.20	1.50	-	2.8	-	7.90	24.20
"	I	T	3	.25	50.00	2.00	4.80	3.0	-	9.20	28.50
Beans	I	N	1	.48	64.90	-	-	-	-	4.60	7.80
"	I	S	1	.48	36.00	.50	-	-	3.80	4.90	8.90
"	I	N	2	.46	65.00	-	-	-	-	4.70	8.20
"	I	S	2	.48	37.20	0.50	-	1.00	1.50	5.40	9.30
"	I	S	3	.52	65.80	-	2.00	-	-	6.10	8.20
"	I	T	3	.60	63.20	1.00	2.70	3.20	-	7.80	11.00
"	P	N	1	.41	64.90	-	-	-	-	3.80	7.90
"	P	S	1	.56	60.20	0.50	-	-	4.00	4.50	9.80
"	P	N	2	.47	62.20	-	-	-	-	4.10	7.90
"	P	S	2	.49	61.90	0.60	3.50	1.20	-	4.50	10.20
"	P	S	3	.48	64.00	0.70	-	1.90	-	5.40	6.83
"	P	T	3	.56	61.50	1.00	4.20	3.00	-	7.30	9.50

TABLE NO. 29
TECHNICAL COEFFICIENTS

REGION: MIDDLE EASTERN

Crop	Cycle	Technology	Group		Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H - T)	Animal Traction (D-Y)	Other Costs (Lps)		Yield (qq)
Maize-Beans	I	N	1	M	.12	64.70	-	-	-	-	5.25	M	6.00
"				F	.40	-	-	-	-	-	-	F	3.50
"	I	S	1	M	.14	69.20	-	-	-	4.20	5.00	M	8.00
"				F	.40	-	-	-	-	-	-	F	3.60
"	I	N	2	M	.15	65.00	-	-	-	-	6.10	M	5.50
				F	.36	-	-	-	-	-	-	F	3.50
"	I	S	2	M	.15	69.50	-	-	0.52	2.70	5.00	M	7.00
"				F	.39	-	-	-	-	-	-	F	4.00
"	I	N	3	M	.15	68.00	-	-	-	-	6.25	M	3.20
"				F	.38	-	-	-	-	-	-	F	2.30
"	I	S	3	M	.18	63.80	.80	-	2.10	2.70	6.90	M	8.00
"				F	.42	-	-	-	-	-	-	F	4.70
Sorghum	I	N	3		.17	57.70	-	-	-	-	7.50		19.00
"	I	S	3		.20	56.50	-	-	3.40	-	12.00		21.50

TABLE NO. 30
TECHNICAL COEFFICIENTS

REGION: MIDDLE EASTERN

Crop	Cycle	Tech-nology	Group		Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H-T)	Animal Traction (D-Y)	Other Costs (Lps)		Yield (qq)
Maize-Sorghum	I	N	1	M	.15	66.00	-	-	-	-	7.20	M	8.94
"				S	.12	-	-	-	-	-	-	S	9.80
"	I	S	1	M	.15	50.20	-	-	-	-	9.45	M	10.00
"				S	.14	-	-	-	-	-	-	S	11.30
"	I	N	2	M	.15	55.80	-	-	-	-	8.10	M	8.05
"				S	.12	-	-	-	-	-	-	S	8.20
"	I	S	2	M	.16	58.00	1.00	-	1.00	1.20	11.70	M	11.90
"				S	.14	-	-	-	-	-	-	S	12.00
"	I	N	3	M	.16	57.20	-	-	-	-	8.55	M	5.80
"				S	.13	-	-	-	-	-	-	S	6.90
"	I	S	3	M	.16	56.10	1.00	-	3.40	1.00	13.10	M	9.00
"				S	.14	-	-	-	-	-	-	S	11.50

TABLE NO. 31
TECHNICAL COEFFICIENTS

REGION: WESTERN

Crop	Cycle	Tech-nolo-gy	Group	Seed (qq)	Labour (D-H)	Fertil izers (qq)	Chemi-cals (Lps)	Mechanical Traction (H-T)	Animal Traction (D-Y)	Other Costs (Lps)	Yield (qq)
Maize	I	N	1	.22	55.50	-	-	-	-	11.90	17.00
"	I	S	1	.25	54.30	0.80	-	-	4.20	15.30	24.20
"	I	N	2	.22	54.00	-	-	-	-	12.00	18.00
"	I	S	2	.26	55.00	0.90	-	1.00	1.00	13.60	20.43
"	I	S	3	.25	56.70	1.50	-	1.80	-	18.00	22.20
"	I	T	3	.29	55.20	2.40	-	4.20	-	20.10	28.80
"	P	N	1	.20	52.80	-	-	-	-	8.40	15.75
"	P	S	1	.22	50.20	0.90	-	-	3.40	11.60	21.25
"	P	N	2	.20	54.10	-	-	-	-	7.70	13.20
"	P	S	2	.23	52.10	1.20	-	1.20	2.70	10.30	16.90
Beans	I	N	1	.82	64.50	-	-	-	-	4.80	9.25
"	I	S	1	.91	63.35	1.00	-	-	2.55	6.00	11.75
"	I	N	2	.82	65.90	-	-	-	-	5.40	8.10
"	I	S	2	.90	63.20	1.85	-	2.00	-	6.60	11.55
"	P	N	1	.80	66.70	-	-	-	-	4.80	8.75
"	P	S	1	.92	64.90	0.90	-	-	2.80	6.00	11.25
"	P	N	2	.80	66.20	-	-	-	-	4.70	9.00
"	P	S	2	.95	62.25	1.00	-	2.10	-	6.20	10.25

TABLE NO. 32
TECHNICAL COEFFICIENTS

REGION: WESTERN

Crop	Cycle	Technology	Group		Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H-T)	Animal Traction (D-Y)	Other Costs (Lps)	Yield (qq)
Maize-Beans	I	N	1	M	.20	60.20	-	-	-	-	10.20	M 12.30
"				F	.58	-	-	-	-	-	-	F 3.10
"	I	S	1	M	.20	58.00	0.70	-	-	4.20	14.40	M 15.20
"				F	.58	-	-	-	-	-	-	F 4.30
"	I	N	2	M	.20	61.00	-	-	-	-	9.90	M 12.20
"				F	.60	-	-	-	-	-	-	F 3.30
"	I	S	2	M	.20	60.00	0.90	-	1.00	3.40	15.00	M 17.00
"				F	.60	-	-	-	-	-	-	F 4.30
"	I	N	3	M	.19	62.30	-	-	-	-	10.80	M 14.00
"				F	.62	-	-	-	-	-	-	F 3.90
"	I	S	3	M	.20	61.70	1.50	6.20	3.20	-	17.40	M 20.30
"				F	.62	-	-	-	-	-	-	F 6.00
Sorghum	I	N	1		.18	53.20	-	-	-	-	6.90	12.10
"	I	S	1		.20	55.00	-	-	-	3.80	7.40	15.40
"	I	N	2		.18	55.00	-	-	-	-	6.50	13.80
"	I	S	2		.20	54.25	1.00	-	2.20	2.00	10.20	22.80

TABLE NO. 33
TECHNICAL COEFFICIENTS

REGION: WESTERN

Crop	Cycle	Technology	Group	Seed (qq)	Labour (D-H)	Fertilizers (qq)	Chemicals (Lps)	Mechanical Traction (H-T)	Animal Traction (D-Y)	Other Costs (Lps)	Yield (qq)
Maize-Sorghum	I	N	1	M .15	69.70	-	-	-	-	13.75	M 14.80
"				S .12	-	-	-	-	-	-	S 10.70
"	I	S	1	M .18	59.20	-	-	1.00	2.00	17.05	M 19.60
"				S .14	-	-	-	-	-	-	S 13.90
"	I	N	2	M .15	59.90	-	-	-	-	13.90	M 12.57
"				S .13	-	-	-	-	-	-	S 10.50
"	I	S	2	M .18	51.80	1.20	-	1.50	2.80	19.20	M 17.90
"				S .15	-	-	-	-	-	-	S 15.60
Rice	I	S	1	1.00	79.20	2.80	20.70	0.50	3.00	9.00	11.00
"	I	T	1	1.30	79.10	3.00	28.00	1.00	4.00	10.20	13.20
"	I	S	2	1.10	80.00	2.50	18.20	2.00	2.50	10.10	14.00
"	I	T	2	1.30	76.20	3.20	30.90	2.00	4.20	12.60	18.20
"	I	S	3	1.12	89.20	3.00	16.90	2.90	-	11.40	13.30
"	I	T	3	1.40	72.90	4.00	35.20	4.00	-	13.80	16.30

ANNEX 3

MATHEMATIC LAYOUT OF THE MODEL

VARIABLES

X	=	Cultivated area in manzanas
T	=	Land availability
MFU	=	Family Labour utilized in its own farm
MOC	=	Contracted labour
MFC	=	Family labour sale
MJC	=	Contracted day labourers
MOF	=	Family labour availability
MOJ	=	Day Labour availability
S	=	Seed
FER	=	Fertilizers
QUM	=	Chemicals
TM	=	Mechanical traction
TA	=	Animal Traction
OC	=	Other Costs
P	=	Production
AC	=	Self-consumption
AV	=	Sales
OU	=	Other Uses
COSTO	=	Total Production cost
Z_t	=	Negative deviations accounting
Z	=	Deviations absolute Value
CRED	=	Credit accounting

PARAMETERS

a	=	Amount of labour required per unit of area
b	=	Amount of Seed required per unit of area
c	=	Amount of fertilizers required per unit of area
p	=	Value in chemicals required per unit of area
f	=	Tractor hours required per unit of area
g	=	Oxen days required per unit of area
h	=	Value in other expenditures required per unit of area
r	=	Yield per unit of área
s	=	Reserve salary
w	=	Salary
	=	Price of seed per the Lth product
	=	Fertilizers price
	=	Tractor-hours price
	=	Oxen-days price
d_t	=	Income deviations with respect to average income
k	=	Factor to convert deviations with respect to the mean in standard deviation
ø	=	Aversion risk factor
	=	Interest rate

SUB-INDEXES

i	=	Product
j	=	Cycle
k	=	Technology
l	=	Producer
m	=	Region
n	=	Interval number
t	=	Year

ECUACIONES - EQUATIONS

BALANCE DE LA TIERRA - LAND BALANCE

$$\sum_i \sum_k X_{ijklm} \leq T_{jlm}$$

BALANCE MANO DE OBRA - LABOUR BALANCE

$$\sum_i \sum_k a_{ijklm} X_{ijklm} - MFU_{lm} - MOC_{lm} \leq 0$$

$$MOC_{lm} - MFC_{lm} - MJC_{lm} = 0 \qquad l = 2, 3$$

$$MFU_{lm} + \sum_l MFC_{lm} \leq MOF_{lm}$$

$$\sum_l MJC_{lm} \leq MOJ_m$$

BALANCE DE REQUERIMIENTOS DE INSUMOS - INPUT REQUIREMENTS BALANCE

SEMILLA - SEED

$$\sum_l \sum_j \sum_k b_{ijklm} X_{ijklm} - S_{im} \leq 0$$

FERTILIZANTES - FERTILIZERS

$$\sum_l \sum_j \sum_i \sum_k c_{ijklm} X_{ijklm} - FER_m \leq 0$$

QUIMICOS - CHEMICALS

$$\sum_l \sum_j \sum_i \sum_k p_{ijklm} X_{ijklm} - QUM_m \leq 0$$

TRACCION MECANICA - MECHANICAL TRACTION

$$\sum_l \sum_j \sum_i \sum_k f_{ijklm} X_{ijklm} - TM_m \leq 0$$

TRACCION ANIMAL - ANIMAL TRACTION

$$\sum_l \sum_j \sum_i \sum_k g_{ijklm} X_{ijklm} - TA_m \leq 0$$

OTROS COSTOS - OTHER COSTS

$$\sum_l \sum_j \sum_i \sum_k h_{ijklm} X_{ijklm} - OC_m \leq 0$$

BALANCE DE PRODUCCION - PRODUCTION BALANCE

$$\sum_k r_{ijklm} X_{ijklm} - P_{ijlm} \leq 0$$

DISTRIBUCION DE LA PRODUCCION - PRODUCTION ALLOTMENT

$$\sum_j P_{ijlm} - AC_{ilm} - AV_{ilm} - OU_{ilm} \leq 0$$

CONTABILIZACION DEL COSTO - COST ACCOUNTING

$$\sum_m \sum_l sMFU_{lm} + \sum_m \sum_l wMOC_{lm} + \sum_m \sum_i \delta_i s_{im}$$

$$+ \sum_m \beta FER_m + \sum_m QUM_m + \sum_m \delta TM_m + \sum \gamma TA_m$$

$$+ \sum_m OC_m - COSTO \leq 0$$

CONTABILIZACION REGIONAL DE LA PRODUCCION - REGIONAL PRODUCTION ACCOUNTIN

$$\sum_l P_{ijlm} - PR_{ijm} \leq 0$$

CONTABILIZACION NACIONAL DE LA PRODUCCION - REGIONAL PRODUCTION ACCOUNTIN

$$\sum_m PR_{ijm} - PN_{ij} \leq 0$$

VENTAS - SALES

$$PN_{ij} - \sum q_n E_n \leq 0$$

BALANCE DE CONVEXIDAD - CONVEXITY BALANCE

$$\sum_n E_n \leq 1$$

RIESGOS - RISKS

$$\sum_m \sum_l \sum_j \sum_i d_{ijlmi} X_{ijklm} - Z_i \geq 0$$

$$\sum_i z Z_i - KZ \geq 0$$

CONTABILIZACION DEL CREDITO - CREDIT ACCOUNTING

$$\sum_m \sum_i \alpha\, S_{im} + \sum_m \beta\, FER_m + \sum_m QUM_m + \sum_m \delta\, TM_m - CRED \leq 0$$

FUNCION OBJETIVO - OBJECTIVE FUNCTION

$$MAX \quad \sum_n W_n E_n - COSTO - \Phi Z - \rho\, CRED$$

ANNEX No. 4

LAND CLASSIFICATION BY ITS AGROLOGICAL CAPACITY

(from "A Manual on Conservation of Soil Water", U.S. Departament of Agriculture Handbook No. 61, Washington, D.C., June, 1964).

The agrological capacity is the adaptation presented by land to specific uses.

Land is used either for crop production that requires cultivation, or for a certain form of permanent vegetation (generally pastures, other forms of forrage plants or timberly trees), that requires few or no tilling.

Land classification by its agrological capacity has the purpose to indicate these uses and its limitations. There are eight categories, that go from better to the more cultivated land (Class I), to land that is not adequate, either for cultivation or as forests, but that may be used for hunting, recreation or protection of hydrological basins (Class VIII). The definition of these categories is presented in the following paragraphs:

I. Very good land, adequate for intensive cultivation of a variety of products. Without erosion risks.

II. Good land, that may be cultivated with simple methods. It has smooth gradients and it is slightly succeptible to erosion; it includes deep soils with moderate fertility.

III. Moderately good land, that may be utilized regularly for rotation crops. This category is formed by land with moderate slopes; erosionable soils; soils with a slowly permeable sub-soil; low deep to sandy loam soils; and gravel soils, with scarce capacity of water retention.

IV. Relatively good land that may be utilized for permanent vegetation as pastures or trees, but that may be ocassionally cultivated to renew or establish prairies.

V. Almost flat land, not adequate for cultivation as a result of some characteristics; for instance, for being of stony, humid or dry nature that prevents cultivations. Adequate for pastures, forests, and some tree cultivations. This class includes marshy land where drainage is not feasible.

VI. Land subject to many limitations to pastures or forests. Too heavy slopes, subject to erosion, low depth, humid or dry, or with some other characteristic that makes it inadequate for cultivation, but with a carefull organization may be destined to pastures or forests. Some areas may be ploughed

enough to establish pastures and some others may be used for tree cultivations.

VII. Inadequate land for cultivation, with serious limitations or risks to be used as forest or pastures. This category includes land with heavy slopes, stony, erosioned, dry, marshy land or with other unfavorable characteristics; but may be used for forest or pastures if it is carefully organized.

VIII. Land not adequate to be used for forest or pastures, but that may be used for hunting or for recreational purposes. This category includes marshes, beaches, rocks and land with deep cracks.

ANNEX NO. 5

REPORTS PREPARED BY THIS PROJECT

A ñ o 1981

Documento No.	1	DESCRIPCION DEL PROYECTO
"	2	RESUMEN DE LA DESCRIPCION DEL PROYECTO
"	3	SUGERENCIAS SOBRE TERMINOS DE REFERENCIA PARA EL ESTUDIO DE LOS EFECTOS DE POLITICAS DE DESARROLLO AGRICOLA PARA EL CONSUMO DE ALIMENTOS EN CENTRO - AMERICA. " DOCUMENTO DE TRABAJO ".
"	4	PROGRAMA DE TRABAJO
"	5	INFORME TRIMESTRAL. PERIODO ABRIL A JUNIO, 1981
"	6	DOCUMENTACION PROGRAMA GENERACION DE MAPAS (PANMAPA)
"	7	INSTRUCTIVO SOBRE EL MANEJO DEL PROGRAMA DE GENERACION DEL MAPA DE HONDURAS.
"	8	PROGRAMA DE COMPUTACION ELECTRONICA PARA PRESENTACION VISUAL DE DATOS ESTADISTICOS.
"	9	INFORMACION BASICA PARA LOS MODELOS DE PROGRAMACION LINEAL, REGION SUR.
"	10	INFORME DEL CONSULTOR DR. BERNARDO MORALES F. SOBRE " ESTUDIO DE LOS EFECTOS DE POLITICAS DE DESARROLLO AGRICOLA PARA EL CONSUMO DE ALIMENTOS DE LA POBLACION CENTROAMERICANA "
"	11	INFORME DEL CONSULTOR DR. ROGER D. NORTON SOBRE " ESTUDIO DE LOS EFECTOS DE POLITICAS DE DESARROLLO AGRICOLA PARA EL CONSUMO DE ALIMENTOS DE LA POBLACION CENTROAMERICANA "
"	12	ESTRUCTURA MATEMATICA MODELO DE FINCA.
"	13	FIRST EVALUATION OF THE PROJECT. PREPARED BY. ERIC THORBECKE: TERRY ROE Y GRANT SCOBI
"	13 A	AYUDA MEMORIA SOBRE LOS RESULTADOS DE LAS REUNIONES PREPARATORIAS PARA LA PRIMERA EVALUACION.
"	14	NOTAS SOBRE EL ANALISIS DE LA DEMANDA DEL CONSUMIDOR EL PROYECTO SOBRE LOS EFECTOS DE POLITICAS AGRICOLAS EL CONSUMO DE ALIMENTOS. PREPARED BY: GRANT M. SCOBI

Año 1981

Documento No.	15	INFORME TRIMESTRAL PERIODO JULIO A SEPTIEMBRE DE 1981
"	16	ENCUESTA NACIONAL SOBRE LAS CONDICIONES DE VIDA DE LOS HOGARES. CONSUPLANE - BCH - DGEC - 1977-78. LISTA DE TABULADOS. BOLETAS. (ANEXO No. 4)

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Documento No.	17	DESCRIPCION AGRO ECONOMICO Y SOCIAL DE LA REGION SUR.
"	18	SEMINARIO TECNICO SOBRE LOS AVANCES DEL PROYECTO " ESTUDIO DE LOS EFECTOS DE POLITICAS DE DESARROLLO AGRICOLA EN EL CONSUMO DE ALIMENTOS DE LA POBLACION CENTROAMERICANA "
"	20	INFORME DEL CONSULTOR: GRANT M. SCOBIE. " NOTAS SOBRE EL PLAN DE ANALISIS DE LA DEMANDA DEL CONSUMIDOR.
"	19	PLANTEAMIENTO SOBRE LA ORGANIZACION Y RECOLECCION DE LOS REQUERIMIENTOS DE INFORMACION PARA EL MODELO DE - FINCA. REPORTE PARA LA PARTICIPACION EN EL SEMINARIO TECNICO CELEBRADO DEL 13 AL 15 DE ENERO DE 1982.
"	21	INFORMACION BASICA PRELIMINAR PARA LA ELABORACION Y VALIDACION DEL MODELO AGRICOLA REGIONAL.
"	22	INFORME ANUAL.
"	23	EVALUATION OF THE PROJECT " STUDY OF THE EFFECTS OF AGRICULTURAL DEVELOPMENT POLICIES ON FOOD CONSUMPTION OF THE CENTRAL AMERICAN POPULATION" TERRY L. ROE.
"	24	REPORT OF TRIP TO EVALUATE THE SIECA/ECID PROJECT ON EFFECT OF AGRICULTURAL DEVELOPMENT POLICIES ON FOOD CONSUMPTION IN CENTRAL AMERICA." ERICK THORBECKE.
"	25	INFORME SOBRE SUELOS; USO ACTUAL Y CAPACIDAD DEL USO DE LA TIERRA EN LA REGION SUR.
"	26	DISEÑO METODOLOGICO DE LOS MODELOS DE OPTIMIZACION RECOMENDACIONES. DR. CARLOS A. BENITO.
"	27	HACIA LA RACIONALIZACION DE LA POLITICA AGROPECUARIA Y ALIMENTARIA. UN SISTEMA DE INFORMACION. DR. CARLOS A. BENITO.
"	28	NUTRITION RELATIONSHIPS IN FARM MODELS. (ROUGH DRAFT) ROGER NORTON Y DANIEL SALCEDO.

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Documento No.	29	INFORME DE LA SEGUNDA EVALUACION DEL PROYECTO
"	29A	NOTES ON EVALUATION TEAM MEETING SECOND INTERIM TECHNICAL EVALUATION. July 14-16,1982
"	29B	COMENTARIOS SOBRE EL STATUS DEL PROYECTO AGRICOLA NUTRICIONAL EN HONDURAS. (Versión en Español) PREPARADO POR: ROGER D. NORTON.
"	30	LINEAMIENTOS DE POLITICAS PARA EL DESARROLLO AGRICOLA Y NUTRICIONAL EN HONDURAS Y DE SU ESTRUCTURA INSTITUCIONAL.
"	31	PATRON DEL GASTO Y DEL CONSUMO DE ALIMENTOS EN LOS HOGARES EN HONDURAS.
"	31A	PATTERN OF EXPENDITURE AND FOOD CONSUMPTION IN HONDURAN HOUSEHOLDS.
"	32	EVALUATION REPORT. PREPARED BY: STANLEY R. JOHNSON.

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Documento No.	33	INFORME SOBRE SUELOS: USO ACTUAL DEL SUELO DE LA TIERRA EN LA REGION SUR.
"	34	PLAN DE TRABAJO DETALLADO ENERO 1983 - MARZO 1984.
"	35	APLICACION DE UNA METODOLOGIA CUANTITATIVA EN LA EJECUCION DE PROYECTOS RURALES DE DESARROLLO INTEGRAL (Doct. de Trabajo).
"	36	RELACIONES PRODUCTIVAS Y NUTRICIONALES EN UN MODELO DE PROGRAMACION LINEAL A NIVEL DE FINCA.
"	36A	PRODUCTIVE AND NUTRITIONAL RELATIONSHIP IN A LINEAR PROGRAMMING MODEL AT FARM LEVEL.
"	37	ANALISIS INSTITUCIONAL DEL SECTOR AGRICOLA, PUBLICO Y PRIVADO.
"	38	PROGRAMA DETALLADO DE LABORES REVISADO
"	39	ELASTICIDADES DE LOS GASTOS DE CONSUMO EN HONDURAS
"	39A	ELASTICITIES OF CONSUMPTION EXPENDITURES IN HONDURAS
"	40	INFORME ANUAL
"	40A	ANUAL REPORT. May 1982 - April 1983
"	41	INFORME TERCERA EVALUACION . THIRD EVALUATION OF THE PROJECT. TEGUCIGALPA, D.C. HONDURAS 16-20 MAYO DE 1983. PREPARED BY: ROBERTA VAN HAEFTEN; GARY SMITH; NUTRITION ECONOMICS GROUPS. JUNE 1983.

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Documento No. 42 CONSUMO DE ALIMENTOS E INGESTA DE NUTRIENTES POR GRUPOS SOCIO ECONOMICOS EN LOS HOGARES DE HONDURAS.

" 42A FOOD CONSUMPTION AND NUTRIENTS INTAKE BY SOCIO-ECONOMIC GROUPS IN HONDURAS HOUSEHOLDS.

" 43 USO DE LOS MODELOS EMPIRICOS (NOTAS PARA UN TALLER)

" 43A USE OF LINEAR PROGRAMMING IN AGRICULTURAL PLANNING. NOTES FOR A WORK-SHOP.

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Documento No. 44 ELASTICIDADES, PRECIO-INGRESO DE LOS PRINCIPALES PRODUCTOS ALIMENTICIOS EN HONDURAS. (Informe Final)

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Documento No. 45 PROGRAMACION LINEAL EN LA PLANIFICACION AGRICOLA.
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Documento No. 46 DOCUMENTACION DE LA REGION SUR DE HONDURAS PARA EL MODELO DE FINCA Y DEL MODELO DE PROGRAMACION AGRICOLA.

Documento No. 47 DOCUMENTACION DE ARCHIVOS DE COMPUTACION

Documento No. 48 MODELO SECTORIAL DE PROGRAMACION LINEAL PARA LA PRODUCCION NACIONAL DE GRANOS BASICOS.

48A SECTORIAL MODEL OF LINEAR PROGRAMMING FOR NATIONAL PRODUCTION OF BASIC GRAINS

Documento No. 49 RESUMEN GENERAL DEL PROYECTO
A SUMMARY OF THE PROYECT

Documento No, 50 A REVIEW OF THE HONDURAN AGRICULTURAL AND NUTRITIONAL PROJECT
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