

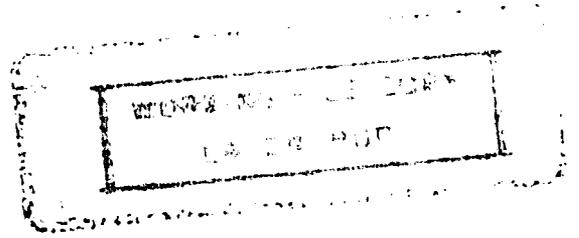


MINISTRY OF AGRICULTURE

AND

AGENCY FOR INTERNATIONAL DEVELOPMENT

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EVALUATION OF PERUVIAN AGRICULTURE RELATIVE TO USAID ASSISTANCE

VOLUME I

PREFACE

The United States Agency for International Development (AID) and its predecessors since 1943 have assisted Peru in developing its Agricultural Sector. The programs jointly carried out by AID and the Peruvian Government in seeking this goal have remained almost unchanged despite the fact that Peru has had changes in its government along with radical changes in objectives and goals during the period. Although it is agreed that these programs have served a useful purpose it was mutually decided between AID and the Minister of Agriculture of the Government of Peru that they should be evaluated to determine if they were appropriately related to Peru's present country development goals. It was also agreed that the study should be a joint effort and should evaluate the USAID/Peru Mission agricultural program in relation to country agricultural performance and development goals and to recommend, as appropriate, changes in the Mission program within existing and anticipated funding availabilities.

To do this the study would examine recent performance of the agricultural sector and relevant government policies to

determine the main reasons for success or failure. In this regard all the major commodities would be included in the study. Particular emphasis would be given to the commodities in short supply, and possibilities for import substitution.

The scope of work of the study was to concentrate upon the areas believed to be most critical with respect to resource allocation, and the effective equating of demand and supply. For these critical areas the study would recommend changes in Mission agricultural assistance as appropriate, and identify corollary GOP actions necessary to maximize the effectiveness of such assistance.

Douglas Caton Ph. D. Economics, Senior Agriculturist of the Technical Assistance Bureau (TAB) of AID Washington was assigned as leader of the study.

Luis Paz M. S. Economics, Director General of Office of Sectoral Planning of Agriculture (O. S. P. A.) Ministry of Agriculture, Lima, Peru was named as co-leader.

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CHAPTER I

SUMMARY AND CONCLUSIONS

A. Introduction

The purpose of this enquiry has been to evaluate the Peruvian agricultural sector plan in order to identify those areas where the technical or financial resources at AID's disposal could most effectively be brought to bear in support of the policies already established. In this undertaking the primary requirement is isolation of those elements which are the primary or sole responsibility of the government and at the same time essential to the success of any attempt by a foreign or international agency to contribute to the development process. In consequence throughout the study it has been necessary to maintain an integrated systems approach to the agricultural sector which, of necessity, went far beyond the bounds which may be contemplated for AID assistance. At the same time it was essential to keep in mind the proposals and capabilities of other international organizations in the field of agriculture, as well as the competence already generated by on-going AID programs. Forestry and fisheries are specifically excluded from the study.

In addition, no consideration has been given to the sugar industry since it is highly developed and specialized with few linkages to the rest of the sector and also is outside the scope of AID activities.

B. Peruvian Agricultural Performance 1960/70.

Available statistics over the decade of the sixties give a discouraging picture of Peruvian agricultural performance, the worst of any country in Latin America. Agricultural output has remained virtually stagnant (in constant S/.) since 1960, while the non-agricultural sectors have increased at an average of 5.6% annually; agricultural output per capita declined by 20% during the period, and productivity of rural workers have been declining at about 2% per year.

On the export side Peru has faced relatively weak international markets for the four staple items sugar, cotton, coffee and wool. As a result total volume of exports has shown no tendency to increase. At the same time imports of wheat, meat and oils showed an upward trend; however, considerable progress has been made since 1965 in substituting rice and dairy

imports. Total agricultural imports have been between \$100 and \$130 million annually.

The causes of the above unsatisfactory outcome are rooted in a complex of factors such as the agrarian structure, prices and marketing, and the flow of capital and technical knowledge to producers, all of which reflect on the individual farmer's motivation to invest labor and capital to produce more. At the same time evidence supports the contention that income has become less equitably distributed; the average per capita income gap between agriculture and the non-agricultural sectors has widened; within agriculture the gap between the Costa and Sierra has widened. Further at least prior to 1968 few policies were effectively applied to improve income distribution within regions through such mechanisms as taxation, land distribution, water pricing or credit allocation. Price policy has fixed resources in certain commodity, and, in general has not provided producer incentive.

In the formulation of future policy for agricultural development it is essential to have a clear understanding of why the development efforts of the Government in the sixties failed to improve

income distribution or induce higher and more efficient production in agriculture. In the first place the goals for agriculture were ill-defined, which in itself may be interpreted as a lack of sufficient priority of policy. It is axiomatic that there will be competing claims on public financial and technical resources. Urban consumers will not be overly concerned with agriculture as long as foreign exchange earnings are sufficient to import food and keep prices at "acceptable" levels. The industrial sector sees little prospect in the potential of the rural market; mining and fisheries are oriented to the export market; the former agricultural structure was not conducive to the flow of capital and knowledge to subsistence farmers. Accepting the foregoing as an approximation of the structure within which agriculture was expected to develop, it is no surprise to find that the public sector was unable to influence agricultural performance. A case in point is physical and biological research which virtually has covered the spectrum of possible problems without real focus or specificity with respect to priority production needs of the country. Similarly economic research on

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production and marketing have little relationship to the policies actually applied, such as price control, foreign trade regulations, credit or investment in highways and irrigation.

Even accepting sector goals which were too vague for effective implementation, no mechanism existed whereby the farmer's needs for biological or economic research could be transmitted to the research administrators. The lack of focus and coordination is equally evident in the case of extension, credit, marketing, price control and irrigation and highway programming. Extension has operated independently of research and marketing; the service was re-organized four times with constantly changing personnel. Accordingly there was little continuity of program. No correlation exists between extension expenditures and agricultural output or productivity, which suggests that any attempt to measure effectiveness would be confounded by the random influence of other factors such as availability of credit, economically attractive technology or price incentives.

In the case of credit the focus of the Banco de Fomento Agropecuario (BFA) has been on the small low-income farmers

without access to commercial sources of capital. However, since sectoral guidelines were unavailable no attempt could be made to orient credit to support other agricultural development programs, specific priority commodities, or selected beneficiaries or regions. Nor was there any basis to establish the real credit needs in terms of both long-term and short-term requirements.

Deficiencies in the marketing system which result in price uncertainty to producers, heavy spoilage rates, wide seasonal price fluctuations, high marketing and excessive consumer prices, have long been recognized. In spite of this recognition the state was unable to come to grips with the problem. Decrees were issued setting up marketing agencies, maximum consumer prices and minimum producer prices in a few cases, which failed to provide producer incentives and improve the efficiency of the system. Of the 14 commodities examined in depth in this study ^{1/} about 74% of production

1/ Bananas, broad beans, canary beans, cotton, corn, rice, potatoes, tomatoes, onions, wheat, beef, milk and milk products, pork, poultry (meat) and mutton.

enters the marketing system in volume terms. This figure serves to underscore the critical importance of marketing and explains the stress which has been laid on the activity throughout the study.

Historically many deficiencies have existed with respect to distribution of irrigation water rights which have undoubtedly led to economically inefficient and socially unjust distribution of this scarce resources. In addition, the pricing of water at about 0.002 soles per M³, far below its opportunity cost, provided no economic efficiency criteria for selection of crops and production intensity levels on the Costa. Inevitably this is prejudicial to farmers in the Sierra and Selva. With respect to irrigation in the Costa, and highway construction in the Selva it would appear that additional analysis is needed in order to determine whether other alternatives have been considered in terms of social and economic benefits and whether beneficiaries as well as bearers of cost have been taken into full account. The availability of financing is only one among the many considerations to be examined. While settlement has been promoted in support

of these expensive infrastructure ventures, the colonization itself has proved to be costly in terms of state financing, and results in production, number of beneficiaries and social impact have been disappointing; realization of benefits has been much slower than expected.

In summary, agriculture's stagnation over the past decade may be attributed largely to institutional failure to establish a firm policy commitment to agricultural development, and, in consequence failure to recognize the need for a systematic approach. If this was recognized, there was a failure to put into practice effective coordination of the state agencies involved. One indicator of the level of producer confidence or expectations over the period is the declining use of fertilizer.

C. Agriculture - Present Status and Prospects

(1) Natural resource potential

From a technical viewpoint Peru possesses a vast potential for agriculture. On the Costa it is estimated that there is sufficient water and land to increase the irrigated area by 600,000 Ha.,

almost double present irrigation. In the Selva about 2.7 million Ha. are said to be suitable for cropping relative to 1.9 million Ha. cropped in the whole country in 1967. Virgin lands suited to pasture in the Selva are placed in excess of 10 million Ha. In the Sierra indicators are that the crop area should be reduced by 10-15% for soil conservation reasons, with replacement by pasture or forestry. Extrapolation of past trends in new land and water development over the period 1971-90 would occupy only 30% of the Costa potential and 10% of the Selva.

It is evident that agricultural potential is not determined solely by the existence of natural resources. The costs of developing these resources may well become limiting. In addition to bringing in new lands, the alternative is always available of intensification on existing farm areas to achieve production or other goals for agriculture. The cost functions associated with land expansion become crucial. In the case of irrigation on the Costa, indications are that new area will not be obtained except at sharply increasing marginal costs. Expansion in

the Selva is expected to be at constant costs (infrastructure and land preparation); however, unless local urban consumption centers develop (closer to the Selva) marginal costs of production and marketing will increase with distance.

The questions of intensification may be viewed within a production function context, where output per unit of land is plotted against progressive increments of capital and labor. The crucial elements are improved management and improved inputs, i. e., technology, which manifest themselves in increased yields per acre, increased output per year through multiple cropping, and a higher percentage of land actually in production through reduction of fallow. Area in fallow in 1967 amounted to 600,000 Ha., over a quarter of total area available for cropping. The question of available technology in relation to realizing of potentials through land expansion and intensification are discussed below.

(2) Immediate opportunities

On the Costa available technology supported by other essential elements of a production - marketing package (credit

extension, price incentives on inputs and products) appears to offer considerable scope for (a) use of feed grains, forage and by-products from cotton cane and cereals, for intensive development of poultry, hogs, cattle fattening and dairying, and (b) increasing yields of rice and canary beans. It is estimated that yields of irrigated corn and sorghum could be doubled economically. In the case of rice, it appears that land leveling, timely sowing, and application of 320 kilograms of nitrogen fertilizer per hectare (double the customary application) can increase yields by 50%; introduction of the IR varieties may raise this to 100%. Similar increases may be expected for canary beans with improved varieties, fertilization and double cropping. The potential for rapid increases with both per unit and total output of livestock products is enormous, if the improved nutrition is accompanied by elementary precautions with respect to animal health and husbandry. Breed improvement offers the possibility of expansion over the long run. In the cases cited here, the requirements for seeds, fertilizer, cultural practices, plant protection, animal nutrition and health, are known and tested.

In the Sierra, except for potatoes, technology is not as well developed as in the case of crops suited to the Costa. However, sufficient knowledge is available to permit considerable advances to be made in the productivity of potatoes, wheat, corn, barley, broad beans, sheep, beef, and dairying. In the case of crops, expanded yields can readily be obtained through the same procedures as outlined above for the Costa; however, the response in absolute terms is considerably lower due to the less favored natural environment. Nevertheless, the location of production and adoption of technology should be guided by inter-regional comparative advantage, and the social consequences of the relative immobility of the Sierra population.

Selection and testing crop varieties and practices is required in some areas, but implementable results should be expected within two years. Corn is of particular significance since it is well adapted to Sierra conditions, provides an essential supplement to natural pasture in livestock production, responds well to fertilizer, suitable high yielding hybrids are available, and it is expected that high protein hybrids will be

available in the near future, and, thus improving the nutritional content of a staple food among the highland population.

Adoption of known practices for improved pasture establishment, fencing, and animal health would show marked increases in wool and mutton production per sheep and per Ha. within 1 or 2 years. Over the longer run it will be important to introduce breed characteristics which emphasize meat rather than wool. Opportunities to improve beef production in the intermediate and lower altitudes are similar to sheep, where they would graze in association. For both cattle and sheep there appears good reason to foster integration of the industry with specialized intensive fattening undertaken in the Low Sierra and Costa. The potential for dairying in the lower altitude regions of the Sierra is comparable with the Costa.

The opportunities in the Selva depend largely on expanding area rather than intensification, as has been suggested above for the Costa and Sierra. The Selva Alta appears to offer the most immediate promise due to its proximity to existing infrastructure and markets relative to the Oriente. The status of technology is in no way comparable to the Costa and Sierra. Thus, it

may be expected that much of the knowledge will be gained at the expense of farmers. Prime candidate products appear to be rice, corn, yuca, palm oil, and beef cattle on improved pasture.

(3) Projections based on past trends

The basis of the agricultural plan is provided by the projections of supply and demand of agricultural commodities in Peru. These were made from an examination of past trends and behavioral characteristics of consumers and producers, plus qualified assumption with respect to continuance or changes in past policies.^{2/} This study provides a benchmark against which the impact of normative changes of policy, public administration, or producer and consumer behavior with respect to elasticities of supply and demand, may be appraised. The principal conclusions of this study are (i) that agricultural output

^{1/} "Resumen del Plan Agropecuario a Mediano Plazo 1971-1975," OSPA, Ministerio de Agricultura, Lima, Octubre 1970.

^{2/} "Long Term Projections of Demand for and Supply of Selected Agricultural Commodities through 1980 - Peru," Universidad Agraria, La Molina, Lima, June 1969.

will expand at 3% annually (1% through yield improvement and 2% through area expansion), (ii) that the value of the deficit commodities will increase to \$104 million by 1975 and to \$156 million by 1980, and (iii) income distribution will be regressive with respect to total population in the Sierra and Selva regions, and with respect to the rural population in all regions.

The supply projections are predicted on both major expansion of irrigated land (20,000 Ha annually) and intensification from existing irrigated in the Sierra (15,000 Ha per year receiving improved irrigation), and colonization of 15,000 Ha annually in the Selva. The relatively slow expansion of the import deficit is due to the low projected rate of increase in per capita consumption, particularly in the Sierra (38% of total population in 1980). A highly significant aspect of the projections is the implicit regression income distribution. The ratio of per capita income in the Sierra to the Costa plus Selva declines from 1:3.5 in 1970 to 1:5.1 in 1980. Comparing the same index for the rural urban population the ratio declines from 1:4.2 to 1:5.6, and taking the comparison between the

Sierra rural population (24% of total in 1980) and the "rest of the country" the ratio changes from 1:7 to 1:13 over the 10 year period.

D. The Sector Plan

As already indicated the objectives and program of the agricultural sector plan provide the framework within which alternatives AID programs have been evaluated. In the discussion in section (b) and (c) above an attempt has been made to identify the technical, economic, social and institutional factors which the government took into account in formulating the plan, and which, at the same time, are equally relevant to the identification of those areas where AID may expect to make the most useful contribution in furthering implementation of the plan. The unsatisfactory performance of agriculture from 1960 to 1970, and the undesirable consequences of the 1970-80 projections set the stage for the plan.

One of the primary objectives is to progressively reduce disequilibrium between per capita incomes in rural areas and those in the urban sector, and also improve income distribution in agriculture itself. Parallel with this goal is the

promotion of active campesino participation in the market economy of the country.

All other objectives, while subordinate to distributive and employment aspects, are production oriented as being the only basis for improved stability and levels of rural incomes and nutrition levels. The fundamental production aim is simultaneously to increase total output and efficiency of production and marketing. Lowered consumer prices should alleviate the market constraint on agriculture. A similar situation applies to the import substitution (and export where possible), which also contributes to the objective of saving foreign exchange.

The institutional structure for implementation of the development plan centers on agrarian reform. Under the law the entire country must be incorporated in reform zones by the end of 1972. Of the 1,022,000 families who are potential direct beneficiaries of reform, 370,000 must have received some 15 million Ha. by 1975. It appears likely that communal operation will be the form of organization used. At the same

time communities and small farmers surrounding reform units will be encouraged either to join the central unit or form their own associations. All state institutions connected with agriculture will be mobilized in support of this effort.

The action programs of the plan center on 14 commodities, and groups of commodities. Priority is placed on import substitution: - wheat, expanding production at 13.8% annually over the period - vegetable oils (peanuts, soya, olive oil and oil palm) expanding at about 20% annually - beef at 10.5%, and potential beef substitutes, mutton at 9.3%, and pork at 25% - and milk at 10.8%. Of second order importance are the basic domestic consumption commodities: - rice, corn, potatoes and beans increasing 6-9% annually - and poultry meat and eggs at 14.9%. The final category is export - cotton increasing at 4.6% - sugar at 2.2% - coffee at 8% - sheep wool at 14% - and alpaca wool at 3.3%. These relatively ambitious increases are sought through yield improvement in the range of 3-8% annually and area expansion (in the significant crops) of 1-3% annually.

Major infrastructure investments over the 1971-75 period in the rural sector for highways, marketing facilities and irrigation are not detailed in the plan.

E. Sector Evaluation

(1) Analytical framework for specification of the problem

Drawing on the plan and recent history of performance of agriculture the two basic premises upon which the sector is evaluated are as follows:

- If development programs are to be effective they must have a specific commodity focus with regional concentration, and they must encompass for each commodity a systematic procedure which integrates the principal production and marketing elements within a viable institutional framework.
- The institutional vehicle for implementation of the development program will be agrarian reform; therefore operations of institutions which service agriculture or provide basic infrastructure must be restructured within this context to maximize probabilities of success of the selected programs.

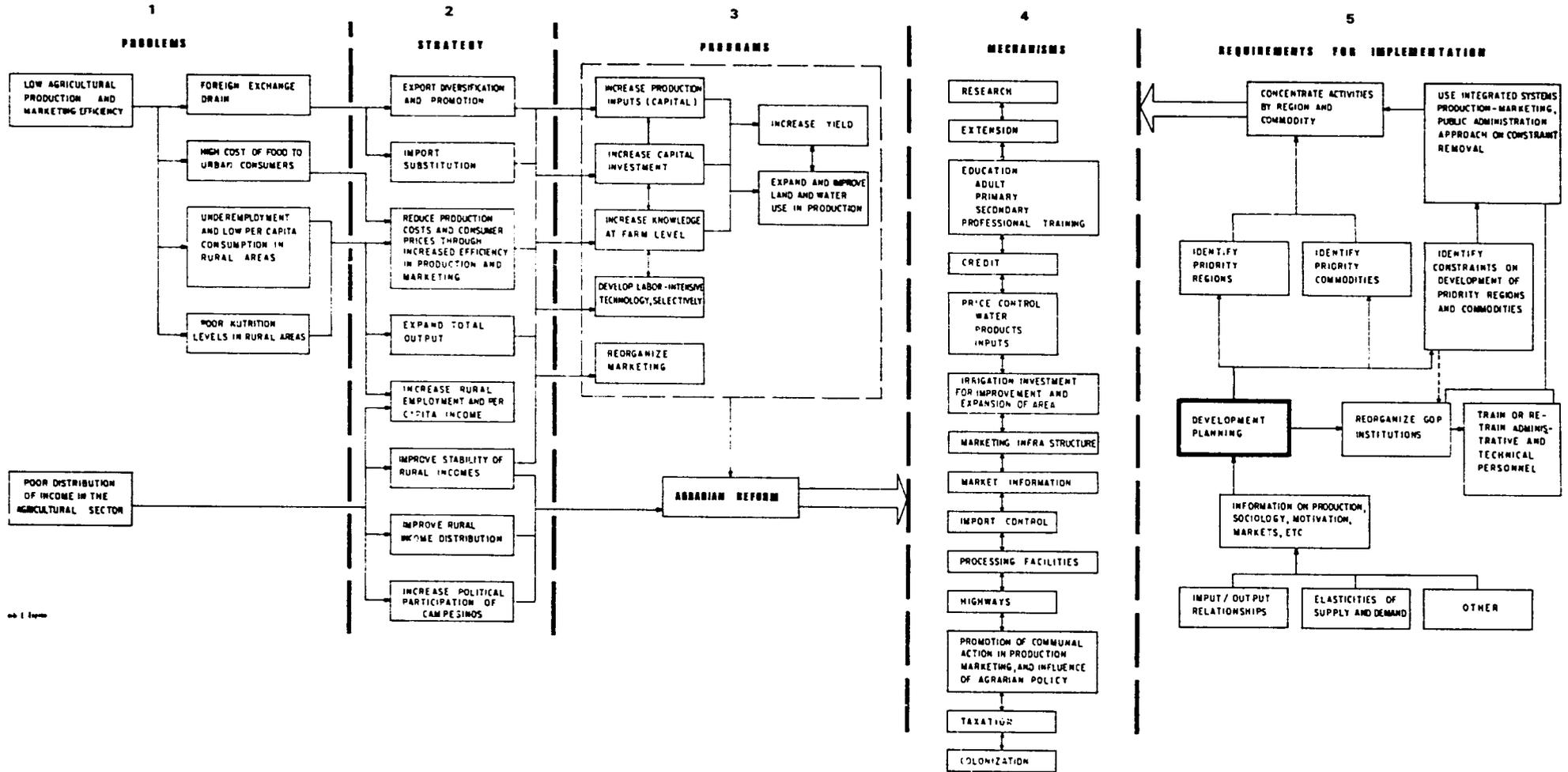
The first step in evaluation involves placing the agricultural plan within the context of an internally consistent system from which constraints may be identified, and from which sub-systems may be abstracted for more detailed study. Chart 1, is an attempt to diagrammatically represent the plan and the inter-relationships between multiple goals and the strategy, programs and policy instruments or mechanisms used for implementation. The two pivotal points in the chart maybe identified as "development planning" which establishes the priority commodities and regional concentration (within the constraints of goals and budget)^{1/} plus the selection and integration of various policy instruments for implementation, and "agrarian reform" as the primary implementing agency.

As the second stage in the evaluation, the implementation component (i. e. column 5, and execution of mechanisms - Column 4, in Chart 1) is identified as the critical constraint

^{1/} The selection of commodities and regions is discussed in Section E-2 below.

CHART NR 1

USAID AGRICULTURAL PROGRAM EVALUATION
ANALYSIS SCHEME BASED UPON GOP AGRICULTURAL DEVELOPMENT PLAN



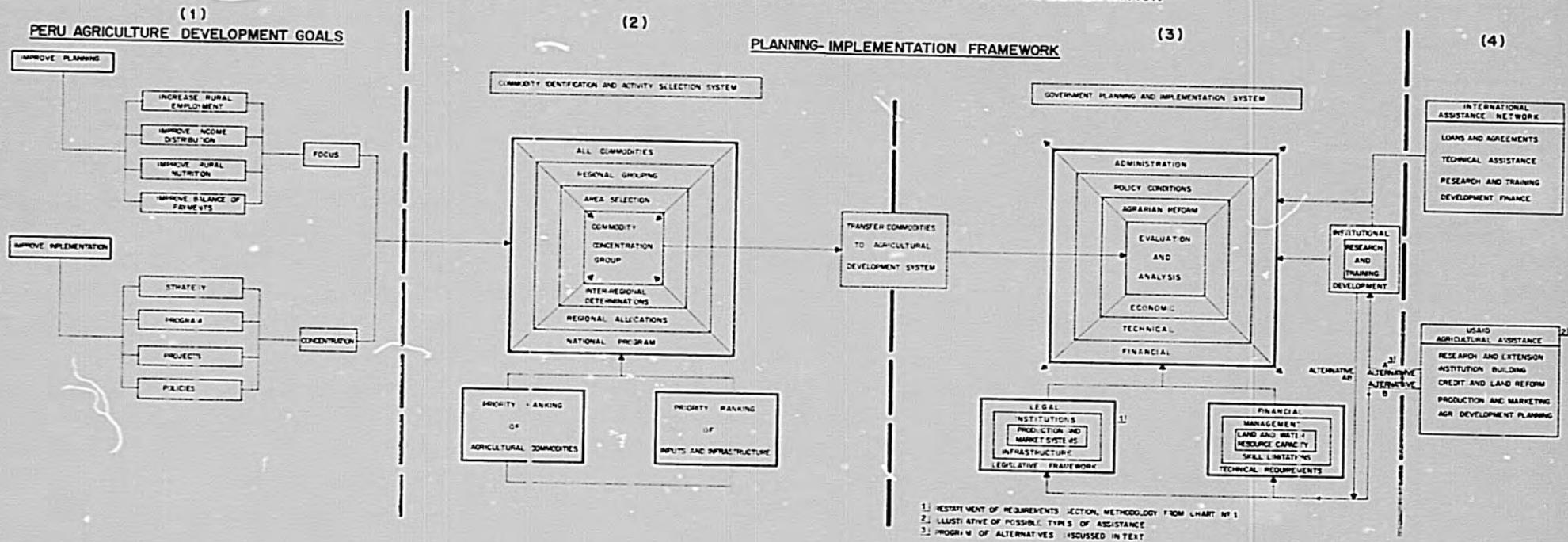
and shown graphically in Chart 2. Column 2 of Chart 2 deals with the procedure for identifying and ranking priority commodities and the regions of concentration. Once identified, the specific development programs are transferred to the implementation system - column 3 of Chart 2 - where details of the production - marketing system must be derived and the institutional arrangements for execution worked out consistent with technical, administrative and financial constraints. Column 4 of Chart 2 has been added to show the relationship of AID and other international assistance to the implementation phase - this aspect is taken up in Section F, below.

Since the basic premise above is implementation of the production - marketing system through agrarian reform, the third stage in the evaluation involves definition of the institutional and technical needs in relation to the existing situation. This is depicted in Chart 3. Two major gaps are identified in the existing system:^{1/}

^{1/} The integration gap (column 1) between AID assistance and government requirements for program implementation is discussed in Section F.

CHART Nº2

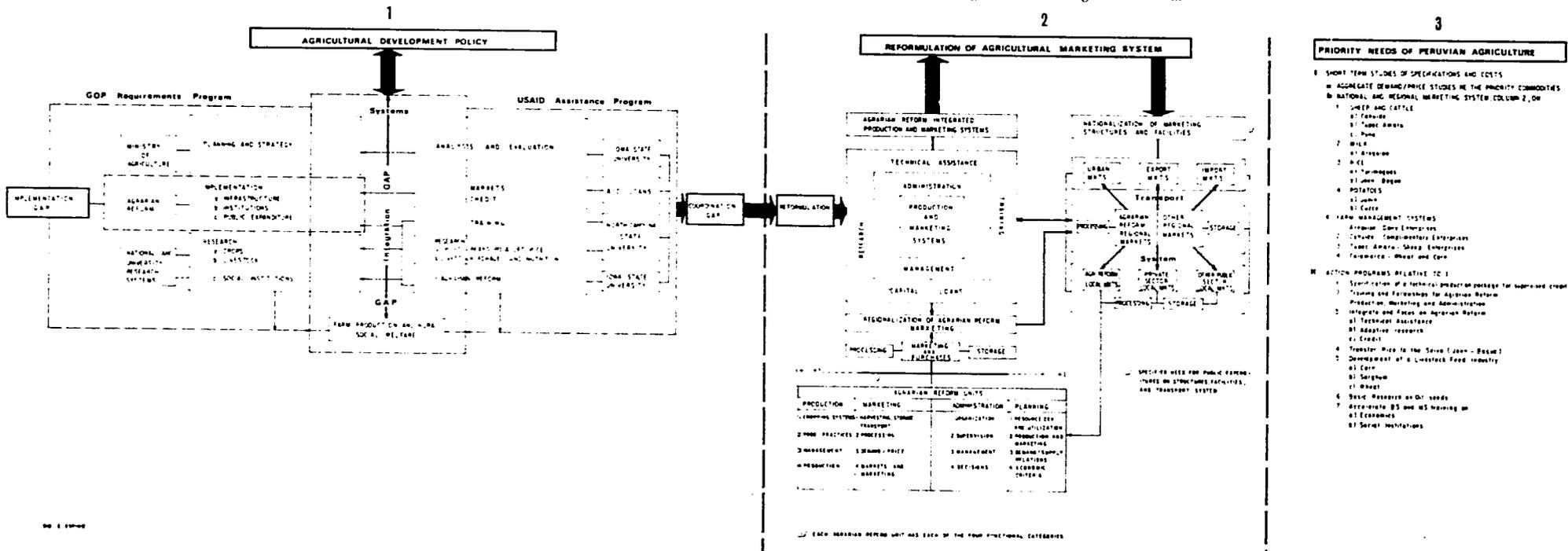
RELATIONSHIP OF GOALS AND INTERNATIONAL ASSISTANCE TO AGRICULTURAL PLAN IMPLEMENTATION



- The implementation gap which comprises the lack of definition of how the various institutions concerned with infrastructure and agricultural development will be integrated through agrarian reform for execution of the development plan; this is shown on the left hand side of column 1, Chart 3.
- The production - marketing systems gap (column 1 Chart 3) relating planning and implementation procedures to both farmers and consumers simultaneously; the linkage is incomplete from the policy goals through training, research, credit, extension and marketing to the farm level where production decisions are made and social welfare achieved.

Column 2 of Chart 3 shows in general terms how the structure may be reformulated to bridge these two gaps by building up the production - marketing systems on priority commodities working from the local situation (agrarian reform unit or district) through the region (s) of concentration to the national level. The procedure has been elaborated in more detail for the marketing

CHART #3
 Evaluation of Peru's Agricultural Development Program Relation to Production-Marketing Systems and Agrarian Reform



✓ EACH AGRARIAN REFORM UNIT HAS EACH OF THE FOUR FUNCTIONAL CATEGORIES

component (right hand side of column 2, Chart 3) which is regarded as the critical bottleneck in the whole process, and where it is essential to find operative policies and efficient administration at the national level as soon as possible.

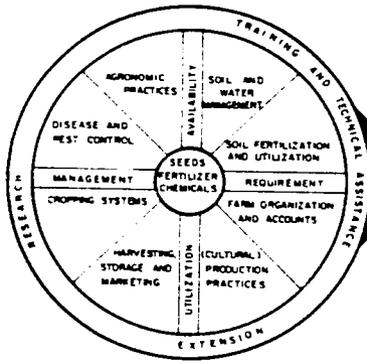
Column 3 of Chart 3 illustrated where AID programs may contribute to bridging the production - marketing gap - it is assumed that the implementation gap is not amenable to extra-national assistance (discussed in Section F below).

The fourth step in the evaluation involved illustration of the analysis needed to develop an integrated production - marketing system for one crop and one livestock commodity. Rice was selected as the representative crop and used to illustrate a program of intensification of land use. The livestock commodity chosen was beef, which was applied to illustrate the case of land expansion. Diagrammatic formulation of the system for rice is shown in Chart 4. The principal elements of the system are: identification of all technical requirements to increase productivity per Ha; the production function, i. e. the yield response to various inputs (fertilizer

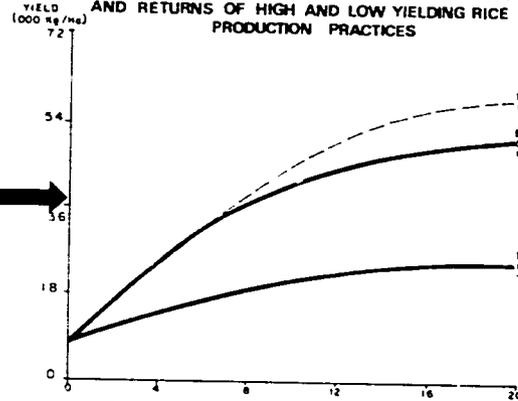
CHART NO. 4

DIAGRAMATIC RELATIONSHIP OF RICE PRODUCTION AND MARKETING IN PERU, 1970 WITH NATIONAL WEIGHTED AVERAGE YIELD ESTIMATED AT 4528 Kg/Ha AND AVERAGE NET FARM COSTS OF FERTILIZER.

FARM LEVEL INTEGRATED APPROACH, FOR INCREASED PRODUCTIVITY



REPRESENTATION OF TOTAL AND MARGINAL COSTS AND RETURNS OF HIGH AND LOW YIELDING RICE PRODUCTION PRACTICES



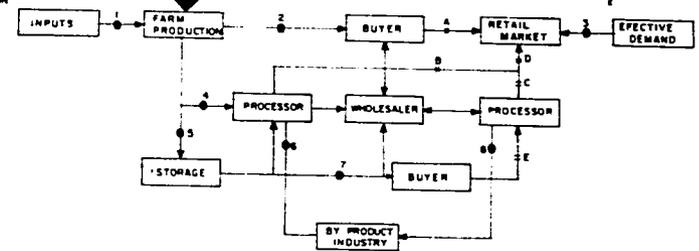
AGGREGATE PRODUCTION ESTIMATES OF RICE FOR PERU 1970

A WITH IMPROVED PRACTICES					
# FARMES	Kg/ha	MT/ha	ha/RICE	MT/RICE	TOTAL MT
10,000	5,700	57	10.2	581,400	

B WITH TRADITIONAL PRACTICES					
# FARMES	Kg/ha	MT/ha	ha/RICE	MT/RICE	TOTAL MT
4,000	1,600	16	5.0	32,000	

1/ 1970 ACTUAL = 612,737 MT
 2/ ESTIMATE = 613,400 MT, AV. YIELD 4,528 MT./ha.

DIAGRAMATIC REPRESENTATION OF THE RICE PRODUCTION AND MARKETING SYSTEM IN PERU



● PRIMARY CONSTRAINT POINTS

- 1 INPUTS NOT AVAILABLE, OR NOT UTILIZED
- 2 PRICE TO FARMER DOES NOT REFLECT TRUE VALUE
- 3 DEMAND RESTRICTED BY INCOME
- 4 IMPERFECT MARKET TO FARMER
- 5 STORAGE NOT AVAILABLE
- 6 VALUE OF BY PRODUCTS NOT INCLUDED IN FARM PRICE
- 7 IMPERFECT MARKET TO FARMER

■ SECONDARY CONSTRAINT POINTS

- A NO ROADS
- B NO MARKET FACILITIES
- C IMPERFECT COMPETITION
- D PRICE DOES NOT COVER COST
- E TRANSFER EFFECT FROM D

EVALUATION OF PROFITABILITY

1. FOR A SINGLE CROP $\frac{COST_1(M)}{Kg/ha} - \frac{P_1}{Kg/ha}$ $\frac{\Delta P_1}{\Delta P_2} > \frac{C_1}{C_2}$ (1) (PROFITABLE IF RATIO IS LESS THAN 1)

2. FOR ALTERNATIVE CROPS AT THE MOMENT $\frac{Kg/ha \cdot P_1}{Kg/ha \cdot P_2}$ (2) (NO CHANGE IF RATIO IS GREATER THAN 1)

3. OVER TIME $\left(\frac{\Delta P_1}{\Delta P_2} \right) \left(\frac{P_2}{P_1} \right)$ (3) (NO CHANGE IF RATIO IS GREATER THAN 1)

LEGEND
 P₁ PRICE OF COMMODITY BEING PRODUCED
 P₂ PRICE OF AN ALTERNATIVE COMMODITY
 Δ AMOUNT OF CHANGE IN PRICE

NOTATION THIS TYPE OF EVALUATION APPLIES ONLY TO COMPETITIVE RELATIONS, NOT TO COMPLEMENTARY OR SUPPLEMENTARY CROP ROTATIONS

FERTILIZER INPUT (BAGS OF 46 Kg) PER Ha.

A RETURN WITH IMPROVED PRACTICES							
UNIT OF FERT INPUT	TOTAL YIELD (KG/HA)	Δ YIELD (KG/HA)	TOTAL COST (SOLES)	Δ COST (SOLES)	TOTAL RETURNS (S/202 = KILO)	Δ RETURNS (SOLES)	ΔB/ΔC
0	1,545.0	727.7	50	—	3,121.00	—	—
83.6	2,272.7	1,409.1	550	500	4,591.0	1,470	2.94
167.2	3,681.8	863.7	1,100	500	7,437.0	2,846	5.69
250.8	4,545.5	454.5	1,600	500	9,182.0	1,745	3.49
334.4	5,000.0	250.0	2,100	500	10,100.0	918	1.83
418.0	5,250.0	250.0	2,600	500	10,504.0	404	.81

B WITH TRADITIONAL PRACTICES							
UNIT OF FERT INPUT	TOTAL YIELD (KG/HA)	Δ YIELD (KG/HA)	TOTAL COST (SOLES)	Δ COST (SOLES)	TOTAL RETURNS (S/202 = KILO)	Δ RETURNS (SOLES)	ΔB/ΔC
0	900.0	—	50	—	1,818.00	—	—
83.6	1,496.0	596	550	500	3,021.9	1,204.0	2.40
167.2	1,946.0	450	1,100	500	3,931.0	909.0	1.81

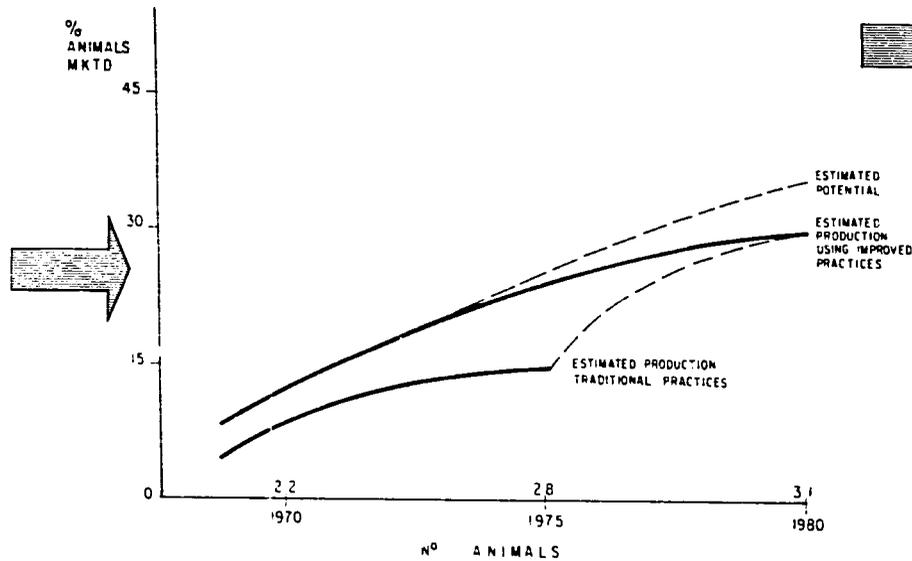
CHART Nº 5

DIAGRAMATIC RELATIONSHIP OF A BEEF CATTLE PRODUCTION - MARKETING SYSTEM INVOLVING LAND DEVELOPMENT AND RESTOCKING *

Factor Relations

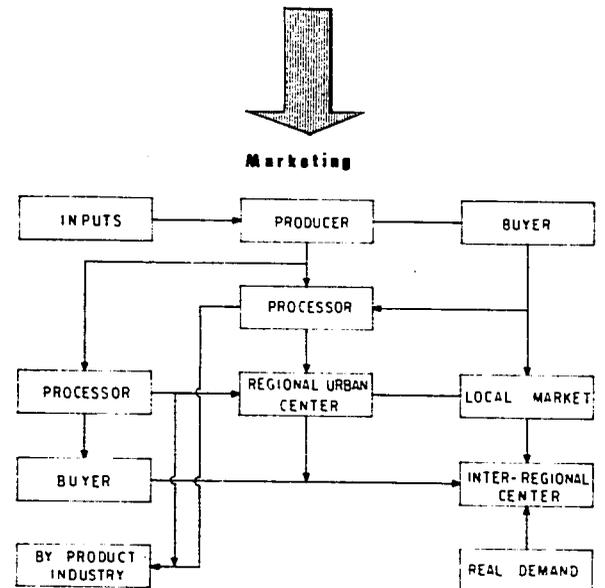
- A. CAPITAL INVESTMENT COSTS**
 1 ADD 300,000 HEIFERS PLUS 10,000 BULLS
 2 CLEAR AND IMPROVE LAND AT 7.826 SOLES PER HECTARE 150,000 HECTARES = 1,173,900,000 SOLES
- B. ANNUAL RECURRENT COST**
 3 FERTILIZE PASTURES AT 43 SOLES PER HECTARE HECTARES = 6,450,000 SOLES
 4 PASTURE MAINTENANCE AT 600 SOLES PER HECTARE HECTARES = 900,000,000 SOLES
 5 REPRODUCTION
 a) BREEDING CONTROL
 b) HEALTH AT 43 SOLES PER HEAD

Input - Output Relations - 1980



Influence of Land Development and Restocking on Number of Animals Marketed

YEARS	Nº ANIMALS (TRADITIONAL)	Nº ANIMALS (IMPROVED)	TOTAL ANIMALS	TOTAL PRODUCTION MT	INCREASE IN PRODUCTION MT
1970	308,000	—	308,000	22,400	—
1975	357,500	99,700	457,200	35,063	12 663
1980	375,500	124,800	500,300	38,654	3 591



* SIMILAR INCREASED PRODUCTION CAN BE PROJECTED FOR DAIRY AND SHEEP

in this case); estimation of the profit maximization point through equation of marginal costs and revenues; and identification of the constraint points in the supply of inputs and marketing of output. The case of beef production from expansion on new lands in the Selva with import of basic breeding stock is shown in Chart 5. The elements are similar to those shown for rice.

(2) Priority commodities

A primary requirement of the foregoing methodology is identification of the priority commodities to which the production - marketing approach to development will be applied on a selective regional basis. The principal agricultural commodities currently produced in Peru number 62. In the plan this was reduced to 23 plus 14 non-traditional crops with export potential, primarily fruits and vegetables. From the list 12 commodities were selected on the basis of their present relative importance, representativity of at least one major product for each region, their specific relationship to the development objectives (beneficial to low income farmers, employment

TABLE 1

PRIORITY RANKING CRITERIA AND RANKING OF PERU AGRICULTURAL COMMODITIES
RELATIVE TO GOP AGRICULTURAL DEVELOPMENT GOALS.

COMMODITY	LAND IMPROVEMENT OR LAND EXP. POT	HIGH RATIO OF BENEFICIARIES TO CAPITAL	HIGH RATIO OF LOW INCOME BENEFICIARIES	IMPORT SUBSTITUTIONAL	IMPROVED NUTRITION POTENTIAL	POTENTIAL TO HAVE MULTIPLIER AFFECT	PRODUCTION CONSTRAINED BY CAPITAL	PRODUCTION CONSTRAINED BY TECHNOLOGY	PRODUCTION CONSTRAINED BY MARKETING	HIGH RATE OF RETURN ON PUBLIC INVESTMENT	RANK	
											NUMERICAL	PERCENT
WEIGHT (BASIS = 100)	(15)	(10)	(17)	(8)	(10)	(10)	(15)	(5)	(10)	(10)		(100)
RICE	15	10	8	0	2	8	5	0	10	10	9	(68)
WHEAT	10	5	17	8	10	10	10	2	8	10	4	(90)
MILK	15	8	10	8	10	10	15	2	10	10	1	(98)
SHEEP	15	10	17	0	8	5	15	3	8	10	3	(91)
CHICKENS/HOGS	15	10	17	8	10	10	15	4	8	8	2	(92)
BEEF	15	5	10	8	10	5	15	2	10	7	6	(89)
POTATOES	5	10	17	0	5	2	10	1	5	10	10	(65)
BEANS	10	10	12	0	8	2	10	1	5	4	11	(62)
COTTON	5	10	10	0	0	10	15	2	10	10	8	(72)
CORN	10	10	13	8	10	10	15	4	10	10	5	(90)
FRUIT	10	5	6	0	5	5	10	5	10	5	12	(61)
VEGETABLES	15	5	10	0	8	10	10	2	10	10	7	(80)
COLUMN RANK (NUMERICAL AND PERCENTAGE)	3 (9.8)	2 (9.8)	4 (8.6)	6 (5.0)	4 (8.6)	4 (8.7)	2 (9.6)	5 (5.6)	1 (10.4)	1 (10.4)	—	

generation, nutrition, import substitution, expectation of rapid social and economic impact). As an exercise in priority ranking these 12 commodities were then scored on the basis of 10 weighted criteria in Table 1. While no claim is made as to the appropriation of the weights applied, nevertheless, the procedure provides a point of departure if the development program must focus on less than 12 commodities simultaneously for budget, technical or staffing reasons. The rank order established is: 1. milk, 2. chickens and hogs, 3. sheep, 4. wheat, 5. corn, 6. beef, 7. vegetables, 8. cotton, 9. rice, 10. potatoes, 11. beans, 12. fruit.

The analysis of these commodities was carried one stage further to illustrate the requirements (inputs and infrastructure) to mount a development campaign. In Table 2 eight of the commodities are scored on 10 weighted input criteria. Those with the highest scores have the least number of prerequisites to launch a development program under the existing situation. As in Table 1, no claim is made as to the coverage or weighting of the input criteria. However,

TABLE 2 ILLUSTRATION OF PRIORITY RANKING CRITERIA AND RANKING OF ADDITIONAL INPUT AND INFRASTRUCTURAL REQUERIMENTS FOR ACCELERATED CROP PRODUCTION ^{1/}

ENTERPRISE (WEIGHT) ^{2/}	IMPROVED GENETIC MATERIALS (10)	SOIL FERTILIZATION (10)	IMPROVED PRODUCTION PRACTICES (15)	FARM MGT (10)	DISEASE AND PEST CONTROL (5)	STORAGE AND/ OR PROCES- SING (10)	IMPROVED MARKETS & MARKETING (15)	MINIMUM PRICE SUPPORT (5)	FARM LEVEL TECH. AND MGT. ASST. (10)	RESERARCH AND/ OR TRAINING SUPPORT (10)	ENTERPRISE RANK (100)
WHEAT	X	X	X	X	X	X	X	X	X	X	100
CORN	X	X	X	X	X	X	X	?	X	X	95 ^{5/}
RICE	?	X	X		X	X	X	X	X	X	80
POTATOES		X	X		X	X	X	X	X	X	70
SHEEP	X	X ^{4/}	X	X	X	X	X	X	X	X	100
BEEF	X	X ^{4/}	X	X	X	X	X	X	X	X	100
M/LK	X	X	X	X	X	X	X	X	X	X	100
FRUIT / VEGETABLES	X	X	X		X	X	X	X	X	X	95
PRACTICE RANK	6	8	8	5	8	8	8	6	8	8	92.5 7.2

^{1/} CRITERIA ARE BASED UPON TABLE 1 CHECK-MARKS INDICATE PRIORITY EMPHASIS

^{2/} WEIGHTS BASED UPON RELATIVE IMPORTANCE.

^{3/} IMPROVED PASTURES.

^{4/} ALSO SUPPORTS LIVESTOCK PRODUCTION.

if Table 2 is accepted as reasonable approximation this suggests the following hypotheses about past agriculture policy:

- inadequate analysis of the crucial technical inputs.
- piecemeal approach in terms of the commodities selected, and the production - marketing requirements within each commodity chosen for special attention.
- no systematic consideration of input - output relations and capital formation.
- uncritical reliance on traditional approaches with lack of specificity in planning; in consequence little continuity and a lack of on-going re-evaluation.

The conclusion drawn with respect to the priority commodity group is the need to examine the state of technical knowledge, the effectiveness of transferring research findings to the farmer, the capability of the infrastructure and marketing system to handle inputs and output, and the institutional capacity to provide needed services and incentives.

(3) Strategy alternatives

The fundamental issue is how the multiple goals for agriculture may be reconciled and achieved. No optimum can be identified; the path will be via sequential decisions and successive approximations. The aim is to isolate a few manageable priorities and adequate mechanisms which will lead to improved public administration and decision making resulting in improved performance on goal achievement.

With focus on the priority commodities identified in the previous section, the evaluation of technical alternatives centers on 5 characteristics of Peruvian agriculture; the natural resource potential, cost functions related to expansion onto new lands, input - output relationships in intensification of land use, and the distribution of population and income plus location preference and mobility of labor. With either assumptions or estimates of these aspects, the base is laid for a first approximation of some alternative ways of approaching the sector goals in terms of location of production of the priority commodities, inputs and infrastructure needs and costs.

If improved income distribution is to be regarded seriously as the number one objective of agricultural development, then it must be assumed that deliberate policies will be implemented to minimize or reverse the trend projected in Section C-iii above. Nutrition and employment relate directly to income distribution. The need to generate foreign exchange does not appear to be critical. At the same time when urban markets are constraining on a priority low income group in the rural economy, the case can readily be made for import substitution. Opportunities for major expansion in export commodities are not encouraging; nor are there export items (with the exception of wool) which would benefit the truly marginal rural population. The issue is how to focus public investment, services and controls (prices and foreign trade) in such a way as to elicit expanded production from identified groups to be benefited.

The foregoing discussion provides a framework for exploration of possible consequences of some programs currently under review by the Peruvian government, and introduction of one or two illustrative alternatives, with no attempt to be

exhaustive. Among the more notable programs is the proposal to invest \$550 million in the Olmos, Majes and Chira-Piura irrigation projects with a total of 290,000Ha. The construction period will be 9-12 years, thus any significant benefits will not be forthcoming in less than 15 years. While construction employment will be generated, it is by no means assured that the group benefited has high priority in social terms - certainly the marginal rural population will be unaffected for a decade. While substantial urban development may be expected within 20-25 years, these potential long term benefits must be weighted against alternative uses of \$550 million which may yield improve productivity and incomes of marginal farmers or agricultural workers within a year or two. While there are undoubtedly social arguments in favor of coastal irrigation schemes, there are equally compelling arguments for alternative investments which offer higher economic as well as social returns.

From the viewpoint of production statistics and probable economic returns, the temptation is always to promote increased

agricultural output in the Costa. Taking import substitution as a single objective the case would no doubt be made for intensification of the coastal valleys for beef, milk, oil-seeds and wheat. An alternative might be: - promotion of improved wheat production in the Sierra; advanced technology for Sierra crops which compete with wheat lands to release more Has. for wheat; or adopt price policies which may favor wheat substitutes from the Sierra. A similar procedure might be applied to milk. Another possibility could be improved corn production in the Sierra as a feed grain for hogs or poultry associated with price policy and import controls to substitute pork and poultry for beef.

The axis for the sector development program, agrarian reform, has been underway for two years. Alternatives exist as to how to proceed - one may be to disperse efforts some of which may be related directly or indirectly to the reform process - another may be to organize institutions and major financing behind the

program in order to improve the probabilities of success on the areas already launched, and seek mechanisms to permit replication of viable units at an accelerating rate.

(4) Suggested areas of concentration

At the outset mention may be made of those areas where de-emphasis may be considered in order to free resources for the priority areas. There appear to be good reasons to re-evaluate the timing and extent of major new irrigation investments on the coast. If expanded production from the coast is desired, prospects are excellent for introducing advanced technology, improved water distribution and irrigation practices, and improved water supply to existing areas. In fact, there may be reason to de-emphasize coastal development if alternatives opportunities exist to expand output in the Sierra which are not seriously prejudicial in economic terms. In terms of the income distribution objective there appears little to be gained in the short run from promoting export crops, and import substitution should not be regarded as an over-riding

factor in allocating resources to agriculture. Self-sufficiency in wheat is probably neither an economically nor socially desirable goal.

The point of departure, around which to expand successively into related activities, would appear to be the development of production-marketing systems for agrarian reform units in the Sierra, in sheep and cattle, (pasture, forages and nutrition), corn, potatoes, and hogs. This would lead into regional marketing improvement which would integrate the Costa and Sierra with respect to inputs, milk, and milk processing, inter-regional livestock movements of dairy calves, beef yearlings and lambs, plus a feed grains program in corn and sorghum on the Costa. The feed grains program then leads into second order priority activities - production - marketing programs for associated rice, wheat, hogs and poultry on the Costa and the gradual transfer of rice production from the Costa to the Selva. In the same category would be an integrated pasture and cattle program in the Selva.

Certain supporting activities will be required for the evolving programs. Notably research which will have both short and intermediate term application in: pasture - live-stock relationships in the Sierra and Selva; crops and animal disease and pest control; production of oilseeds, irrigated vegetables, tropical fruits, wheat and corn. Training will be necessary in farm management and public administration and the university capability should be strengthened in social institutions, economics, extension, marketing, and applied research. An on-going program of special studies will be required in such areas as: ex-post program and policy evaluation; planning an integrated production - marketing system; the role of agri-business; employment technology and income distribution; employment multipliers; and inter-regional comparative advantages.

F. Guidelines for AID Programs

The general framework, within which constructive AID assistance may be provided to further agricultural development in accordance with the government plan, was established

in Section E-1 above - and specifically introduced into Chart 2 and 3. In the future AID should think in broader and more imaginative terms with regard to the type of activity supported, the nature of the assistance, and the strategy for its implementation in a dynamic milieu. It is axiomatic that all AID programs address priority needs of the government; at the same time the explicit nature of present agricultural policy dictates that these programs take due account of social as well as economic processes.

The relationship of AID programs to current public institutions and activities in the agricultural sector are shown in Chart 3, column 1. The institutional implementation gap, the systems marketing - production gap, and the integration gap identified in this chart become the focus of both the government and AID in seeking to reformulate a more meaningful assistance package. The suggested approach is to integrate and concentrate the program in such a way as to improve the chances of achieving a measurable impact plus potential multiplier effects.

The recommendation is that AID technical and financial assistance can be most effectively applied in supporting selected aspects of the agrarian reform program related to priority commodities working from the reform unit or zone through the region to the national level using an integrated production - marketing systems approach to achieve short-term impact. The expectation is that such an approach could be replicated to accelerate achievement of the Government's economic and social development goals for agriculture. If AID efforts are focused on the 15 million Ha. and 370,000 families to be involved in the reform process by 1975, plus some of the planning and administrative processes related to implementation - the scope is sufficient to occupy the resources available. Success of the agrarian reform is seen as vital if Peruvian agriculture is to become a dynamic sector of the economy; if it fails the prospect, at best, is a repeat of the sixties in the forthcoming decade. In any given area where AID may plan assistance it is essential to assess the degree of policy commitment which governs the extent to which Ministry decisions will be implemented.

Aside from programs directly tied to the public sector AID may also have a role in retaining a focus on the contribution of the private sector in support of the agrarian reform in such areas as seeds, fertilizer, equipment, transport requiring specialized inputs or management. It would be a mistake to underestimate the potential contribution of a private sector subject to a degree of public regulation.

With respect to existing AID programs the criteria for evaluation are: critical mass; relation to other inputs (external and internal); the constraints at all levels from planning, policy determination, teaching and research through implementation reflected in the production - marketing system; and relevance of present inputs to the evolving needs of development.

The present AID and GOP agricultural programs does not have critical mass with regard to the gaps identified in Chart 3. There is a clear lack of focus and coordination among the AID programs of technical and financial support to agriculture, which in large part is a consequence of the Government's failure

to systematically structure the sector development program. However, AID has made no real effort to seek solutions, with respect to moving towards a more closely integrated set of programs.

There is need to re-orient the NCSU projects to be more responsive to the revised goals, particularly with research, training and technical assistance on production - marketing systems backing up the agrarian reform. The ISU program can be said to be indirectly related to policy but requires more integration with micro-analysis associated with implementation of the agrarian reform. The credit program needs to be recast to focus on the priority commodities, and it is evident that any activities in marketing should be firmly established within the systems approach outlined above, i. e. the scheme for developing integrated local markets at the regional level, and expanding to the national level in some instances, as outlined in Chart 3, column 2.

Chart 2, column 4 shows the options open to AID in the provision of technical assistance. Alternative A is continuation

of the present program of NCSU and ISU with progressive adjustment to the priority activities connected with implementation of the plan identified above. Alternative B is a "package" of activities supporting the Government's planning and implementation system, where the "package" has a core staff for technical direction and on-going re-evaluation in conjunction with Ministry of Agriculture. Alternative AB would call for a major re-orientation of the NCSU and ISU programs to perform the role of the core staff in B, and at the same time assume an active problem-solving orientation. This would involve working through priority projects with specific application to: development of production - marketing systems, project planning and implementation, and farm management and adoption of the production technology packages.

Alternative A is rejected. Alternative AB would be regarded as a fall-back option if staffing of a core group for B were to prove difficult or suffer excessive delays. Thus, Alternative B is the prime recommendation. Consideration

should be given to forming a core group of 5-7 senior technicians - one or two in sector analysis, one in macro - economic studies of supply and demand, one or two in production - marketing systems, one in public administration, and one in private sector development. This group in association with the Government would develop projects, implementation procedures, and staff requirements.

Thereafter the work would require studies, coordination of technical assistance and loan projects, continuous program evaluation and re-orientation (with the Government and in accord with other sources of international assistance), and new project development. In exercising these functions it is to be expected that use would be made of consultants, plus international research and technical assistance organizations (e. g. CIMMYT, CIAT, IRRI, IICA, and FAO) and AID funded research in the U. S. or elsewhere applicable to Peruvian agricultural problems. At this stage there is no reason to believe that the total number of contract positions under the NCSU and ISU programs would be materially affected.

Recommendations

The recommendations section of Chapter 6, provides for a "set of projects within areas of concentration. "

A. General

Projects are grouped by area of concentration in each of two periods: 1971-1975 and 1976-1980. In each time period the projects are then grouped as: action, training, studies, and research.

Illustrative project recommendations are then made for USAID. In the illustrations the frame of reference is broadened to include social as well as economic processes in the context of Policy and Agrarian Reform. In these regards assistance strategy is applied with specific reference to GOP agricultural objectives on courses of action which will insure the most immediate problem solving impact.

To accomplish these ends, guidelines for development of an integrated program of assistance to agriculture are presented. These guidelines emphasize an analysis framework, a master plan strategy and a staffing innovation.

B. USAID

It would be premature to identify, the order of priority for projects in which AID assistance should be considered. Chart 3, column 3 gives an illustration, based on a first approximation, of some of the apparent higher priority areas drawn from the "areas of concentration" discussed in Section E-3 above. Examples are:

1. Subregional production-system in support of agrarian reform in the Sierra, possibly based initially on Cahuide and Tupac Amaru. This may be supported by research on farm management, capital formation, and project administration.
2. Pasture and feeding improvement for dairy and sheep production in the central and southern Sierra; with support of IVITA, the University of Florida animal nutrition project and the Texas A and M animal disease project.

3. Planning for a program of land development for improved pasture in the Pucallpa region with importation of heifers for beef production; with support of CIAT.
4. Programming for integrated development in the North Costa, with partial transfer of rice production to the Selva and introduction of a crop rotation built around corn, sorghum or wheat plus hog fattening; with assistance of CIMMYT, the University of California crop protection project and the NCSU soil fertility project.
5. Institutional (or organizations) and macro-economic aspects connected with design and implementation of the above projects within an agrarian reform context; with support of the ISU team.

It is worth re-iterating that AID assistance should: (i) be coordinated internally and with the government as a package, (ii) have a priority commodity and regional focus using a production - marketing systems approach to development,

where research, training and credit directly support such systems, and (iii) be related to, an integrated with, the agrarian reform at the farm level.

Implementation

A special section was prepared on AID staffing for planning and program leadership. It is recommended that a liason staff to work for USAID and the Ministry of Agriculture be developed one for each of six subject matter areas of concentration:

- (1) Sector evaluation analysis,
- (2) Macro Demand / Supply analysis,
- (3-4) Production and marketing systems,
- (5) Private sector development, and
- (6) Farm and Institutional management.

This Program Management staff would be responsible for program formulation and project monitoring of AID assistance in Agriculture. The staff would be recruited through U. S. Universities and/or from the USDA.

The last section of Chapter 6 discusses implementation from the country side. The introductory statement points out the need for country leadership and responsibility for Program development and project implementation. USAID technical assistance should be advisory.

Technical and financial assistance needs of agrarian reform is rediscussed for emphasis. A suggested organization for implementation based upon a vertical and a horizontal approach and commodity technical commissions is developed for consideration.