requests that will lead to the support of small-scale farmers will be studied together with 5.2 Expectations of local authorities, as well as being incorporated in Chapter 6 Basic Development Concept and Chapter 7 Basic Development Plan.

5.2 Expectations of local authorities

1) Expectations of departmental governors

Departmental governors and heads of district governments were elected by popular vote after the new constitution took effect in June 1992, since when Paraguay has been taking the path towards democratization in every sector. As it is unthinkable that the nation will go against this trend, Paraguay is expected to move forward towards its goal of decentralization.

As mentioned in Chapter 4, the Study Area is lagging in the enhancement of agricultural and rural infrastructure and the development of software related to it, and is urgently required to work out ways to materialize them. Such enhancement and development will greatly benefit the interests of the public, and thus it is hoped that the central government and local authorities will work on these systematically.

In this Study we visited 14 departmental offices and interviewed ten departmental governors (regarding the four other departments, we interviewed secretary generals or officers in charge). The major issues discussed in the interviews were as listed below (see Table 5.2.1). The "Recommendation of candidate model areas" listed in the table will be discussed in Chapter 7.

(1) Major agricultural problems include single-crop farming for cotton and damage from the picudo pest (6 departments), low productivity (5 departments), a shortage of leaders (4 departments), lack of adequate irrigation facilities (4 departments), and a lack of proper education (3 departments).

(2) Major requests for support of small-scale farming include organizing farmers (5 departments), construction of farm roads (3 departments), supply of inexpensive materials (3 departments), technology and capital (3 departments), distribution (2 departments), and preservation of farmland (2 departments).

(3) Most of the departmental governors in the Study Area expect devolution to be promoted, and strongly intend to proceed with plans and development under the control of each department after they have enhanced the functions of their departmental offices.

2) Departmental and district expectations

The heading "Expectations of this Study for a Support Programme" was included in the survey of departments (14 departments) and the survey of districts (214 districts) recommissioned to a local organization. The results of these surveys

are outlined in Table 5.2.2 and Table 5.2.3. The breakdown of the departmental and district expectations that topped the survey list is as follows. Particularly, they place high expectations on the development of social infrastructure in rural areas.

	Departmental expectations	District expectations (totalled per department)
(1) Farm roads, drinking water, communications, electricity	5 departments	7 departments
(2) Personnel training	4	1
(3) Technical guidance and advice	3	2
(4) Comprehensive agricultural reform	1	0
(5) Processing of agricultural products	1	0
(6) Economic support	0	1
(7) Conservation of soil	0	1
(8) Production of crops for export	0	1
(9) Support for small-scale farmers	0	1
	Total 14	Total 14

Table 5.2.1 Results of interview surveys with departmental governors
(10 out of 14 departmental governors interviewed; for remaining 4 departments, secretary generals or officers in charge interviewed)

Department	Agricultural issues	Support of small-scale farmers	Support of landless farmers	Decentralization of power	Recommendation of candidate model areas
CONCEPCION (7 districts*)	(i) Lack of adequate roads (ii) Serious damage from picudo cotton pest (iii) Shortage of quality drinking water (iv) Lack of WID activity	(i) Need to improve land productivity (ii) Request for establishment of seed centre Farmers are being organized (e.g. pineapples)	(i) Creating two settlements	(i) Devolution is not in progress (ii) Expect that devolution will be promoted through election of departmental governor by popular vote	No. 1: Horqueta No. 2: Yby Yau No. 3: Part of Concepción
SAN PEDRO (17 districts)	(i) Single crop farming for cotton: diversification is needed (ii) Low productivity (iii) Lack of proper education	(i) Guidance on diversification (home-consumption and sales) provided by the Ministry of Agriculture and Livestock (ii) Farmers are being organized from production to distribution (iii) Request for promotion of measures for WID	(i) Plan to create employment opportunities by securing coordination among government agencies and promoting processing industries (ii) Request for acquisition of land and development of infrastructure by IBR	(i) The Department is making its own plans to promote devolution (ii) Efforts made by Department's officers in charge are being recognized (iii) Need for environmental monitoring by the Department	No. 1: Choré No. 2: Capibary No. 3: Guayaybí
CORDILLERA (20 districts)	(i) Low-level productivity (ii) Lack of adequate road infrastructure (iii) Shortage of irrigation water for cultivation of rice (iv) Lack of coordination among agriculture-supporting organizations	(i) Seminars for loans are held (ii) Some small-scale farmers are following the example of advanced areas and ethnic Japanese immigrants	(i) Waiting for settlement to be created by IBR for two years	(i) Promotion of devolution	No. 1: Arroyos y Esteros No. 2: Piribebuy No. 3: Caraguatay

Note: * The number of districts as of April 1996 was 214

Department	Agricultural issues	Support of small-scale farmers	Support of landless farmers	Decentralization of power	Recommendation of candidate model areas
GUAIRA (18 districts)	(i) Low productivity in sugar cane (ii) Shortage of funds (iii) Insufficient yield of vegetables (iv) Insufficient yield of cassava	(i) None	(i) There are some cases of illegal trespassers	(i) Central government agencies should set up branch offices in the Department offices	No. 1: Independencia No. 2: Borja No. 3: M. J. Troche
CAAGUAZU (20 districts)	(i) Single-crop farming for cotton (ii) Unorganized farmers (iii) Deterioration of soil	(i) Request for funds for soil preservation project (ii) Request for development of infrastructure in new settlements and indigenous residential land	(i) Promotion of land certificate issues by IBR	(i) Earthwork machines needed to maintain roads are now available for use (ii) Transfer of authority in the fields of education, sanitation, and electrification to the department	No. 1: R. A. Oviedo No. 2: Repatriación No. 3: San Joaquín
CAAZAPA (10 districts)	(i) Shortage of engineers (ii) Shortage of funds (iii) Lack of adequate municipally-run local markets	(i) Use of public land as grassland (grass productivity is low)	(i) Most of the land is treated as public land; promotion of land certificate issues	(i) Promotion of devolution	No. 1: Caazapa* No. 2: Maciel No. 3: Yegros
ITAPUA (29 districts)	(i) Land productivity is low in the western part of the Department, and the Department is planning to relocate farmers to other departments or areas (ii) Lack of education and technology	(i) None	(i) Even if settlements are defined, some illegally trespass on others' land (ii) IBR created 27 settlements, and is now working to issue land certificates	(i) Now that elections are held by residents, growth in every area is expected (ii) Because of the strong centralized power, cannot expect much	No. 1: Col. Bogado No. 2: S.P. del Paraná No. 3: S. Cosme y Damián

* The number of districts as of April 1996 was 214

Department	Agricultural issues	Support of small-scale farmers	Support of landless farmers	Decentralization of power	Recommendation of candidate model areas
MISIONES (10 districts)	(i) Shortage of leaders (ii) Shortage of long-term low-interest loans (iii) Low-level land productivity (iv) Shortage of labour due to many farmers who go to other countries or departments to work	(i) Mutual coordination among supporting organizations is secured by the Department (ii) Request for establishment of a comit*	(i) One group of farmers was relocated to another department by IBR (ii) 300 farm households are awaiting settlement. (iii) Request for creation of two settlements (190 farms) in the department	(i) Polled expectations of farmers and made a request to the central government: the Department wishes to implement by itself	No. 1: Santa Rosa No. 2: Santa Maria No. 3: Yebebyry y Ayolas
PARAGUARI (17 districts)	(i) Deterioration of soil (ii) Damage from picudo cotton pest (iii) Shortage of irrigation facilities	(i) Need to improve livestock (ii) Request for guidance on model cultivation of crops (iii) Need to organize farmers	(i) None	(i) Promotion of devolution	No. 1: Ybycuí No. 2: Sapucai No. 3: Carapeguá
ALTO PARANA (19 districts)	(i) Shortage of leaders of small-scale farming (ii) Damage from picudo cotton pest	(i) Technical guidance will be provided, using video tapes (50-60 farms at a time) (ii) Guidance on formation of farmers' organizations will be provided (establishment of 10 new organizations and one central organization) (iii) Guidance on environmental conservation plan will be provided (expected to be provided in all 19 districts)	(i) Land certificates already issued for 20 out of 78 settlements (for 50 of the remainder, the Department expects that the issue of land certificates will be promoted) (ii) The Department plans to provide land used for military purposes for landless farmers	(i) The Department desires to go ahead with its own plan rather than with the uniform plan of the central government (ii) Promotion of devolution	No. 1: J.E. O'Leary No. 2: Minga Porá No. 3: Hernandarias
CENTRAL (19 districts)	(i) Lack of technical guidance (e.g. how to handle agricultural chemicals) (ii) Lack of technology on agriculture and livestock farming (iii) Shortage of irrigation facilities	(i) Request for technical guidance for 5% of small-scale farmers (about 750 farmers) (ii) Improvement of distribution of crops for export to Argentina through strengthening of organizations (iii) Production of virus-free strawberry seedlings	(i) Request for cultivation of strawberries on leased land	(i) Promotion of devolution	No. 1: J.A. Saldivar No. 2: Itá No. 3: Villeta

Department	Agricultural issues	Support of small-scale farmers	Support of landless farmers	Decentralization of power	Recommendation of candidate model areas
ÑEEMBUCU (16 districts)	(i) Small area of cultivated land and deterioration of soil (ii) Lack of supporting technology (iii) Shortage of funds (iv) Poor drainage conditions in low and damp areas	(i) Budget for issue of land certificates was approved for the first time in 1996 (ii) There is no distribution channel for farm products (iii) Desire to switch to cultivation of cotton	(i) Settlement land is being specified by IBR (not so many illegal trespassers; leased-land based farming) (ii) The number of workers is on the decrease as many farmers go to neighbouring countries to work	(i) Proceeding with regional development with residents' participation by organizing comit ñ (ii) People are beginning to realize that they are making efforts for their own Department	No. 1: Gral. Díaz No. 2: M.J.D. Martine No. 3: Isla Umb*
AMAMBAY (3 districts)	(i) Lack of farmland conservation technology (ii) Few diffusion staff members (iii) Need to enhance the will to produce crops	(i) The Department distributes vegetable seeds (ii) The Department wishes to adopt a method of preserving farm land (iii) Establishment of farmers' organizations and development of infrastructure are indispensable	(i) The Department has independently installed wells in seven settlements (ii) Farmers want to stop growing crops just for home-consumption	(i) The way the central government allots the budget is far from what the Department demands (ii) Promotion of devolution	No. 1: P.J. Caballero No. 2: Capitan Bado No. 3: B.V. del Norte
CANINDEYU (9 districts)	(i) Infrastructure is not developed in most rural areas (ii) Lack of education and technology (iii) Single-crop farming for cotton involves great risk	(i) Request for maintenance of roads (ii) Request for technical and financial assistance	(i) There is no problem since IBR issues land certificates	(i) Promotion of devolution	No. 1: Curuguaty No. 2: Corpus Cristi No. 3: Ygatimí

Table 5.2.2 Departmental expectations of this Support Programme Study (Until top 3rd)

Department	1st	2nd	3rd
Concepción	Farm roads, drinking water, communications, electricity		
San Pedro	Personnel training	Production of farm crops for export	
Cordillera	Technical guidance and advice	Credit support	Sanitation support
Guairá	Farm roads, drinking water, communications, electricity		
Caaguazú	Comprehensive agricultural reform	Machinery bank	Farm roads, drinking water, communications, electricity
Caazapá	Farm roads, drinking water, communications, electricity		
Itapua	Farm roads, drinking water, communications, electricity		
Misiones	Personnel training	Technical guidance and advice	
Paraguarí	Processing of farm products		
Alto Paraná	Technical guidance and advice		
Central	Personnel training	Credit assistance	
Ñeembucú	Technical guidance and advice		
Amambay	Personnel training	Technical guidance and advice	
Canindeyú	Farm roads, drinking water, communications, electricity		

Source: Based on the results of locally commissioned studies

Table 5.2.3 District expectations of this Support Programme Study (Until top 4th)

Department	1st	2nd	3rd	4th
Concepción	Farm roads, drinking water, communications, electricity	Technical guidance and advice	Processing of farm produce	Personnel training
San Pedro	Economic support	Creation of employment sources		
Cordillera	Technical guidance and advice	Credit support	Personnel training	Creation of employment sources
Guairá	Farm roads, drinking water, communications, electricity	Technical guidance and advice	Economic support	Personnel training
Caaguazú	Farm roads, drinking water, communications, electricity	Sanitation assistance	Technical guidance and advice	Personnel training
Caazapá	Farm roads, drinking water, communications, electricity	Credit support	Processing of farm produce	
Itapua	Farm roads, drinking water, communications, electricity	Creation of employment sources	Production of farm produce for export	Sanitation support
Misiones	Conservation of soil	Personnel training	Machinery bank	Farm roads, drinking water, communications, electricity
Paraguarí	Farm roads, drinking water, communications, electricity	Technical guidance and advice	Personnel training	Credit support
Alto Paraná	Technical guidance and advice	Personnel training	Credit support	Economic support
Central	Personnel training	Technical guidance and advice	Credit support	Farm roads, drinking water, communications, electricity
Ñeembucú	Production of farm produce for export	Technical guidance and advice		
Amambay	Support of small- scale farming	Afforestation		
Canindeyú	Farm roads, drinking water, communications, electricity	Technical guidance and advice		

Source: Based on the results of locally commissioned studies

BASIC DEVELOPMENT PLAN

Chapter 6 Basic Development Concept

Paraguay faces the following conditions with regard to small-scale farmers.

① Small-scale farmers own 6 hectares farmland per farm on average, but some of them have difficulty in securing daily food due to ineffective use of land and poor productivity.

② It is only recently that small-scale farmers have compared the living conditions of those living in urban areas with their own, and recognized the state of their living conditions.

③ Reflecting their living culture and consciousness, deeply rooted in their own practice of living in self-sufficiency, small-scale farmers do not have a very strong desire to purchase durable consumer goods, etc.

④ Small-scale farmers with a Guaraní cultural background are not good at producing crops because they are not familiar with agricultural production techniques.

⑤ On top of this, there are not so many suitable cash crops that can be produced by small-scale farmers, with the exception of cotton.

To sum up, most small-scale farmers do not have any proper means of earning cash, do not have purchasing power, and are finding it more and more difficult to satisfy the traditional condition of Paraguayan farmers, namely "to be able to live in contentment without economic hardship".

6.1 Basic principles for development

1) Plan for national economic growth

(1) Need for an economic development plan

The population of the small-scale farmers' sector is expected to increase sharply in future. However, under current circumstances whereby no headway is being made in agrarian reform, it will probably be difficult for the increase in population to be fully absorbed within the small-scale farmers' sector in order to prevent a further compression of small-scale farm operations.

The problems of small-scale farmers should be solved via the redistribution of industrial population and income resulting from the growth of the national economy. Effective demand created by industrial activities, particularly new industrial activities that make use of surplus labour force, will have a derivative effect, i.e. the revitalization of all economic areas, which may also lead to an increase in demand for farm produce.

(2) Promotion of agriculture under MERCOSUR

Since Paraguay has the largest proportion of trade with other countries within MERCOSUR, it is expected that Paraguay will be greatly influenced by the enforcement of the tariff union.

The consumer population in urban areas of Paraguay is said to be in the range of 1.2 to 1.5 million, but the size of the domestic market is small, preventing the establishment of production centres that could be stable suppliers for the domestic market. On the other hand, Brazil and Argentina have large domestic markets which enable them to establish major production centres and supply farm produce with flexibility. Chile is a good producer of horticultural products, taking advantage of its climatic conditions. Farm products from those countries are highly competitive on the market. Under MERCOSUR, Paraguay's farm produce needs to be more competitive than ever. As for the course of growth in agricultural production, the country is urgently required to develop markets and produce small quantities of many different varieties at home, and specialize in the production of competitive cash crops for export from an international point of view.

2) Targets of the development plan and small-scale farmers to be covered by the plan

The planned income target of the programme for the support of small-scale farmers under MERCOSUR has changed from the previous goal, namely "to be able to live in contentment without economic hardship", to a target of bringing their incomes closer to those of urban residents.

Small-scale farmers to be covered by the Support Programme will be comprise 247,000 farming businesses that were classified as businesses occupying less than 20 hectares of farmland in the 1991 Agriculture and Livestock Farming Consensus.

3) Principles for agricultural development

(1) Diversification of crops

The yield of cotton, previously the largest cash crop for small-scale farmers, has been reduced by half owing to damage from the picudo pest, etc. Since it is very difficult to effect measures to deal with the picudo under the conditions of production by small-scale farmers, it is urgently necessary to introduce alternative cash crops. The following different measures for crop diversification should be taken, depending on the prospective shipment destinations of farm produce.

(a) Farm produce should be shipped as marketable produce based on an evaluation and analysis of market information, such as trends in the consumer market.

(b) If Paraguay plans to export the surplus of crops for home- or domestic

consumption to MERCOSUR, it will not be able to increase its competitiveness in crops produced at home.

(c) If the country is to formulate a production plan in consideration of market competitiveness, something first needs to be done about planting seasons and varieties.

(d) Crops for export outside MERCOSUR

① Since Paraguay is heavily dependent on the member nations of MERCOSUR (particularly on its two largest members) for its trade and future economic uncertainty in these two large countries will directly affect the economy of Paraguay, the nation would be advised to find trading partners in other areas as well.

② Paraguay is urgently required to acquire foreign currency, and in our judgment the most suitable methods of acquiring foreign currency through agricultural production include an increase in the production of soybean, wheat, rice, etc., and the export of such crops.

(e) For exports to MERCOSUR, crops (mainly fruits) should be selected in consideration of production time, transportation, storage capacity, and marketability.

(f) For the domestic market, crops (mainly vegetables that lose their freshness) should be selected in consideration of marketability and import substitution.

(g) Diversified varieties of crops for home-consumption should be selected in consideration of their nutritional value and the achievement of self-sufficiency.

(2) Improving agricultural productivity

Efforts should be made to improve land productivity through soil improvement, the use of fertilizers and agricultural chemicals, the introduction of improved varieties or breeds, the acquisition of cultivating and breeding techniques, etc., and to improve labour productivity by rationalizing agriculture through the provision and use of farming tools.

(3) Diffusion of technology and establishment of organizations

The diffusion of agriculture will promote an improvement in the knowledge and technology of farmers from agricultural production to sales, and thus increase their income. To this end, the formation of local committees and cooperatives and the active use of these organizations must be promoted.

4) Principles for rural development

(1) Thorough agricultural education and establishment of an agricultural production culture.

Many small-scale farmers are not equipped with the basic conditions for understanding agricultural diffusion activity, because they gave up compulsory

education before completion. These farmers should be provided with education, including extensive basic education, over a long period of time to improve their talents as farmers, and should be trained to become independent farmers.

Small-scale farmers who have inherited the Guaraní culture of hunting and gathering are not familiar with agricultural production techniques. It is difficult to encourage agricultural production without the acquisition of agricultural production technology (culture).

(2) Improved living conditions

Although farms are scattered all over rural areas in the Study Area, these areas are sites of production as well as places of living, rest and relaxation. The development levels of infrastructure such as roads that can be used for profitable sales of farm produce and purchases of production materials, quality drinking water, and the utilization of electricity are low. Efforts must be made to improve the living conditions and environment based on a development plan that considers the balance of development levels between regions.

5) Principles for environmental conservation measures

When the production and living bases of small-scale farmers are located near environmental conservation areas or in buffer zones, deterioration of the region's natural environment and difficulty in promoting sustainable agriculture are assumed to result not only from the reduction of forests but also from other phenomena such as the dilapidation of conservation areas and soil runoff.

In addition to this, there are other problems to be solved, including contamination caused by agricultural production activity itself, protection of the indigenous population, and, on ordinary farmland, soil runoff and deterioration. Active steps must be taken to solve these problems, including farmland conservation measures.

6) Measures for WID

To achieve growth in a socio-economy in which small-scale farming maintains a balance, everyone must participate in development on an equal footing and benefit equally from it, regardless of sex. To eliminate the social gap between men and women, both sides must change their attitudes so that they can understand their respective positions. To this end, they must gain an understanding of their respective roles through role playing, while female leaders must be trained in initiating public education activities.

Furthermore, an attempt must be made to encourage women to participate in economic activities that may bring them income and thus improve women's economic standing.

6.2 Development strategy

Basic principles will be determined after analyzing and examining hindering factors and preconditions for achieving certain objectives. The development strategy will be finalized in line with the content of this basic principle. Then, this development strategy will be put into practice and the objectives achieved. The major premise behind the planning of development strategy is that harmonious development is required in order to maintain and promote sustainable agriculture. If there is a change in the preconditions or a shortage of funds, the basic principle or development strategy will be amended.

The development strategy for this Support Programme will be discussed on the basis of Chapter 5 (Factors hindering development and future expectations). On the other hand, the International Fund for Agricultural Development (IFAD) estimates small-scale farmers' share of contribution to the export industry to be 35% and their share of contribution to food production to be 65%. The development strategy should consist entirely of indirect support that will increase these shares and thereby achieve "increased incomes and improved living conditions" and "increased competitiveness under MERCOSUR" (see Figure 6.2.1).

The development strategy shall be classified into the four categories of agriculture, rural areas, WID, and the environment. Each of the categories is described as follows.

(1) Agricultural measures include:

a) Land use

Promotion of the issue of land certificates that serve as security for agricultural credit

b) Agricultural development

(a) Improvement of farmland, improvement of grassland, provision of small-scale irrigation facilities, construction and maintenance of new farm roads, etc., with the aim of reinforcing production bases

(b) Diversification of agricultural and livestock products, production of alternative agricultural and livestock products for export, increased production of grain, expansion of scale through leasing of land, introduction of agricultural machines, measures against the picudo pest, purchase of superior seeds and seedlings, increased production of medicinal herbs, introduction of dairy bulls, provision of artificial insemination centres, introduction of equipment for apiculture and sericulture, etc., with the aim of modernizing agriculture and improving productivity

c) Distribution

Establishment of a market information network, construction of collection and shipment facilities, strengthening of plant quarantine and pesticide residue analysis,

etc., with the aim of improving distribution to fulfil the requirements of MERCOSUR

d) Processing

Construction of agricultural and livestock product processing facilities to increase added value, establishment of a food processing research institute to improve quality, etc.

e) Farmers' organizations and education of farmers

Farmers' organizations, testing and research, reinforcement of farmers' education, etc., with the aim of strengthening the farming business of small-scale farmers

f) Conservation of farmland

Farmland conservation measures for sustainable agriculture

g) Agricultural credit

Provision of agricultural credit for increased incomes and improved living conditions of small-scale farmers

(2) Rural measures include:

a) Amplification of education

Amplification of primary education with the aim of mastering procedures for joining farmers' organizations, applying for agricultural credit loans, and acquiring agricultural technology

b) Securing drinking water

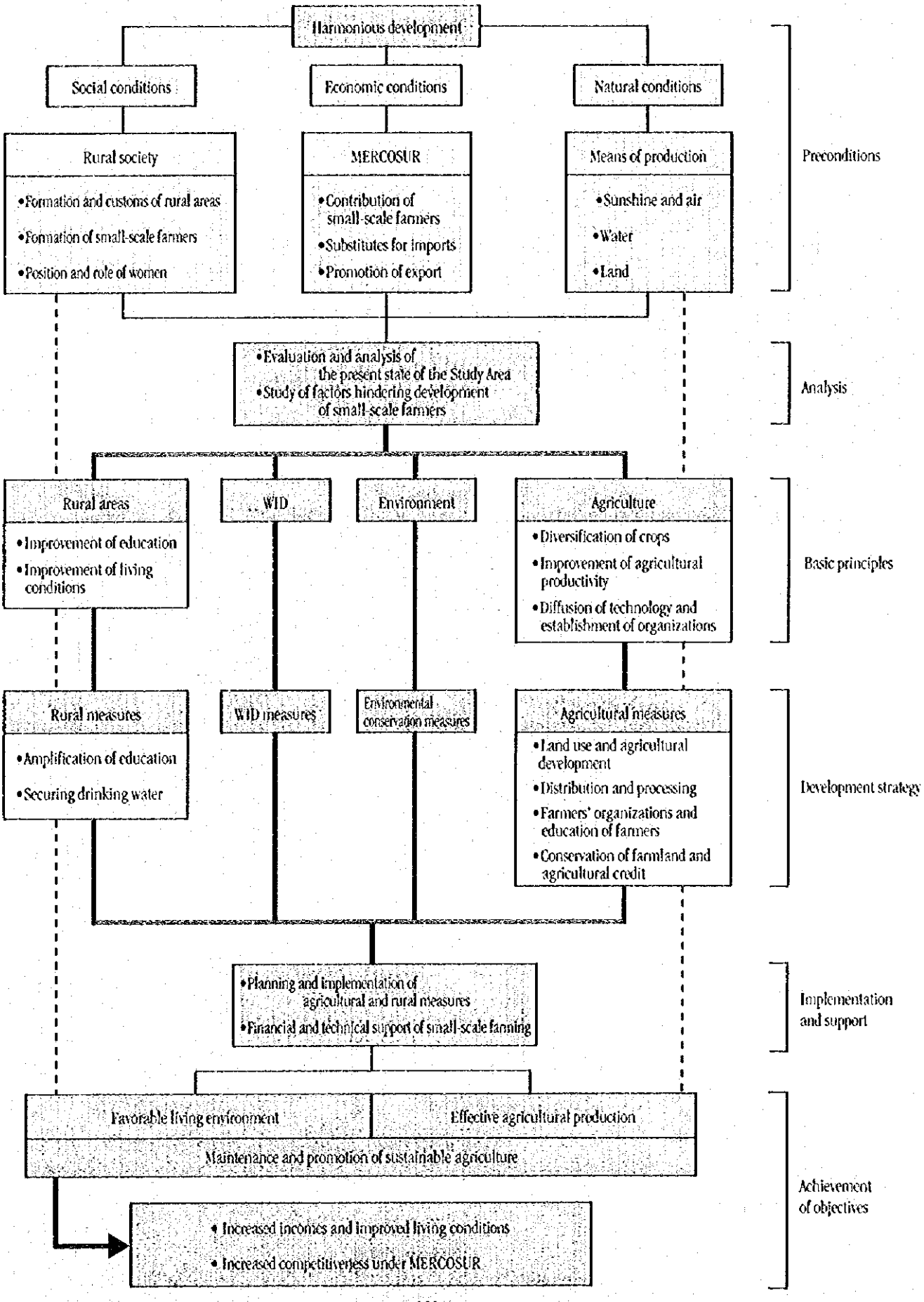
Securing quality drinking water from the viewpoint of hygiene

(3) Environmental conservation measures include public education using manuals for technical guidance and implementing model projects for environmental conservation.

(4) Measures for WID include personnel training, provision of joint purchasing centres, participation of rural women in economic activity, etc., with the aim of improving the quality of life for rural women.

Of the above four measures, those that are particularly important and urgently needed will be incorporated in 12 projects in 6 model areas, to be described lator (Chapter 8), to which end immediate fund raising and implementation are required.

Figure 6.2.1 Flowchart of the Support Programme for Small-Scale Farmers



6.3 Development targets

6.3.1 Setting the project target year

The target year of the development plan has been set at 2017 in consideration of the implementation of the projects, the situation in which the projects will manifest their effects, the schedule for the unification of markets under MERCOSUR, and the time scale for operation of this unified market.

To carry out the development plan smoothly by the target year, it will be divided into three periods (short-term, medium-term, and long-term), and the basic principles for each of the periods will be set as follows.

① Short-term period (5 years from 1998 to 2002)
Projects will be implemented in some of the model areas and their effects will manifest themselves, while exports of agricultural and livestock produce to MERCOSUR countries will increase. This will also be a period during which the reinforcement of farmers' organizations and the education of farmers will start, while credit and technical support for farmers who have joined organizations will be promoted.

② Medium-term period (5 years from 2003 to 2007)
Projects will be implemented in all the model areas, their effects will start to be felt, model projects implemented during the short-term period will affect neighbouring areas, the planning of projects will be promoted, and the arrangements for producing import-substitute crops will be completed. This will also be a period during which the ratio of organized farmers will be improved, and the construction, administration, and operation of farm produce processing and distribution facilities will be started.

③ Long-term period (10 years from 2008 to 2017)
All the projects in the development plan will be underway and will start to manifest demonstrable effects, while the arrangements for exporting agricultural produce to markets inside and outside MERCOSUR will be established. This will also be a period during which the education of farmers will spread to villages, agricultural credit loans will circulate smoothly, and agricultural techniques will be diffused and firmly established.

6.3.2 Outlook for the target year

The outlook for the future of Paraguay can be described as follows, using the mathematical economics method while also considering past trends and measures such as national development plans (see Table 6.3.2.1 and CUADRO A 6.3.2.1).

① Paraguay's population growth rate will gradually fall from the high annual rates of 2.5 - 3.5% to about 2.4% as predicted by the World Bank and the United Nations. The total population of the nation is estimated at 6.64 million in the target year of 2017. Because of population migration from rural to urban areas, there will be a marked population increase in Asunción and provincial cities.

② The number of households will also increase at a higher rate than the population growth rate, and, as with the population, there will be a similarly marked increase in urban areas as well as a significant increase in rural area. Due to population migration and the increasing number of single-member and nuclear family households, the population per household will decrease from the current 4.7-5.0 persons to 4.2-4.5 persons.

③ There will be a shift of importance in the industrial structure from primary industries such as agriculture, livestock farming, and forestry to secondary and tertiary industries, and commerce in imports from MERCOSUR will form the core of the industrial structure.

④ Population increases in urban areas and the improved nutritional balance will result in a significant increase in demand for food, but the amount of imported food will hardly change because of the expansion of domestic production. Agricultural production will increase and Paraguay will grow as an exporting nation (mainly exporting grain).

⑤ The farming population increased by approximately 29% during the decade from 1981 to 1991. At this rate, the farming population in the target year of 2017 is estimated at 2.82 million for the whole of Paraguay and 2.78 million in the Study Area. However, since there will be a marked flow of farming population to Asunción and local core cities, the farming population should remain at the current level, and is estimated at 1.6 million for the entire nation and 1.58 million in the Study Area.

⑥ The number of farm businesses increased by approximately 23% during the decade from 1981 to 1991. However, new entries will be restricted in future due to a decrease in settlement land and from the viewpoint of environmental protection. On the other hand, the number of farm businesses is expected to decrease because the number of farmers who give up farming will increase. Under such circumstances, the number of farm businesses should manage to stay at the present level, as with the farming population, and is estimated at 307,000 for the entire nation and 300,000 for the Study Area.

⑦ As regards land use for agriculture, while the area of land used to grow annual crops and forage crops will increase, natural grassland will diminish as it will be turned into improved grassland or cultivated land, or land with higher productivity. As for farm produce, exports of crops such as soybeans, rice, maize,

and wheat to markets within MERCOSUR will expand while those of cotton, fruit, milk, and honey to MERCOSUR will increase. There will also be an increase in the supply of vegetables, fruit, and milk to domestic markets. As for livestock farming, the capacity per unit area will improve due to the introduction of superior stud bulls and the improvement of grassland, and the number of dairy cows will increase considerably due to the increased production of compound feed in which poor quality grain is used.

Thus, agriculture in Paraguay will see the following improvements: arrangements for sustainable production will be strengthened, effective use of land will be encouraged, production bases will be maintained and reinforced, export of agricultural products will be expanded, while, in the small-scale farming sector, productivity will be raised, crop production will be diversified, and income will be increased.

Table 6.3.2.1 Prospects for leading indicators

Item	Present state (1991 or 1992)		Target year (2017)	
	Nationwide	Study Area	Nationwide	Study Area
Total population	4,152,588	3,546,017	6,640,000	5,890,000
Male	2,085,905	1,797,293	3,340,000	2,990,000
Female	2,066,683	1,748,724	3,300,000	2,900,000
Urban areas	2,089,688	1,556,468	4,030,000	3,550,000
Provinces*	2,062,900	1,989,549	2,610,000	2,340,000
Total number of households	855,547	728,149	1,518,000	1,351,000
Urban areas	443,691	331,345	908,000	799,000
Provinces*	411,856	396,804	610,000	552,000
Farming population	1,698,724	1,676,711	1,600,000	1,580,000
Small-scale farming population	1,306,155	1,302,798	1,310,000	1,300,000
Number of farms	307,221	300,523	307,000	300,000
Landless	7,962	7,610	8,000	7,000
Small-scale	247,616	246,560	248,000	247,000
Medium-scale	43,375	41,485	43,000	41,000
Large-scale	8,268	4,868	8,000	5,000

Source: Compiled from Censo Nacional de Poblacion ('92) and Censo Agropecuario ('91)
* "Provinces" include non-farming households in small cities.

6.3.3 Recipient farms in the target year

The number of recipient farms in the target year will be 247,000, classified

into the following four types in consideration of the present form of production and the current size of land area occupied: ① farms that will increase production of agricultural and livestock produce for export to countries outside of MERCOSUR; ② farms that will increase production of agricultural and livestock produce for export to countries within MERCOSUR; ③ farms that will increase production of high-quality agricultural and livestock produce for domestic markets; and ④ farms that will diversify crops for home consumption to improve their living conditions (see Fig. 6.3.3.1 and ANEXO 6.3.3).

① The number of farms that export agricultural and livestock produce to countries outside of MERCOSUR is set at 12,500. They will formulate farming plans, distribution plans, organization reinforcement plans, loan plans, and agricultural infrastructure improvement plans to increase production of agricultural and livestock produce that is suitable for storage and transportation as well as being internationally competitive.

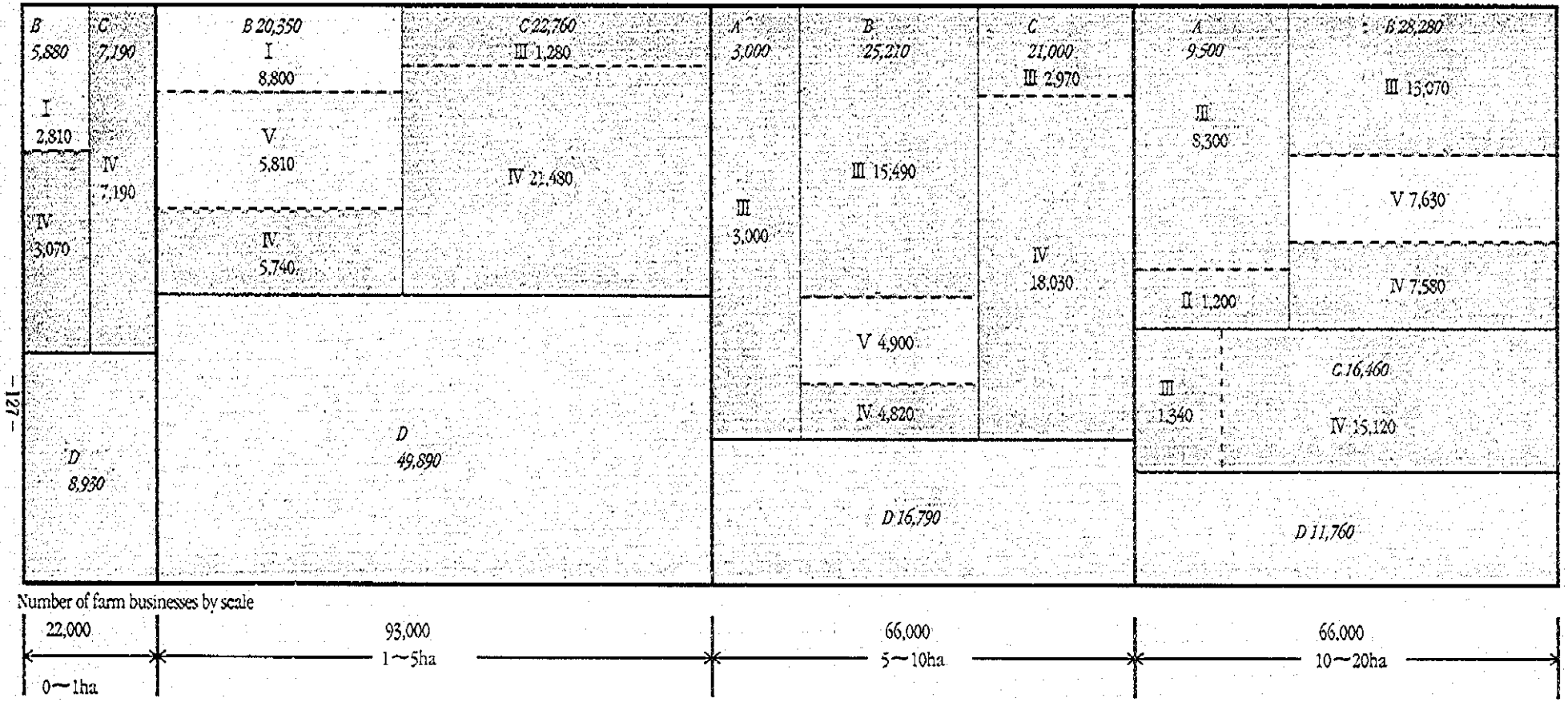
② The number of farms that export agricultural and livestock produce to markets within MERCOSUR is set at 79,720. They will make farming plans, farm produce processing plans, distribution plans, organization plans, agricultural credit plans, and agricultural infrastructure improvement plans to increase agricultural and livestock produce that has advantages such as high-quality produce materialized by farm produce processing and crops whose cultivation is limited by climatic conditions.

③ The number of farms that supply agricultural and livestock produce to domestic markets is set at 67,410. They will finalize farming plans, distribution plans, plans for supporting farmers, and agricultural infrastructure improvement plans to enable a stable supply of agricultural and livestock produce that can be cultivated at home and have advantages due to improved productivity with a view to replacing agricultural and livestock produce imported in large quantities.

④ The number of farms that aims to improve living conditions is set at 87,370. They will achieve self-sufficiency by diversifying their production of agricultural and livestock produce through the well-planned use of land, correct nutritional imbalance, and increased production of marketable crops such as cotton on farmland not used to grow crops for home consumption. To this end, they will formulate farming plans, plans for supporting farmers, and agricultural infrastructure improvement plans.

The development plan will take account of agricultural credit plans, environmental protection measures, farmland conservation measures, and WID measures that will be applicable to all 247,000 farms.

Figure 6.3.3.1 Composition of farm business types subject to the project



A : Outside the region
B : Within the region
C : Domestic
D : Improvement of living conditions

I : Apiculture
II : Sericulture
III : Crop farming
IV : Dairy farming
V : Mixed crop and dairy farming

"Within the region", specified as the consumption destination, indicates the type of beneficiary farm that will increase production of farm produce for export to markets within MERCOSUR; "domestic", the type that will increase production of high-quality farm produce for supply to domestic markets; "outside the region", the type that will increase production of farm produce for export to countries outside of MERCOSUR; and "improvement of living conditions", the type that will diversify production of crops for home consumption. Forms of farming represent the main areas that will be promoted by applicable farms. "Crop farming", "apiculture," "dairy farming" and "sericulture" indicate a single form of farming, and "mixed crop and dairy farming" a compound form of farming consisting of crop cultivation and dairy farming. "Improvement of living conditions" indicates beneficiary farms engaged in various compound forms of farming.

CHAPTER 7 BASIC DEVELOPMENT PLAN

7.1 Land use plan

1) Basic concept

(1) Data from the 1991 National Agriculture and Livestock Census are adopted as regards the area of land used for agricultural activities. The area involved in the land use project is shown in Table 7.1.1 and CUADRO A 7.1.1.

(2) Within the total Study Area of 15,971,000 hectares, primary emphasis will be placed on securing farmland for agricultural and livestock production necessary for the support of small-scale farmers. Land currently classified as forests or other land in the Study Area is to be excluded from development for environmental conservation purposes. The areas where development is restricted under any laws or regulations will be included in forests and other land. Part of natural grassland will be converted to arable land. In addition to grassland, forage fields and fallow land as well as woodland undergrowth will be used for feeding livestock.

As regards arable land, farm roads need to be maintained appropriately for the timely delivery of farm produce, and farmland must be conserved in order to maintain soil productivity.

2) Categories of land use

(1) Arable land

Arable land includes land cultivated with annual, perennial, and forage crops as well as fallow land.

(2) Natural grassland

Natural grassland includes perennial natural grassland.

(3) Woodland

Woodland includes reforestation areas, natural forests, and land covered by applicable laws and regulations (e.g. ecological reserves).

(4) Others

Other land includes urban areas, rivers and streams, lakes and ponds, wetlands, the public domain, and land covered by applicable laws and regulations (e.g. ecological reserves).

Table 7.1.1 Area of land use plan

unit: ha

Category	Total area	Arable land	Natural grassland	Woodland	Others
Current	15,971,000	3,682,701	4,794,128	3,357,468	4,236,703
Planned	15,971,000	3,718,501 (113,574)	4,658,328	3,357,468	4,236,703
Change	—	135,801	-135,801	—	—

Source: Censo Agropecuario Nacional 1991, Anuario Estadistico del Paraguay 1994.
Note: The area of fallow land to be cultivated is shown in brackets.

3) Direct cost of the project

Gs 1,434 million (see CUADRO A 7.1.2 for details).

7.2 Agricultural development plan

7.2.1 Cultivation plan

1) Soil improvement measures

Soil in the Study Area is fit for agricultural production both physically and chemically, and it is reported that the soil presents few obstacles for production. In recent years, however, insufficient soil management has resulted in chemical impediments such as a loss of organic matter in soil, soil acidification and a deficiency of phosphate, as well as in physical impediments such as soil compaction and formation of plough sole. Although soil improvement measures are desirable in order to remove these impediments, it is difficult to implement such measures on all of the arable land. Therefore, they will be implemented case by case in the process of soil management during the cultivation period.

Replenishment of organic matter in the soil will be conducted through cultivation of green manure crops and ploughing in of their plant bodies. Many fields lie fallow in winter due to a lack of appropriate cash crops which would facilitate the cultivation of green manure crops such as barley and broad beans. On the other hand, the cultivation of green manure crops is more difficult due to competition with cash crops in summer. Research is underway on mixed cropping of the mucuna green manure crop with maize. This method may be generalized in the future.

In Latin America, the dose of lime for correcting soil acidity is generally calculated to be 1.5 to 2 times the amount required for neutralizing interchangeable aluminum. Thus the dose of lime will be about 1 ton per hectare.

As in the case of lime fertilizer, phosphate is fit for application to all strata of soil when soil improvement is intended. The necessary dose varies according to the type of soil, the coefficient of phosphate absorption, the content of effective phosphate, the type of crop, and other factors. When applied in large doses,

phosphate becomes insoluble, thus lowering the utilization rate. The appropriate dose of P_2O_5 will be 40 kg/ha in tierra roja soil, where the phosphate absorption coefficient is high, and 20 kg/ha in sandy soil, where the coefficient is low.

As for soil compaction, the growth of dry-field crop roots is generally affected when soil is harder than 15 kg/cm^2, and particularly when it is harder than 20 kg/cm^2 (according to cone penetrometer). Countermeasures for soil compaction and plough sole include deep ploughing by tractors and subsoiling.

2) Benefits of soil improvement measures

The chemical and physical properties of the soil will be improved by applying organic materials, phosphate and lime, breaking the plough sole, etc.

Soil improvement will facilitate crop growth, with improved yields leading to increased income.

3) Cultivation

(1) Selection of planned crops

a) Classification of crops for selection

For the purpose of selection, planned crops are classified into commercial and non-commercial crops. Commercial crops include those which will become marketable if their quality is upgraded through improvements to existing cultivation techniques used by small-scale farmers. The present techniques will continue to be applied to non-commercial crops, which will be sold or home consumed in the present manner.

b) Eligible crops for selection

Commercial crops eligible for selection include major crops cultivated in Paraguay and crops which, according to IAN and other sources, are supposed to be cultivable in the Study Area. Candidates for non-commercial crops are ② those included in FAO's "Per Capita Energy Intake and Consumption in Paraguay" (1991), ② those deemed necessary for correcting nutritional deficiency among the Paraguayan population, and ③ those deemed necessary for securing additional income.

c) Method of selection

Commercial crops will be selected according to six criteria: adaptability to temperature, susceptibility to pests and diseases, difficulty of cultivation, profitability, marketability, and added value. Criteria for non-commercial crops are past cultivation records, difficulty of cultivation, and need to improve nutrition, etc. For each evaluation item, crops will be classified into three levels and given points. A crop will be adopted for the project if its total points exceeds the aggregate of average points for each item.

d) Result of selection

19 commercial crops will be selected (7 annual crops, 5 vegetables, and 7 perennial crops). A total of 22 crops will be selected as non-commercial crops (8 annual crops, 9 vegetables, 3 perennial crops, and 2 other crops; see CUADRO A 7.2.1.1).

(2) Classification of consumption areas and selection of corresponding crops

Consumption areas for the project crops selected as above will be classified into four categories according to the following criteria.

① Export to MERCOSUR and non-MERCOSUR countries

Farm produce represents a major feature of exports from Paraguay, accounting for 80% of its total exports (1994). Small-scale farmers in the Study Area, who account for about 80% of all farming households in Paraguay, can help build up the foreign currency reserves of this agricultural country if the production of export crops is promoted by a policy of diversification. Although commercial crops will be primarily exported to MERCOSUR countries, some of them will be exported to other countries in order to diversify risk.

② Sales on the domestic market

Although farm produce has an insignificant share in total imports by Paraguay, substituting agricultural imports by increasing domestic production or improving product quality will save some foreign currency. Since the Paraguayan population as a whole has tendencies similar to small-scale farmers in terms of the nutritional imbalance, non-commercial crops produced by these farmers will also be consumed by the national population in general. For this reason, some of the commercial and non-commercial crops of small-scale farmers will be sold on the domestic market.

③ Home consumption by small-scale farmers

In general, small-scale farmers constitute low-income households with a serious nutritional imbalance. Producing non-commercial crops to improve this situation will help reduce farmers' expenses and balance their nutritional intake. Therefore, non-commercial crops will be consumed by the farmers themselves.

b) Selection of crops by consuming areas (see CUADRO A 7.2.1.1)

① Crops to be exported outside MERCOSUR (promotion items in the livestock sector are underlined)

These crops will primarily include internationally competitive cereals for which long-distance transportation is possible, namely soybeans, wheat, maize, rice, peanuts, sunflowers, oranges, bitter oranges, and silkworms.

② Crops to be exported to MERCOSUR countries

These crops will primarily consist of fruit which have the advantages of consumability in the area and difficulty of cultivation in other member countries. They include cotton, mango, grape, damson, macadamia nut, cow (milk), and

bees (honey).

③ Crops to be sold on the domestic market

These crops primarily include vegetables other than export crops which are imported in relatively large volumes, namely tomato, melon, strawberrie, carrot, banana, green asparagus, and cow (milk). In addition, non-commercial crops of small-scale farmers will also be marketed for consumption by the national population in general. these crops are presented in ④ below.

④ Non-commercial crops

The cultivation of non-commercial crops is aimed at the self-sufficiency of small scale farmers, thus securing additional income and a food supply for the population. These crops are classified into the following three categories.

Crops indispensable for energy intake primarily include annual crops whose main ingredients are carbohydrates and fats, such as cassava, poroto, maize, banana, cow (milk and beef), and related forage crops, as well as pigs, chickens, and other small-medium domestic animals.

Crops to correct the nutritional imbalance include vitamin-rich vegetables and perennial crops such as tomato, melon, strawberry, green asparagus, pumpkin, green pepper, carrot, orange, and maté tea.

Crops for securing additional income include medicinal herbs (in view of dietary habits in Paraguay) and flowering plants (in view of their traditional use in festivities and funerals).

(3) Basic concept for cultivation methods

a) Land-intensive crops to be exported to MERCOSUR and non-MERCOSUR countries

Land-intensive crops include soybean, wheat, maize, rice, peanut, and sunflower. Cultivation techniques for these crops will be improved in the following manner.

① Production materials include improved seeds, fertilizer, agrochemicals, and imported heavy agricultural machinery required for increasing land and labour productivity. Soybeans, wheat, and rice, in particular, will be cultivated using heavy machinery on farmland leased from public agencies, etc.

② Soybeans and wheat will be cultivated by ploughing and in rotation, while maize and sunflowers will be cultivated in rotation to prevent run-off of surface soil while saving labour.

b) Non-land-intensive crops to be exported to MERCOSUR and non-MERCOSUR countries

These crops include orange, bitter orange, cotton, mango, grape, damson, and macadamia nuts. Cultivation techniques will be improved as follows.

① Production materials basically include improved seeds and seedlings, fertilizers, and agrochemicals as well as already available working animals and agricultural

machinery. Measures against the picudo pest will be completely integrated with cotton cultivation. Graft seedlings produced in MERCOSUR countries will be used for macadamia nut cultivation, while domestic graft seedlings will be applied to mangoes.

② As regards fruit production, perennial crops and vegetables will be planted between furrows during the period from new planting or replanting to stabilization, so that management costs may be reduced until the formation of mature orchards.

③ In areas where the yield of cotton has been decreasing due to soil degradation, green manure crops will be planted in rotation to prevent this. Small-scale farmers who are obliged to continue with existing cultivation techniques for reasons such as the difficulty of participating in producers' organizations will reduce damage from the picudo pest via appropriate agricultural production materiel and ploughing in of residues.

c) Crops for the domestic market

Cultivation methods will be improved in the following manner for import-substitute crops to serve the domestic market.

① Agricultural materials will include improved seeds, fertilizers, agrochemicals, and already available work animals.

② Timeliness will be considered in selecting the varieties of improved seeds to be used, so that crops may be marketed at the same time as imported produce. As indicated in d) below, however, traditional techniques will be applied to home consumption crops produced by small-scale farmers that are also consumed by the population in general.

d) Crops for home consumption by small-scale farmers

Cultivation of crops for home consumption by small-scale farmers will continue to depend on existing types of seedlings and animal labour. In principle, fertilizers and agrochemicals will not be used.

e) Basic concept to be adopted in future

① Techniques such as rotating or mixed planting of annual crops (e.g. peanut) and vegetables with green manure crops (e.g. mucuna) to obtain high yields have not been fully developed or widely adopted among small-scale farmers. The feasibility of such techniques will depend on subsequent cultivation research, etc.

② Medicinal herbs are indispensable to dietary habits in Paraguay. Small-scale farmers have been obtaining additional income by extracting and selling such herbs. However, their production will be increased by establishing appropriate cultivation methods and processing techniques to keep pace with the expected increase in population. For this reason, the preparation of a concrete cultivation project will follow the technical results of the farmer support project to be

discussed in 7.2.6.

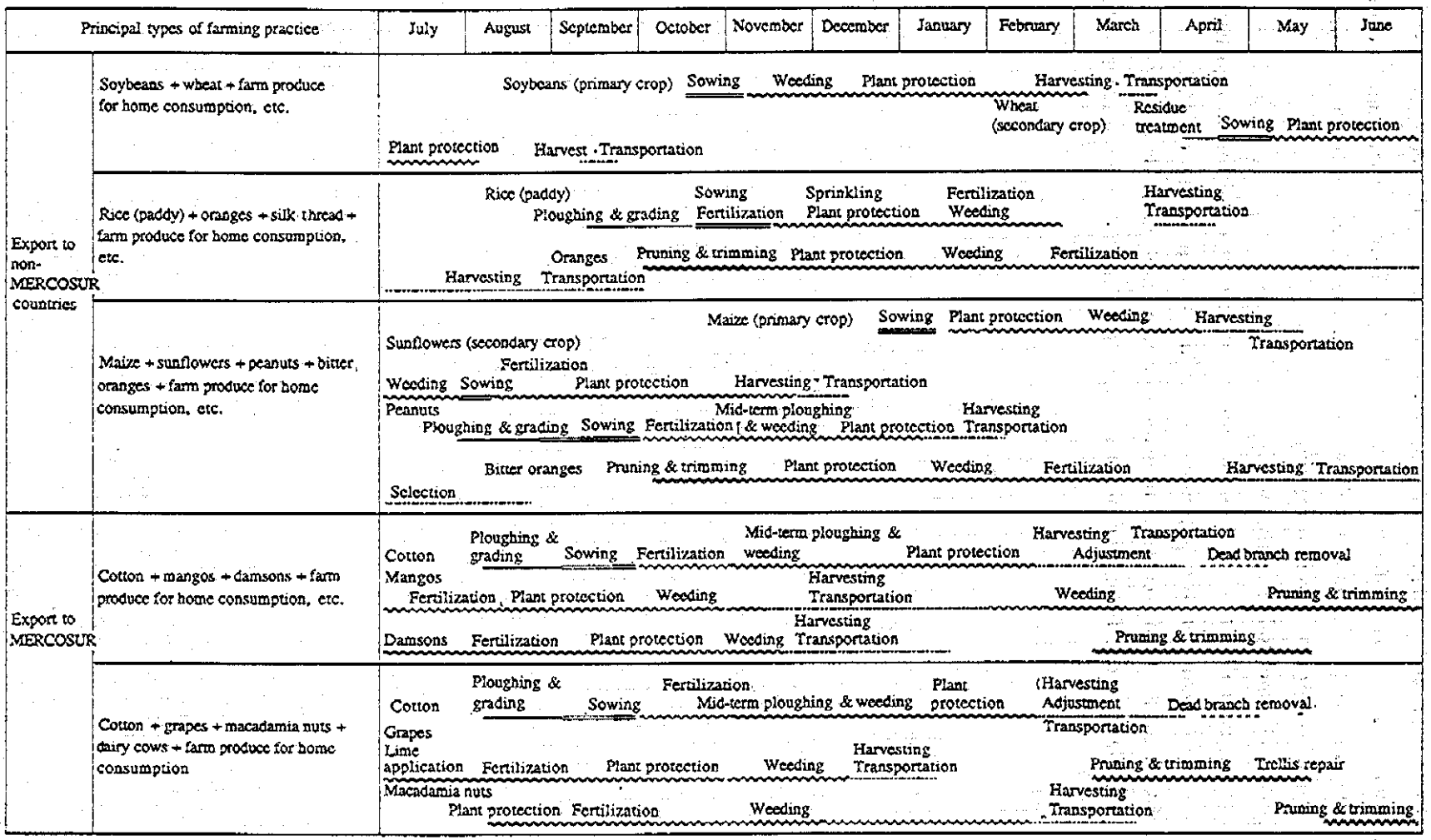
f) Points of note

In addition to the further organization of producers, thorough generalization of and guidance on production techniques, the construction of distribution and processing facilities, and the development of rural agricultural infrastructure, various conditions will be met to accomplish the cultivation project, such as financial support and information.

(4) System and method of cultivation

Principal cultivation systems for the respective types of farming practice based on the concepts in the previous section are shown in Figure 7.2.1.1 (see GRAFICO A 7.2.1.1 for respective cultivation systems and methods for individual crops). Planned types of farming practice are discussed in 7.2.3 Farm practice plan.

Figure 7.2.1.1 Crop planting schedules for principal types of farming practice



Principal types of farming practice		July	August	September	October	November	December	January	February	March	April	May	June
Domestic sales	Tomatoes + carrots + green asparagus + melons + bananas + farm produce for home consumption	Tomatoes: Ploughing & grading; Nursery; Sowing; Settlement; Propping, etc.; Fertilization; Plant protection; Weeding; Sprinkling; Harvesting; Transportation; Adjustment											
		Carrots: Ploughing, grading & sowing; Fertilization; Plant protection; Thinning out; Weeding; Sprinkling; Harvesting; Transportation; Adjustment											
		Melons: Ploughing & grading; Nursery; Fertilization, settlement; Weeding; Harvesting											
		Green asparagus: Plant protection; Harvesting; Transportation; Adjustment; Weeding; Fertilization											
		Bananas: Plant protection; Offshoot removal; Fertilization; Mid-term ploughing & weeding; Harvesting; Transportation											

Notes

1: Farm produce for home consumption is produce cultivated in a traditional manner and sold or used for home consumption by small-scale farmers.

2: Planting schedules of perennial crops are for mature orchards.

3: Omitted from the figure are breeding schedules for livestock and planting schedules for crops oriented toward improvement of living standard.

(5) Production plan

a) Concept of production plan

① Export crops to non-MERCOSUR countries

Production of export crops will correspond to the number of cultivating farms in accordance with the types of farming practice defined in 7.2.3.

② Export crops to MERCOSUR countries

In view of consumability in member states, the production of mango is set at 10% of total consumption in MERCOSUR population, because the fruit is difficult to cultivate in some countries (e.g. Argentina). Production volumes of grapes, damsons, and macadamia nuts are set at 5% of total consumption by the MERCOSUR population, because of their high added value and the possibility of diversified use through processing. As regards cotton, production will be limited within the current cultivation area, taking into consideration the ongoing crop diversification policy. 70% of the present cultivation area will be accounted for by small-scale farmers who will take measures against the picudo pest through technical improvement, with the remaining 30% represented by small-scale farmers who will continue to adopt traditional techniques to remove the picudo.

③ Crops to be sold on the domestic market

As regards tomato, melon, carrot, and banana, which have been imported in large amounts, the existing techniques of small-scale farmers need to be improved in order to make effective sales. Production of these crops will be set at 70% of their respective import amounts. The production amounts of strawberries and green asparagus, which have not been imported, will be set at 20% of total consumption by the national population (excluding small-scale farmers in the Study Area), based on the per capita consumption of domestic produce. Some of the domestic market-oriented crops will continue to be produced using the traditional techniques of small-scale farmers. For such produce, the production volume will be set at 50% of total consumption by the population excluding small-scale farmers in the Study Area.

④ Crops for home consumption by small-scale farmers

Production of all home consumption crops will be set at the total amount of home consumption by small-scale farmers.

b) Planned production volumes

Planned production volumes are shown in Table 7.2.1.1.

① Farm produce diversification

Small-scale farmers cultivating home consumption crops will diversify activities by increasing the number of crops cultivated about two-fold (to over 20 crops). In order to improve nutritional conditions, the per capita consumption by small-scale farmers and by the national population as a whole will be decreased by 20% for crops indispensable for energy intake, and increased by 20% for crops to

correct nutritional imbalance.

② Substitution of farm produce imports

70% of traditional import crops including tomatoes, melons, carrots, and bananas (6,669 tons according to 1991 data) will be substituted by domestic crops.

③ Increased production of export crops

1,088,000 tons of farm produce (soybeans and wheat in particular) will be exported to non-MERCOSUR countries. Exports to MERCOSUR countries including cotton will be increased to 588,000t.

(6) Direct cost of the project

Gs 318,920 million (see CUADRO A 7.2.1.2 for details).

4) Benefits of cultivation

(1) Improved incomes and living standards

Small-scale farmers will diversify and increase production of cash crops to be sold abroad and on the domestic market. Such crops will be marketed according to trends in demand on consumer markets. In addition, small-scale farmers will select crops that would help improve nutritional balance as candidates for increased production, taking into consideration the consumption of the national population as a whole as well as home consumption. Small-scale farmers will reduce household expenses by becoming partially self-sufficient on agricultural and livestock produce which they have been purchasing until now. In addition, their income will be increased by selling some of the produce on the domestic market. Home consumption crops can also contribute to correcting the nutritional imbalance among small-scale farmers as well as the national population. The living standards of small-scale farmers are expected to improve, since they usually rise in proportion to household income. From the viewpoint of the national economy, exports to both MERCOSUR and non-MERCOSUR countries will contribute to the acquisition of foreign currency, while a partial substitution of agricultural imports will reduce the outflow of foreign currency reserves.

(2) Promotion of sustainable agriculture through environmental conservation measures

Land-intensive crops to be exported to both MERCOSUR and non-MERCOSUR countries, such as soybeans, do not require ploughing for cultivation. Thus, run-off of surface soil due to ploughing can be prevented.

(3) Revitalization of rural areas through WID measures

Women play a central role in the production of marmalade, yoghurt, and other cottage industry-type produce, in the culling of medicinal herbs, and in the cultivation of flowering plants. They will be given opportunities to obtain additional income by selling this agricultural and livestock produce.

Table 7.2.1.1 Planned production volumes

1) Commercial crops (crops for sale after improvement to existing technology)

Item / Crop	Per capita consumption		National consumption				Planned		Current		Change	
	Current (kg/year/person)	Planned (kg/year/person)	Import substitution = imports x 0.7 x commercialization ratio	Exports to MERCOSUR states (t)	Exports to non MERCOSUR states (t)	Planned yield (t/ha)	Production volume (t)	Area (ha)	Production volume (t)	Area (ha)	Production volume (t)	Area (ha)
Non-MERCOSUR crops												
Soybean					434,700	3.5						
Wheat					310,500	2.5	345,000	(138,000)	4,483	2,957	478,517	(135,043)
Maize					12,915	3.5						
Rice					129,600	4.8						
Peanut					6,642	1.8						
Sunflower					6,642	1.8	7,380	(4,100)	148	140	7,232	(3,960)
Orange					27,000	20.0						
Bitter orange					160,043	23.5	177,825	7,567	136,655	7,567	41,170	0
MERCOSUR crops												
Cotton				369,999		1.8						
Mango	3.5	3.5		70,000		15.0	77,778	5,185	14,715	327	63,063	4,858
Grape	1.0	1.0		10,000		10.0	11,111	1,111	1,660	214	9,451	897
Damson	0.5	0.5		5,000		10.0	5,556	556	2,134	213	3,422	343
Macadamia nut	0.1	0.1		1,000		5.3	1,111	210	—	—	1,111	210
Domestic market crops												
Tomato			1,639			80.0						
Melon			169			41.3						
Strawberry	1.4	1.7	1,816			13.0						
Carrot			1,000			15.0						
Banana			3,861			16.0						
Green asparagus	0.5	0.6	641			4.0						
Total			9,126	455,999	1,087,742		625,761	14,629	159,795	11,418	603,966	145,311

Notes:

1. Figures in brackets indicate secondary crops. 69,000 hectares of land will be leased for soybeans and wheat, and 30,000 hectares for rice.
2. Planned, Current, and Change figures for commercial crops which are also classified as non-commercial crops are presented in the table for non-commercial crops. Within the net increase in the "Change" column, secondary crop cultivation on leased land accounts for 69,000 hectares, while secondary crop cultivation on occupied land amounts to 70,003 hectares.
3. The commercialization ratio is assumed to be 100% for cotton and 90% for other produce.

2) Non-commercial crops (crops for sale or home consumption after cultivation via traditional techniques)

Item / Crop	Per capita consumption		Consumption by	National consumption		Current yield (t/ha)	Planned Non-commercial crops		Planned (commercial crops)		Planned		Current		Change	
	Current (kg/year/person)	Planned (kg/year/person)	small-scale farmers (t) = (2) x 1.3 million persons	Consumption of domestic crops (t) = (2) x 2.67 million persons	Production volume (t) = (4) /commercialization ratio		Production volume (t)	Area (ha)	Production volume (t)	Area (ha)	Production volume (t)	Area (ha)	Production volume (t)	Area (ha)	Production volume (t)	Area (ha)
Non-commercial crops																
Cassava	149.4	119.5	155,350	319,065	1,595,325	18.4	1,750,675	95,145			1,750,675	95,145	2,440,133	132,659	-689,458	-37,514
Poroto	10.0	8.0	10,400	21,360	26,700	0.9	37,100	41,222			37,100	41,222	29,961	35,206	7,139	6,016
Maize	58.6	46.9	60,970	125,223	156,529	1.5	217,499	144,999	14,350	4,100	231,849	149,099	214,202	142,854	17,647	6,245
Banana	27.2	21.8	28,340	58,206	72,.758	9.8	101,098	10,316	4,290	268	105,388	10,584	55,585	5,651	49,803	4,933
Soybean	5.8	4.6	5,980	12,282	15,353	1.9	21,333	11,228	483,000	138,000	504,333	149,228	95,474	51,164	408,859	98,064
Rice	10.5	8.4	10,920	22,428	28,035	2.8	38,955	13,913	144,000	30,000	182,955	43,913	6,041	2,988	176,914	40,925
Peanut	2.3	1.8	2,340	4,806	6,008	0.3	8,348	27,827	7,380	4,100	15,728	31,927	11,812	36,862	3,916	-4,935
Sweet potato	29.9	23.9	31,070	63,813	79,766	7.9	110,836	14,030			110,836	14,030	58,369	7,387	52,467	6,643
Tomato	16.9	20.3	26,390	54,201	90,335	40.9	116,725	2,854	1,821	23	118,546	2,877	35,130	858	83,416	2,019
Melon	2.5	3.0	3,900	8,010	80,100	31.8	84,000	2,642	188	5	84,188	2,647	77,117	2,422	7,071	225
Strawberry	1.4	1.7	2,210	4,539	7,565	11.4	9,775	857	2,018	155	11,793	1,012	1,795	158	9,998	854
Green asparagus	0.5	0.6	780	1,602	2,670	3.0	3,450	1,150	712	178	4,162	1,328	—	—	4,162	1,328
Onion	6.2	7.4	9,620	19,758	32,930	4.5	42,550	9,456			42,550	9,456	4,715	1,046	37,835	8,410
Cabbage	1.5	1.8	2,340	4,806	8,010	3.0	13,553	4,518			13,553	4,518	429	143	13,124	4,375
Pumpkin	1.5	1.8	2,340	4,806	8,010	15.0	13,553	904			13,553	904	25,980	1,732	-12,427	-828
Green pepper	4.0	4.8	6,240	12,816	21,360	7.0	27,600	3,943			27,600	3,943	2,855	409	24,745	3,534
Carrot	1.7	2.0	2,600	5,340	8,900	11.2	11,500	1,027	1,111	74	12,611	1,101	3,715	332	8,896	769
Orange	93.0	112.0	145,600	299,040	373,800	17.5	519,400	29,680	30,000	1,500	549,400	31,180	160,923	8,671	388,477	22,509
Maté tea	12.4	14.9	19,370	39,783	44,203	2.6 (exported within the region using traditional techniques)	63,573	24,451			63,573	24,451	18,357	6,957	45,216	17,494
Cotton	—	—	—		—	1.5	132,143	88,095	369,999	205,555	502,142	293,650	450,788	293,650	51,354	0
Medicinal herbs	18.0	18.0	23,400	48,060	53,400	—	76,800	—			76,800	—	76,800	—	0	—
Flowering plants	10	10	13,000 thousand	26,700 thousand	33,375 thousand	300 thousand	46,375 thousand	155			46,375 thousand	155	46,375 thousand	155	0	0
Total			550,160	1,129,944	2,711,757		3,400,466	528,257	1,058,869	383,958	4,459,335	912,215	3,770,181	731,149	-689,154	181,066

Notes: 1. (National population in the target year – population of small scale farmers in the Study Area in the target year) x 0.5 = 2,670,000 persons in the "national consumption" column. 0.5 = current production of small-scale farmers/current production in Paraguay.

2. The commercialization ratios are estimated to be 80% for annual crops (20% for cassava), 60% for vegetables (10% for melons), 80% for oranges and flowering plants, and 90% for medicinal herbs.

3. Leased land accounts for 99,000 hectares of the net increase in the "Change" column.

5) Measures against the picudo pest

The picudo is found everywhere in the Study Area. Particularly effective measures against the picudo have been developed in the "Direct Technology Project", which reportedly incorporates the result of research and study conducted by the Department of Agricultural Extension (Ministry of Agriculture and Livestock) and the National Institute of Agriculture. In this context, the following project will be implemented for small-scale farmers in major production areas who have the potential to improve their cultivation techniques. As for other farmers, efforts to reduce damage from the picudo will consist of appropriate application of existing agricultural production materiel based on the prediction of outbreak as discussed below. Effective plant protection measures include early sowing of cotton seeds. However, the superior seeds required in order to implement this measure are in short supply in Paraguay, and thus production thereof needs to be increased. The project for production of superior seeds is described in 8.3.3.

(1) Details of the project

① Prediction of picudo attacks (particularly in the early stages of flower opening) will be conducted by the implementing body in cooperation with producers.

② Low-interest loans will be provided for cotton growers to allow them to purchase seeds, fertilizer, and other production material in time for the planting season.

③ In order to improve the efficiency of cultivation, technical guidance will be provided for the following.

- Correct sowing season and planting density
- Appropriate method of agrochemical application for plant protection
- Method of weeding
- Method of fertilization
- Maintenance of equipment

④ Training of technical leaders

⑤ Registration of cotton growers and procedures for loans

Technical staff will register cotton growers within each area to make a list of growers. Lenders will notify the form of loan application, application deadline, and other details based on the growers' list.

⑥ Promotion of residue removal

A grower who has conducted residue removal will be issued with a certificate notifying the available loan amount. With this certificate, the grower can obtain cash from lending institutions. Technicians and farm assistants will certify residue removal and issue certificates.

⑦ Soil management and fertilizer distribution

Before grading, soil samples will be extracted from each area to measure soil fertility. After consultation with project managers based on the result of

analysis, lending institutions will provide loans for the purchase of fertilizers.

(2) Area covered

The project is to be implemented in major cotton producing departments including San Pedro, Caáguazú, Itapúa, and Paraguarí. The number of producing households and the cultivation area are as follows.

Number of households: 68,110

Cultivation area: 205,555 hectares

(3) The direct project costs will be Gs 318,920 million.

(4) Benefits

Cotton production will be increased by due implementation of the project.

7.2.2 Livestock plan

1) Basic concept

Livestock has the following characteristics.

① Cattle can be fed on wild grass and therefore can be produced on land unfit for farming.

② Whereas the production of dry field crops largely depends on climatic conditions and is therefore unstable, livestock is less influenced by climate and serves as a safety valve in securing income.

③ Livestock manure is a precious organic fertilizer in sandy soil and alluvial soil areas, and is effective for maintaining soil productivity.

④ In livestock farming, post-harvest by-products of dry field crops can be effectively utilized as fodder.

⑤ By combining livestock farming with dry field farming, meadows can be rotated with dry fields, providing an effective measure for farmland conservation.

⑥ A working system using animal labour is more effective for small-scale farmers than costly investment in farm appliances.

⑦ Livestock improves the nutritional conditions of small-scale farmers.

In view of these characteristics, the livestock project will basically adopt combined crop and livestock farming.

Beef cow, chicken, pig, sheep, and goat will be excluded from livestock promoted by the project due to the following reasons.

① Cow will only be used as working animals, because low profitability would prevent the scale merit in raising beef cattle.

② Poultry farming would involve huge costs for the vaccination of thousands of chickens. Problems also remain concerning the production of compound feed.

③ Low profitability of sheep and goats.

④ It will be difficult to increase consumption of pork.

In contrast, expanded consumption and exports can be expected for milk. In

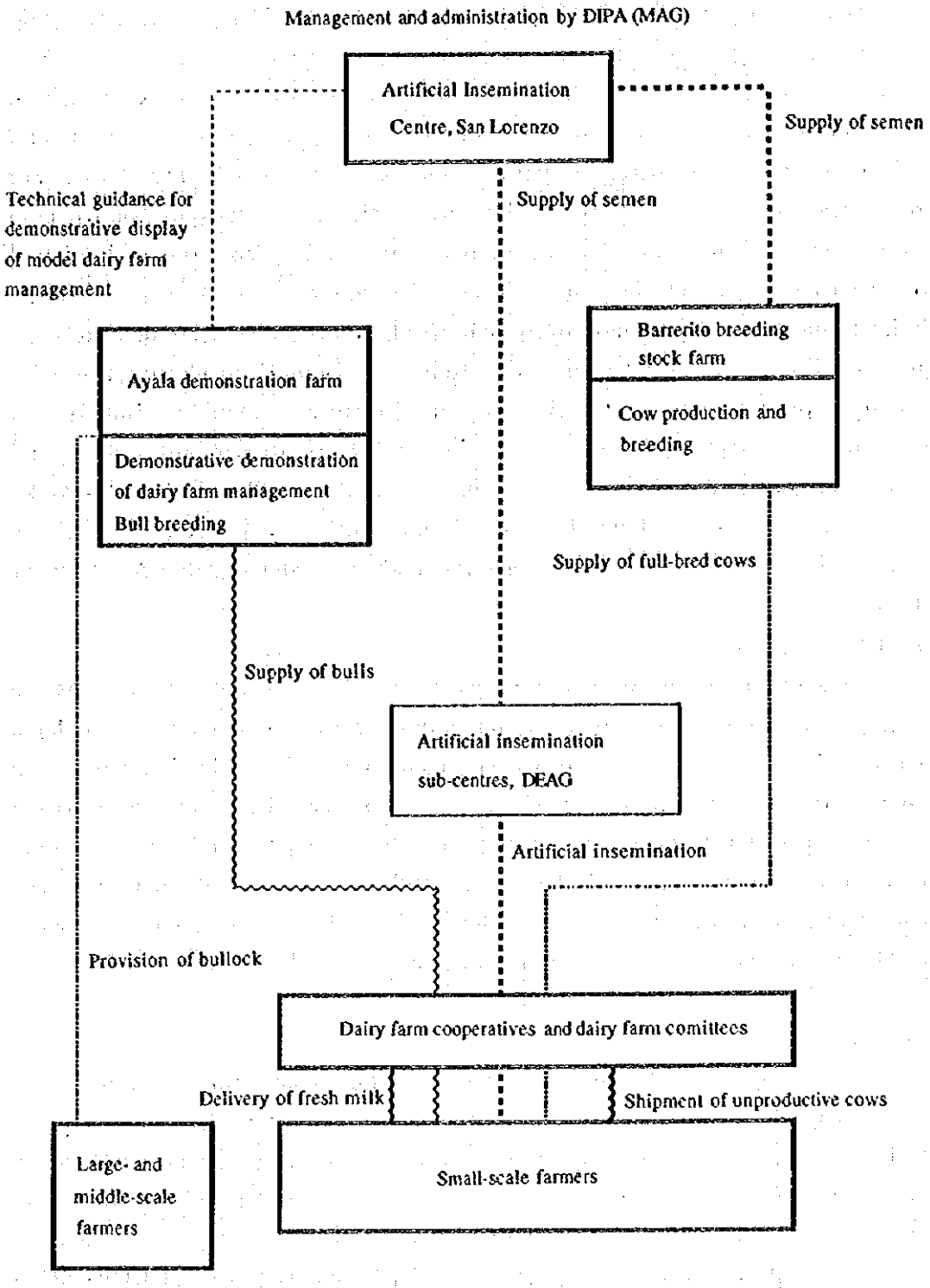
order to increase production thereof, dairy cow breeding will be the pillar of agricultural development in the whole Study Area. The production of honey and raw silk will also be promoted, because their exports are expected to increase. Pigs and chickens are essential for small-scale farmers as sources of home consumption or cash income. Therefore, pig and poultry farming will be considered in the farm practice project.

2) Promotion of dairy farming

(1) Cattle expansion and production plan

An expansion of milk production will be achieved mainly by increasing the number of dairy cows and effecting livestock improvement to increase the amount of milk per cow (see Figure 7.2.2.1). The number of dairy cows will be increased by 50% on the basis of productive cows, or by 30% in total. This number has been determined in consideration of the rate of self-sufficiency in coarse forage and the supply & demand for milk (annual milk consumption currently stands at 84 litres/person, only about half of the consumption standard (150 litres/person) advocated by FAO; Paraguay relies on imports for 40% of the shortfall in demand). The expansion of dairy cattle and plans for fresh milk production by departments are presented in CUADRO A 7.2.2.1.

Figure 7.2.2.1 Flowchart of dairy farm promotion



Note: Technical guidance for demonstrative displays of dairy farm management and the development of the Ayala demonstration farm will be implemented through the Dairy Farming Improvement Project.

(2) Animal improvement

Slow progress in artificial insemination has been an obstacle to dairy cow improvement. Therefore, animal improvement measures will include insemination of Criollo cows by dairy bulls to increase milk production. Specifically, the San Lorenzo Artificial Insemination Centre and the Barrerito Breeding Stock Farm, both administered and managed by the Department of Livestock Research and Production (Direccion de Investigacion y Produccion Animal: DIPA) of the Ministry of Agriculture and Livestock (MAG), will be expanded further. The expansion will help improve the semen production capacity of dairy cattle and increase the production of superior cows. The number of artificial insemination sub-centres, currently administered by the Department of Agricultural Extension (Direccion de Extension Agricola: DEAG) of MAG, will be increased from 28 to about 47. In addition, the Dairy Farming Improvement Project envisages enhancement of the bull breeding farm in Ayala. In this connection, the project will strengthen the system of bull breeding and distribution to individual farms. As a measure to support small-scale dairy farms, 28 bulls have already been distributed. 115 more bulls will be distributed to areas where the benefits of artificial insemination are not available (see CUADRO A 7.2.2.2 for details).

(3) Cattle management

The nutritional conditions of dairy cattle will be improved by developing the forage production infrastructure (including improved grassland and forage fields) in order to substantially improve propagation results and milk production. Combined crop and livestock farming will be the basic type of farm practice. Cattle will be grazed throughout the year to save labour. Cows are to be milked by hand in the morning and in the evening at nearby milking stations. Milking periods and dry periods will be about eight months and three months respectively. Milk production per cow is set at 2,000 litres/year. Base data for the dairy cow productivity plan are presented in Table 7.2.2.1.

(4) Forage production

As discussed in 4.3.2, the self-sufficiency ratio of coarse forage stands at 67% for grass-eating animals kept by small-scale farmers. The ratio will be raised to over 70% in the dairy sector in each department to secure an average self-sufficiency ratio of about 79% among all small-scale farmers. The supply-demand balance for forage has been calculated according to the following procedure.

① Determination of production plan indicators, e.g. for pasture (see CUADRO A 7.2.2.3)

② Calculation of forage requirement based on the dairy cow productivity plan (see CUADRO A 7.2.2.4-5)

③ Calculation of required increase in coarse forage production (see CUADRO 7.2.2.6)

④ Procurement of shortfall in pasture, etc. (see CUADRO A 7.2.2.7).

Natural grassland and fallow land will be improved to pastures of colonial, brachiaria, estrella, etc. Cultivation fields will also be developed for forage crops such as sorgho, maize, and elefante. The forage production infrastructure improvement plan and related costs are presented in 7.3.1 Agricultural infrastructure improvement project.

Table 7.2.2.1 Base data for dairy cow productivity plan

Category	Base data	Justification of base data, etc.
① Weight of productive cows	500 kg	
② Birth interval	14 months	
③ Rate of calf production	85.7%	12 months ÷ 14 months x 100 = 85.7%
④ Useful life of dairy cows	108 months	30 months until first birth = birth interval of 14 months x (6 – 1) births + 8 months = 108 months
⑤ Rate of renovation	17.1%	[12 months ÷ (5 births x 14 months + 8 months)] x 100 ÷ (1 - 0.1) = 17.1%
⑥ Age of first service	20 months	
⑦ Weight at time of reproduction	350kg	
⑧ Age of first birth	30 months	
⑨ Number of births in life	6	
⑩ Weight of calves at birth	female 30kg, male 35kg	
	At 10 days	
⑪ Shipment of calves	5%	
⑫ Mortality rate of calves (0-3 months)	2%	
Mortality rate of calves (4-7 months)	2%	
Mortality rate of heifers (8-19 months)	1%	
Mortality rate of heifers (20-29 months)	2,000kg	
⑬ Milk production (per productive cow)	3.2%	
⑭ Proportion of milk fat	3 months	
⑮ Dry period	Artificial insemination	
⑯ Mating method	and natural mating	

Source: Project MAG/JICA, 1996

3) Apiculture

The density of apiculture is regulated by applicable laws. In this project, the density is determined to be 20 colonies in a 2.5 kilometre radius or one colony every 10 hectares. This number is about 10 times as large as the current number of colonies kept. In view of deforestation in the Study Area and the large-dose application of agrochemicals to promote crop cultivation, the number of colonies will only be increased about five-fold. Apiculture will be expanded principally in areas where lowland marshes and large forests would ensure an abundant supply of meliferous plants. Priority in allocations will be given to the smallest-scale farmers.

Honey bees are usually reared in confinement, but rearing in rotation, involving movement in the nectariferous period, will also be considered in the project. Table 7.2.2.2 shows base data for the honey bee productivity plan.

The honey bee production plan is presented in CUADRO A 7.2.2.8.

Table 7.2.2.2 Base data for honey bee productivity plan

Category	Base data	Justification of base data, etc.
Annual extraction of honey	3 times	In Sept/Oct, December and March
Volume of extraction	30kg	
Species	Italian x African	
Replacement of queen bee	Every 12 months	
Density of colony distribution	1 colony/100ha	

4) Sericulture

For sericulture, we will establish sericultural farms in the departments of Alto Paraná, Caaguazú, Caazapá, San Pedro, and Canindeyú, with the filature plant in Alto Paraná Department functioning as the hub. Since problems exist in improving silkworm and mulberry species, producing silkworm eggs, rearing juvenile silkworms, etc., organisms will be developed to help improve the productivity of mulberry and the quality of raw silk. This flow is presented in Figure 8.3.5.1.

Cooperation will be sought from the JICA Agricultural Test Centre in Paraguay (Centro Tecnologico Agropecuario en Paraguay: CETAPAR) and the National Institute of Agriculture (Instituto Agronomico Nacional: IAN) in basic research on silkworm and mulberry species. Table 7.2.2.3 shows base data for sericulture productivity and other plans.

Table 7.2.2.3 Base data for sericulture productivity and other plans

Category	Base data	Justification of base data, etc.
Distribution of juvenile silkworms to farmers	3rd larval stage	
Frequency of gathering from egg paper/year	7 times	
Cocoon yield	1,000kg/year/ha	Currently 800kg
Rate of silk yield	17%	Currently 15-16%
Weight of cocoon	2g	
Mulberry planting	1,100 trees/ha	

In this project, fresh cocoons are to be delivered to private filature companies equipped with cocoon drying facilities. In the future, however, it is desirable that cooperative sericulture industry groups will equip themselves with cocoon drying facilities in order to retain leadership in determining cocoon prices.

5) Management plan

Table 7.2.2.4 shows the production costs of each area for promotion in the livestock sector in comparison with the present situation. Fairly high profitability can be expected for each area, as long as technology and financial support are provided to increase production.

Table 7.2.2.4 Livestock production cost

Type of farm practice / Category	Current						Planned			Remarks
	Dairy farming	Beef cattle	Egg-laying chickens	Pigs	Apiculture	Sericulture	Dairy farming	Apiculture	Sericulture	
Basis	per productive cow	per head	per head	per head	per colony	1 ha/mulberry	per productive cow	per colony	1 ha/mulberry	
Volume of production	900 litres/year	350 kg/head	10 kg/year	100 kg/head	10 kg/year	800 ha/year	2,000 litres/year	30 kg/year	1,000 kg of cocoon/ha/year	
Price	480 (Gs/L)	920 (Gs/kg)	1,680 (Gs/kg)	800 (Gs/kg)	5,000 (Gs/kg)	4,000 (Gs/kg)	480 (Gs/L)	6,000 (Gs/kg)	4,000 (Gs/kg)	
Gross income	Gs432,000	Gs322,000	Gs16,800	Gs80,000	Gs50,000	Gs3,200,000	Gs960,000	Gs180,000	Ga4,000,000	
Total management cost	167,000	129,000	6,700	32,000	17,500	800,000	550,000	72,000	1,000,000	
Technical expenses	84,000	32,400	4,500	19,000	3,000		149,000	7,000		
Compound feed	64,000	0	4,000	14,000			94,000			
Minerals	0	4,000	0	0			5,000			
Hygiene, vitamins	20,000	28,400	500	5,000	3,000		50,000	7,000		
Artificial insemination										
Cost of supplies	75,000	63,600	1,700	11,000	14,000		315,000	60,000		
Machinery cost	25,000	15,600	1,000	3,000	9,000		111,000	38,000		
Fixed cost	50,000	48,000	700	8,000	5,000		204,000	22,000		
Interest payment	8,000	33,000	500	2,000	500		86,000	5,000		
Agricultural income	265,000	193,000	10,100	48,000	32,500	2,400,000	410,000	108,000	3,000,000	
Income ratio (%)	61.3	60.0	60.0	60.0	65.0	75.0	43.0	60.0	75.0	
Labour							108 hr/productive cow/year	50 hr/colony/year	2,400 hr/1ha of mulberry field	

Source: Project MAG/JICA, 1996.

6) Direct cost of the project

Gs 30,077 million (see CUADRO A 7.2.2.9-15 for details).

7) Benefits

As discussed in "Basic Development Policy", the potentiality of livestock development can be realized when combined with crop cultivation. The three-pronged support measures for small-scale farmers in the sectors of dairy farming, apiculture, and sericulture will enable increased and stable incomes, improved nutrition, and sustainable agriculture. A stable production system will in turn contribute to the acquisition of foreign currency.

7.2.3 Farm practice plan

1) Basic concept

(1) Type of farm practice

Combined agriculture and livestock farming prevails in the Study Area. From the viewpoint of self-sufficiency, correction of nutritional imbalance, diversification of management risk, etc., this combined farming incorporates a complementary relationship between agriculture and livestock. Also in view of the request for continuity expressed by farmers themselves in oral research, the project will adopt this form of combined farming.

(2) Combination of agricultural and livestock products

In view of distributors' preference for one-stop collection and delivery at fixed time and volume, commercial agricultural and livestock products will be combined so that a farmer can produce crops requiring similar cultivation techniques and inputs according to the list of produce by consumption area presented in the cultivation project. In addition to these products, all farmers will produce some non-commercial agricultural and/or livestock products.

(3) Labour

Family labour is the principle in the project. Any shortage will be covered by employment of small-scale farmers. Agricultural machinery or animal labour will be utilized according to the type of agricultural and livestock products produced and the scale of management.

(4) Principal protagonists

Principal protagonists in the handling of commercial farm produce are those organized small-scale farmers who are likely to obtain support in terms of improvement of human resources and farming technology, financing for farming, etc., with special focus on relatively large farms. On the other hand, principal protagonists in the handling of non-commercial farm produce are those small-scale farmers who have difficulties in participating in producers' organizations, with

special focus on relatively small farms.

(5) Management area

The management area will be determined for each agricultural or livestock product in view of the labour force and target agricultural income of individual farms. As regards land-intensive crops, an increase in cultivation areas is likely to augment income. Therefore, small-scale farmers exporting these crops will expand their occupied farmland by renting land. Since the land use ratio in other farmland occupied by small-scale farmers is currently low, farming will be diffused basically within the present boundaries of farms by means of crop rotation, fallow land, etc.

(6) Target agricultural income

In view of the results of locally commissioned studies, etc., principal types of farm practice for small-scale farmers dealing in commercial produce will be set so that the target agricultural income may exceed Gs 5 million. As regards small-scale farmers who handle non-commercial produce or occupy relatively small farms, the target agricultural income will be set to exceed Gs 4 million, and principal types of farm practice will be determined so that the target income may surpass the average annual income of rural households.

2) Farm practice plan

(1) Classification of farm practices

Farm practices are classified into the following categories according to their consumer markets: non-MERCOSUR export and MERCOSUR export types, which contribute to the acquisition of foreign currency; the domestic sales type, which contributes to saving foreign currency; and the lifestyle improvement type, which contributes to self-sufficiency and the improvement of nutritional conditions among small-scale farmers as well as the national population in general.

(2) Size of families

The average number of family members in the target year is estimated as follows, according to the size of occupied farmland: ① 5.7 persons/household for 10-20 hectares; ② 5.5 persons/household for 5-10 hectares; ③ 5.0 persons/household for 1-5 hectares; and ④ 4.6 persons/household for 0-1 hectares. The average number will be 5.3 for all small-scale farmers.

(3) Labour force

The labour force per family in the target year is estimated as follows, according to the size of occupied farmland: ① 3.4 persons/household for 10-20 hectares; ② 3.4 persons/household for 5-10 hectares; ③ 2.5 persons/household for 1-5 hectares; and ④ 1.8 persons/household for 0-1 hectare. The average number will be 2.9 for all small-scale farmers.

(4) Working hours and employment

The working hours per worker within a farm will be 2,400 hours (300

man-days). Working hours will be as follows, according to the size of occupied farmland: ① 8,160 hours (1,020 man-days)/household for 10-20 hectares; ② 8,160 hours (1,020 man-days)/household for 5-10 hectares; ③ 6,000 hours (750 man-days)/household for 1-5 hectares; ④ 4,320 hours (540 man-days)/household for 0-1 hectare. Average working hours in small-scale farms will be 6,960 hours (870 man-days)/household.

Additional workers will be employed only when gross working hours within a farm exceed the designated working hours of family members in a month.

(5) Combination of agricultural and livestock products, and principal protagonists

Based on ANEXO 6.3.1, principal protagonists will be determined in each department for each combination of products (see CUADRO A 7.2.3.1 for information on respective departments).

a) Non-MERCOSUR export type (12,500 households)

① Soybean + (wheat) + farm produce for home consumption (6,900 households)

② Rice + orange + silk thread + farm produce for home consumption (1,500 households)

③ Maize + (sunflower) + peanut + bitter orange + farm produce for home consumption (4,100 households)

b) MERCOSUR export type (79,720 households)

① Cotton + mango + damson + farm produce for home consumption (28,760 households)

② Cotton + grape + macadamia nut + dairy cow (small-scale farmers using industrial processing facilities) + farm produce for home consumption (39,350 households)

③ Honey + farm produce for home consumption (11,610 households)

c) Domestic sale type (67,410 households)

① Tomato + melon + strawberry + carrot + green asparagus + banana + farm produce for home consumption (5,590 households)

② Dairy cows (small-scale farmers using cottage industry processing facilities) + farm produce for home consumption (61,820 households)

d) Living improvement type

① Farm produce for home consumption (87,370 households)

(6) Management balance

The management balance for perennial crops is calculated on the basis of stable management. Despite the costs of grading, seeding, etc. in the first year of planting, perennial crops do not bring an income until the first harvest. For this reason, the cost of raising perennial crops (total production costs for each year until product sales exceed production costs) divided by useful life (determined for each crop) is defined as the orchard maturation cost, to be integrated with the production costs for stable years.

Prices obtained in interview research with ethnic Japanese vegetable farmers represent rent for vegetable cultivation land. As for other crops, 10% of gross income is defined as rent. No rent is recorded for secondary crops in the rotation system.

Capital interest represents loan interest on expenses related to irrigation, production input, and employment. 65% of such expenses will be covered by loans to facilitate farm management. Interest is calculated as 26%, which is the average annual interest of the financial institutions. Six-month loans will be used for farming purposes (see CUADRO A 7.2.3.2 for the management balance of respective crops).

(7) Target agricultural income

For the non-MERCOSUR export type, the target income will be set at over Gs 10 million, which is almost equivalent to the average annual income per household in the capital (about Gs 12 million). For those MERCOSUR export type farms primarily producing fruit, the target income will be set at over Gs 7 million, which is almost equivalent to the average annual income per household in urban areas (about Gs 8 million). As for farms that primarily produce other agricultural or livestock products, the target income will be set at over Gs 5 million, which is almost equivalent to the average amount per household requested by small-scale farmers (about Gs 5 million). The target income of domestic sales type farms will be over Gs 10 million for those primarily producing vegetables, and over Gs 5 million for those primarily producing other agricultural or livestock products. As far as lifestyle improvement type farms are concerned, the target income will be set at over Gs 4 million, which is almost equivalent to the average annual income per household in rural areas.

3) Principal farm practice methods

Table 7.2.3.1 shows the farm practice plan for respective types of farm practice. Concrete cases are discussed in 8.3.

(1) Non-MERCOSUR export type

Under-utilized land of large landowners, agricultural loans, and agricultural production materials will be provided by public agencies in order to form cooperative management bodies each consisting of 25 households (see 8.3.1 for details).

(2) MERCOSUR export type

Farms with special focus on fruit production will establish agricultural production organizations each consisting of approximately 20 households in order to concentrate production activities (see 8.3.4 for details). In farms that concentrate on honey bees, farming activities will be developed mainly in areas with abundant honey-source plants for smaller-scale farms (see 8.3.6 for details). Farms concentrating on cotton will develop a farm practice focusing on the prevention or improvement of soil degradation as well as picudo eradication (see 8.3.3 for details).

(3) Domestic sale type

Farms with a primary focus on vegetables will promote intensive cultivation by combining newly established irrigation facilities and employed labour (see 8.3.2 for details). In dairy cow farms, crop cultivation will be complemented by the improvement of grassland as well as the development of forage infrastructure, processing facilities, and distribution facilities, in order to promote combined agriculture and livestock farming (see 8.3.6 for details).

(4) Lifestyle improvement type

The current farming system will be continued, but attention will be paid to self-sufficiency and nutritional improvement of small-scale farmers as well as the national population as a whole.

Table 7.2.3.1 Farm practice plan

Non-MERCOSUR export type (12,500 households) (1/3)

Type of farm practice Area occupied	Soybean + (wheat) + farm produce for home consumption (6,900 households) 5-10 hectares (1,900 households), 10-20 hectares (5,200 households)
Example of farm practice type Scale of typical farm Labour	Soybean + (wheat) + farm produce for home consumption 10-20 hectares + 10 hectares Family members: 5.7 persons (labour force: 3.4), employed labour: 0 man-days
Calculation of labour	Soybeans: 20 hectares x 1.25 man-days/ha = 25.0 man-days Wheat: 20 hectares x 2.0 man-days/ha = 40.0 man-days Produce for home consumption: 2 hectares x 120.0 man-days/ha = 240.0 man-days
Agricultural income Non-agricultural income Farm household income	Gs17,760,000 = 39,570,000 – 21,810,000 Gs 1,000,000 Gs18,760,000 = 17,760,000 + 1,000,000
Agricultural machinery, etc.	Tractors, seed sowers, combines, trucks, boom nozzles, sterilizers, storage, farm appliances, etc.
Principal areas	Itapúa, Alto Paraná, San Pedro, Canindeyú, Amambay
Remarks	Wheat is a secondary crop. Leased land: 10 hectares. Cooperative covers about 250 hectares. Joint use of agricultural machinery, etc.

(2/3)

Rice + orange + silk thread + farm produce for home consumption (1,500 households) 10-20 hectares (1,500 households)
Rice + farm produce for home consumption 10-20 hectares + 20 hectares Family members: 5.7 persons (labour force: 3.4), employed labour: 0 man-days
Paddy rice: 20 hectares x 7.5 man-days/ha = 150.0 man-days Produce for home consumption, etc.: 2 hectares x 120.0 man-days/ha = 240.0 man-days
GS17,065,000 = 34,616,000 – 17,551,000 Gs 1,000,000 Gs18,065,000 = 17,065,000 + 1,000,000
Tractors, seed sowers, combines, trucks, dryers, water-diverting facilities, storage, farm appliances, etc.
Alto Paraná, San Pedro, Caaguazú, Caazapá, Misiones, Ñeembucú, Canindeyú
Leased land: 10 hectares. Cooperative covers about 200 hectares.

(3/3)

Type of farm practice Area occupied	Maize + (sunflower) + peanut + bitter orange + farm produce for home consumption (4,100 households) 5-10 hectares (1,300 households), 10-20 hectares (2,800 households)
Example of farm practice type Scale of typical farm Labour	Maize + (sunflower) + peanut + bitter orange + farm produce for home consumption 10-20 hectares Family members: 5.7 persons (labour force: 3.4), employed labour: 2.3 man-days
Calculation of labour	Maize: 2 hectares x 1.5 man-days/ha = 3.0 man-days (Sunflowers): 2 hectares x 2.0 man-days/ha = 4.0 man-days Bitter orange: 3.7 hectares x 73.75 man-days/ha x 272.9 man-days Produce for home consumption: 2 hectares x 120.0 man-days/ha = 240.0 man-days
Agricultural income Non-agricultural income Farm household income	Gs13,007,000 = 16,591,000 – 3,584,000 Gs 1,000,000 Gs14,007,000 = 13,007,000 + 1,000,000
Agricultural machinery, etc.	Tractors, seed sowers, combines, trucks, extraction facilities, farm appliances, etc.
Principal areas	Caaguazú, Concepción, Paraguarí, Caazapá, Guairá
Remarks	Sunflowers are a secondary crop. Agricultural machinery is leased. Labour is employed for harvesting maize and sunflowers.

MERCOSUR export type (79,720 households) (1/3)

Cotton + mangoe + damson + farm produce for home consumption (28,760 households) 5-10 hectares (15,490 households) 10-20 hectares (13,070 households)
Cotton + mango + banana + farm produce for home consumption 5-10 hectares Family members: 5.5 persons (labour force: 3.4), employed labour: 73.5 man-days
Cotton: 0.9 hectares x 62.0 man-days/ha = 55.8 man-days Mango: 1.5 hectares x 25.0 man-days/ha = 37.5 man-days Banana: 0.4 hectares x 39.5 man-days/ha = 15.8 man-days Produce for home consumption, etc.: 2 hectares x 120.0 man-days/ha = 240.0 man-days
Gs6,140,000 = 8,025,000 – 1,885,000 Gs1,200,000 Gs7,340,000 = 6,140,000 + 1,200,000
Tractors, speed sprayer, trucks, dryers, farm appliances, animal labour, etc.
Caaguazú, Alto Paraná, Itapúa, San Pedro, Concepción, Caazapá, etc.
20 household cooperatives and production centres for mangos. Bananas are a non-commercial crop.

(2/3) (3/3)

Type of farm practice	Cotton + grape + macadamia nut + dairy cow + farm produce for home consumption (39,350 households)0-1 hectare (3,070 households), 1-5 hectares (11,550 households	Honey bees + farm produce for home consumption (11,610 households)
Area occupied	5-10 hectares (9,720 households), 10-20 hectares (15,210 households)	0-1 hectare (2,810 households), 1-5 hectares (8,800 households)
	Cotton + grape + macadamia nut + farm produce for home consumption 10-20 hectares Family members: 5.7 persons (labour force: 3.4), employed labour: 110.8 man-days	Honey bees + cotton + maize + poroto + bananas + farm produce for home consumption 1-5 hectares Family members: 5.0 persons (labour force: 2.5), employed labour: 76.9 man-days
Calculation of labour	Cotton: 0.7 hectares x 62 man-days/ha = 43.4 man-days Grape: 1.6 hectares x 67 man-days/ha = 107.2 man-days Macadamia nut: 0.5 hectares x 26 man-days/ha = 13.0 man-days Produce for home consumption: 2 hectares x 120.0 man-days/ha = 240.0 man-days	Honey bees: 10 colonies x 6.3 man-days/colony = 63.0 man-days Cotton: 1.5 hectares x 62 man-days/ha = 93.0 man-days Maize: 0.7 hectares x 22 man-days/ha = 15.4 man-days Poroto: 0.4 hectares x 26 man-days/ha = 10.4 man-days Banana: 0.1 hectares x 39.5 man-days/ha = 4.0 man-days Produce for home consumption: 2 hectares x 120.0 man-days/ha = 240.0 man-days
Agricultural income Non-agricultural income Farm household income	Gs6,962,000 = 10,819,000 – 3,857,000 Gs1,000,000 Gs7,962,000 = 6,962,000 + 1,000,000	Gs3,226,000 = 6,311,000 – 3,085,000 Gs1,500,000 Gs4,726,000 = 3,226,000 + 1,500,000
Agricultural machinery, etc.	Tractors, speed sprayer, trucks, farm appliances, etc.	Farm appliances, animal labour, etc.
Principal areas	Caaguazú, Alto Paraná, Itapúa, San Pedro, Cordillera, etc.	Caaguazú, Alto Paraná, Itapúa, San Pedro, Concepción, Caazapá, Ñeembucú, etc.
Remarks	20 household cooperatives and production centres for fruit. Grapes are produced on trellises.	Products other than honey bees are non-commercial crops.

Domestic sale type (67,410 households) (1/2) (2/2)

Type of farm practice	Tomato + strawberry + melon + carrot + green asparagus + bananas + farm produce for home consumption (5,590 households)	Dairy cow + farm produce for home consumption (61,820 households)
Area occupied	1-5 hectares (1,280 households), 5-10 hectares (2,970 households) 10-20 hectares (1,340 households)	0-1 hectare (7,190 households), 1-5 hectares (21,480 households) 5-10 hectares (18,030 households) 10-20 hectares (15,120 households)
Example of farm practice type Scale of typical farms Labour	Tomato + melon + carrot + green asparagus + farm produce for home consumption 5-10 hectares Family members: 5.5 persons (labour force: 3.4), employed labour: 56.1 man-days	Dairy cow + farm produce for home consumption 10-20 hectares Family members: 5.7 persons (labour force: 3.4), employed labour: 50.4 man-days
Calculation of labour	Tomato: 0.1 hectares x 511.5 man-days/ha = 51.2 man-days Melon: 0.1 hectares x 41.5 man-days/ha = 4.2 man-days Carrot: 0.1 hectares x 85.0 man-days/ha = 8.5 man-days Green asparagus: 0.2 hectares x 90.0 man-days/ha = 45 man-days Produce for home consumption: 2 hectares x 120.0 man-days/ha = 240.0 man-days	Cotton: 1.0 hectares x 66.0 man-days/ha = 66.0 man-days Dairy cows: 7 head x 13.3 man-days/ha = 93.1 man-days Carrot: 0.1 hectares x 73.0 man-days/ha = 7.3 man-days Produce for home consumption: 2 hectares x 120.0 man-days/ha = 240.0 man-days
Agricultural income Non-agricultural income Farm household income	Gs 9,408,000 = 12,562,000 – 3,154,000 Gs 1,200,000 Gs10,608,000 = 9,408,000 + 1,200,000	Gs4,884,000 = 7,976,000 – 3,092,000 Gs1,000,000 Gs5,884,000 = 4,884,000 + 1,000,000
Agricultural machinery, etc.	Tractors, seed sowers, sprinkling pumps, trucks, nursery, sterilizers, farm appliances, animal labour, etc.	Tractors, trucks, nursery, sterilizers, animal improvement facilities, farm appliances, animal labour, etc.
Principal areas	Caaguazú, San Pedro, Itapúa, Paraguarí, Cordillera, etc.	Caaguazú, San Pedro, Itapúa, Paraguarí, Central, Ñeembucú, etc.
Remarks		Combined farming (primary focus on dairy farming).

Note: The lifestyle improvement type is omitted because no change in technology is envisaged.

7.2.4 Farm produce distribution project

1) Basic concept

In view of current problems with the distribution of individual crops in producing and consuming areas, improvement measures will be taken for each stage of distribution ranging from production to consumption (export) according to the level of socio-economic development. Therefore, the farm produce distribution project will be prepared based on the following guidelines.

(1) The primary objective will be the realization of organized distribution.

(2) A distribution improvement plan will be prepared according to the level of development.

(3) The development of laws and regulations related to distribution will be promoted progressively as well as the improvement of distribution management organs.

(4) Related facilities will be developed to create a distribution network linking consumers with producers.

2) Distribution improvement plan

(1) Production areas

① Due to topographical conditions, agricultural production activities are concentrated in certain periods. In the between-crop season, the agricultural market in Paraguay is dominated by imports as far as domestically consumed products are concerned. In order to correct this situation, maximum improvement of production technology, increased production, and improved quality will be required in order to hold imports in check.

② Farm households producing farm products for export or domestic consumption will be actively organized into production and distribution organizations (such as cooperatives). National and international information on production and markets will be communicated to farmers through such organizations. Production plans are to be prepared by the farmers themselves under the guidance of cooperatives, but efforts will be made to create a major production area. A credit system will be developed for the procurement of seeds and production materials.

Farmers who want to diversify non-commercial produce will expand their production of cash crops on farmland not used for cultivating non-commercial crops, in order to increase cash income. Borrowing of seeds and agricultural materiel from middle men will be minimized to facilitate the independence of farm management.

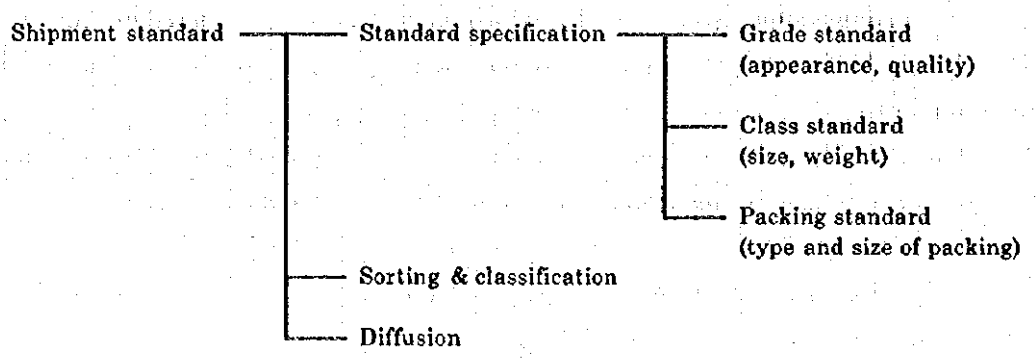
(2) Collection, shipment, transportation, and storage

① The organization of collection and shipment as well as joint sales will be

promoted as much as possible, since this will lead to sales of produce on better terms.

② Domestic products are cheaper than imports partly because they are inferior in packing. International competitiveness will be ensured by introducing shipment standard to improve shipping prices (see Figure 7.2.4.1).

Figure 7.2.4.1 Components of standards & criteria



③ Collection and shipment stations will be established.

④ In order to maintain the freshness of agricultural produce, storage facilities will be established within the framework of the long-term plan.

(3) Consumption areas

The recent expansion of supermarkets requires fruit and vegetables to be sorted according to standards and criteria, thus inducing changes in the distribution system. The standardization of domestic agricultural produce will help improve the competitiveness of national products in the domestic market (against standardized imports) as well as in the international market. Since the level of farmers' production techniques reflects market needs for produce, standardization of shipped produce will also contribute to an improvement of farmers' production techniques.

Shipping cooperatives, distributing cooperatives, etc., will be developed to promote standardization of farm produce as well as to complement market economy activities. For the purpose of promoting the consumption of standardized produce, guidance will be provided so that sorted fruit and vegetables may be put on retail sale channels.

3) Distribution improvement plan according to stage of development

(1) Short-term plan (up to 2002)

MERCOSUR permits Paraguay for the time being to exercise high tariffs on imports from other member countries. Meanwhile, the following measures will be implemented to adjust to the upcoming full liberalization of the MERCOSUR

economy.

① Organization of producers

② Organization of collection and shipment

③ Establishment of producing area distribution centres

④ Expansion and development of consumption area distribution centres

⑤ Consolidation of the Market Information Service for Agricultural Producers (Servicio de Informacion de Mercado al Productores; SIMA).

⑥ Dispatch of agricultural research missions to Brazil and Argentina on a regular basis.

⑦ Establishment and implementation of "shipment standards".

(2) Medium-term plan (2003-2007)

① Continuation, consolidation, and completion of ①-⑥ above.

② Development of producing area distribution centres.

③ Collection and provision by SIMA of information on production and consumption in MERCOSUR countries.

④ Formation of major producing areas.

(3) Long-term plan (2008-2017)

Completion of measures included in the short-term and medium-term plans.

4) Establishment of information system and market development

The promotion of fruit and vegetable production will only succeed when markets are secured for the products. The collection and analysis of information on domestic and overseas markets as well as production trends in Brazil and Argentina are essential in preparing a strategy for fruit and vegetable production.

(1) Information system

① The information activities of SIMA will be expanded under the auspices of the Agricultural Distribution Economy Department of the Ministry of Agriculture and Livestock.

② In addition to the domestic market, information on the Brazilian and Argentine markets will be collected for distribution.

③ Information on domestic and overseas markets thus collected will be quickly provided for organized production and shipment bodies in the country.

(2) Market development activities

① SIMA will conduct research on production and consumption in Brazil and Argentina on a periodic basis. The results of its analysis will be provided for production and shipment bodies as SIMA information.

② Research missions consisting of interested parties will be dispatched on a periodic basis to Brazil and Argentina to collect information on subjects ranging from production sites to consumer market.

③ The possibility of cultivation on contract will be pursued with Argentina, where

the production seasons differ from those of Paraguay.

5) Distribution facilities development plan

(1) Collection and distribution facilities

① As regards fruits and vegetables, the plan envisages the construction of collective sorting and packing facilities in producing areas as well as collective precooling and fixed-temperature facilities. The expansion and development of low-temperature storage and climacteric rise facilities in wholesale markets will also be promoted. For livestock produce, cooler stations (equipped with bulk coolers) will be constructed, and milk lorries will be introduced to transport fresh milk after cooling.

② The plan envisages 20 sorting and packing facilities for fruit and vegetables, 16 sorting and packing facilities for mangoes, and 11 low-temperature storage and climacteric rise facilities.

③ Cooler stations for fresh milk will be constructed in about 140 locations in 13 departments (excluding Central Department). 17 milk lorries will be introduced for fresh milk transportation.

④ Decision on storage facilities will be made by cooperatives and industrial distributors. Details of the collection and shipment plan are shown in CUADRO A 7.2.4.1.

Table 7.2.4.1 presents farm produce distribution facility plans for respective departments.

(2) Direct cost of the project

Gs 31,983 million (see CUADRO A 7.2.4.2-9 for details).

Table 7.2.4.1 Farm produce distribution facilities plan

unit: number of sites

Department	Sorting and packing of mango	Sorting and packing of fruits and vegetables	Fruit and vegetable wholesale markets	Fresh milk collection facilities	
				Cooler stations	Tank lorries
Concepción	1	1	1	8	1
San Pedro	3	3	1	16	2
Cordillera	1	2	1	14	2
Guairá	1	1	1	8	1
Caaguazú	3	3	1	8	1
Caazapá	1	1	1	10	1
Itapúa	2	2		20	2
Misiones	1	1	1	7	1
Paraguarí	1	1	1	18	2
Alto Paraná	1	1		11	1
Central	0	1		0	0
Ñeembucú	0	1	1	10	1
Amambay	1	1	1	2	1
Canindeyú	0	1	1	7	1
Total	16	20	11	139	17

Source: Project MAG/JICA, 1996.

(3) Benefits

① Increased sales prices will improve farm household incomes.

② Employment opportunities will be created in rural areas.

③ Export products will be diversified.

④ The commercialization ratio will rise.

⑤ The development of facilities will increase production.

6) Project for consolidation of plant quarantine and pesticide residue analysis systems

(1) Sites (see GRAFICO A 4.4.1.1)

a) A new plant quarantine and pesticide residue analysis laboratory will be established on the premises of the National Institute of Agriculture (Instituto Agronomico Nacional: IAN).

b) The following eight local plant quarantine offices will be strengthened, as they are located at strategic points for distribution.

Aeropuerto Internacional Silvio Petirossi
Puerto Falcón
Puente Remanso
Regional P.J. Caballero
Regional Ciudad del Este
Regional Encarnación
Aeropuerto International Guaraní
Pilar

(2) Details of the project

a) Implementing body: Plant Protection Department, Ministry of Agriculture and Livestock

b) Outline of the project

① Project for the establishment of a new plant quarantine and pesticide residue analysis laboratory: equipment required for the identification of harmful animals and plants as well as the analysis of pesticide residues will be introduced, and a new administration building will be constructed to accommodate the equipment. Glass and wire rooms will be installed for the isolated cultivation of virus-affected plants, etc. The laboratory will execute difficult tasks such as the identification of harmful diseases and pests as well as the analysis of pesticide residue. In addition, it will conduct training within the country in response to nationwide problems related to plant quarantine and pesticide residue (see GRAFICO A 7.6.2.9-10).

② Reinforcement of local quarantine offices: administration buildings will be constructed with equipment for the identification of harmful animals and plants. At six local offices (excluding the airport), mobility will be strengthened to monitor and control cross-border traffic in harmful animals and plants.

(3) Direct cost of the project

Gs 2,962 million (see CUADRO A 7.2.4.1 and A 7.2.4.10-12).

(4) Benefits

Proper execution of plant quarantine and pesticide residue testing functions will ensure the quality of farm produce and facilitate distribution. The quality of agricultural produce will be guaranteed and distribution will be made smoother.

7.2.5 Farm produce processing project

1) Basic concept

Processing facilities for export crops such as soybeans, wheat, cotton, maize, and meat are fairly well developed in Paraguay, thanks partly to foreign investment. Excess capacity exists for cotton facilities due to a decline in production. Therefore, industrial farm produce processors that can ensure high-quality processing will be the primary protagonists in processing most export crops. Part of the expected increment in milk production will also be handled by industrial factories. When unfit for raw consumption, macadamia nut, honey, fruit, and vegetables will be treated by processing cooperatives etc. formed from small-scale farmers. Bitter oranges, fresh milk, etc. will be processed in cottage industry facilities.

In view of the "one village, one product" movement promoted in Japan, the project will also consider cottage industry-type processing, utilizing surplus labour and female labour in rural areas.

This is a movement that will promote the stimulation of municipalities through localized industry taking advantage of the special characteristics of the region.

Due to the backwardness of research and technological development on food processing, the project envisages the establishment of a food processing research institute to conduct basic research on technical assistance.

2) Farm produce processing

Macadamia nuts will be collectively shelled by producers. Three primary processing plants will be established. For the purpose of promoting the "one village, one product" movement, collective processing facilities are planned in 120 locations, which will process oranges (strawberry, satsuma, papaya, mango, and guava can also be processed) produced by small-scale farmers into jam, marmalade, etc. In addition, cottage industry-type facilities for extracting essence from bitter oranges are planned in about 4,100 locations. As part of the picudo eradication effort, the equipment of one ginning plant will be upgraded to increase cotton seed production. Rice polishing mills will be basically operated by industrial processors. Rice mills planned in the project for the development of model rural areas for paddy field development in Zone 6 will be incorporated in this project. Details of the processing plan are shown in CUADRO A 7.2.5.1. The raw material loss rate in the processing facilities is forecast 5%. Table 7.2.5.1 presents plans for establishing farm produce processing facilities in respective departments.

3) Livestock product processing

Of the 420,000 tons of fresh milk to be produced by small-scale farmers, 30% (100,000 tons) will be processed by industrial processors. As for cottage industry-type facilities processing cheese, yoghurt, etc., processing facilities will be provided for 850 households owning 10 or more head of cattle, as part of farmer support.

Honey will be bottled and shipped by cooperative facilities organized by 11,600 producing households. 150 processing plants are planned in the project, corresponding to about 1.3% of producing farmers. CUADRO A 7.2.5.2 shows details of the livestock product processing plan. The raw material loss rate in the processing facilities is forecast at 5%.

Plans for the establishment of livestock product processing facilities in respective departments are presented in Table 7.2.5.1.

Table 7.2.5.1 Farm produce processing plan

Department	Macadamia-nut processing plants	Collective jam and marmalade processing plants	Cottage industry-type bitter orange processing plants	Rice polishing mills	Fresh milk processing		Collective honey processing plants
					Cottage industry-type plants	Industrial processing (tons)	
Concepción		6	800		53	6,000	5
San Pedro		16	0		74	12,000	15
Cordillera		12	0		43	10,000	12
Guairá		12	100		59	6,000	9
Caaguazú	1	19	2,000		73	6,000	15
Caázapá		11	300		44	7,000	7
Itapúa	1	13	0		103	14,000	23
Misiones		3	0	1	62	5,000	12
Paraguarí		13	0		85	13,000	20
Alto Paraná	1	5	900		40	8,000	8
Central		5	0		40	0	5
Ñeembucú		1	0	1	97	7,000	13
Amambay		1	0		36	1,500	3
Canindeyú		3	0		51	5,000	3
Total	3	120	4,100	2	850	100,500	150

Source: Project MAG/JICA, 1996.

4) Food Processing Research Centre

No major food processing companies are operating in Paraguay and food processing technology is not readily accessible. As a result, the food processing industry is underdeveloped in the country, mainly concentrating activities on low-value added products. In order to support medium and small industries, a Food Processing Research Centre will be established as shown in Figure 7.2.5.1. The site for the institute is to be located at Cnel. Oviedo in Caaguazú Department, located in the central part of the Study Area. A corporation will be organized for this purpose with joint ownership between the Regional Offices of the Ministry of Industry and Commerce (ORMIC) and private companies. The primary objectives of the Research Centre include research on farm produce processing and related storage technology, research on seasoned food processing and related storage technology, research on food processing engineering technology, and the application of biotechnology to food processing. Measures will be taken so that technology obtained from basic research may be diffused. The centre will also conduct research on contract with private entities.

(5) Direct cost of the project

Gs 77,092 million (see CUADRO A 7.2.2.13, A 7.2.4.1, A 7.2.4.8 and A 7.2.5.3-8 for details).

(6) Benefits

① Farm produce processing will increase added value.

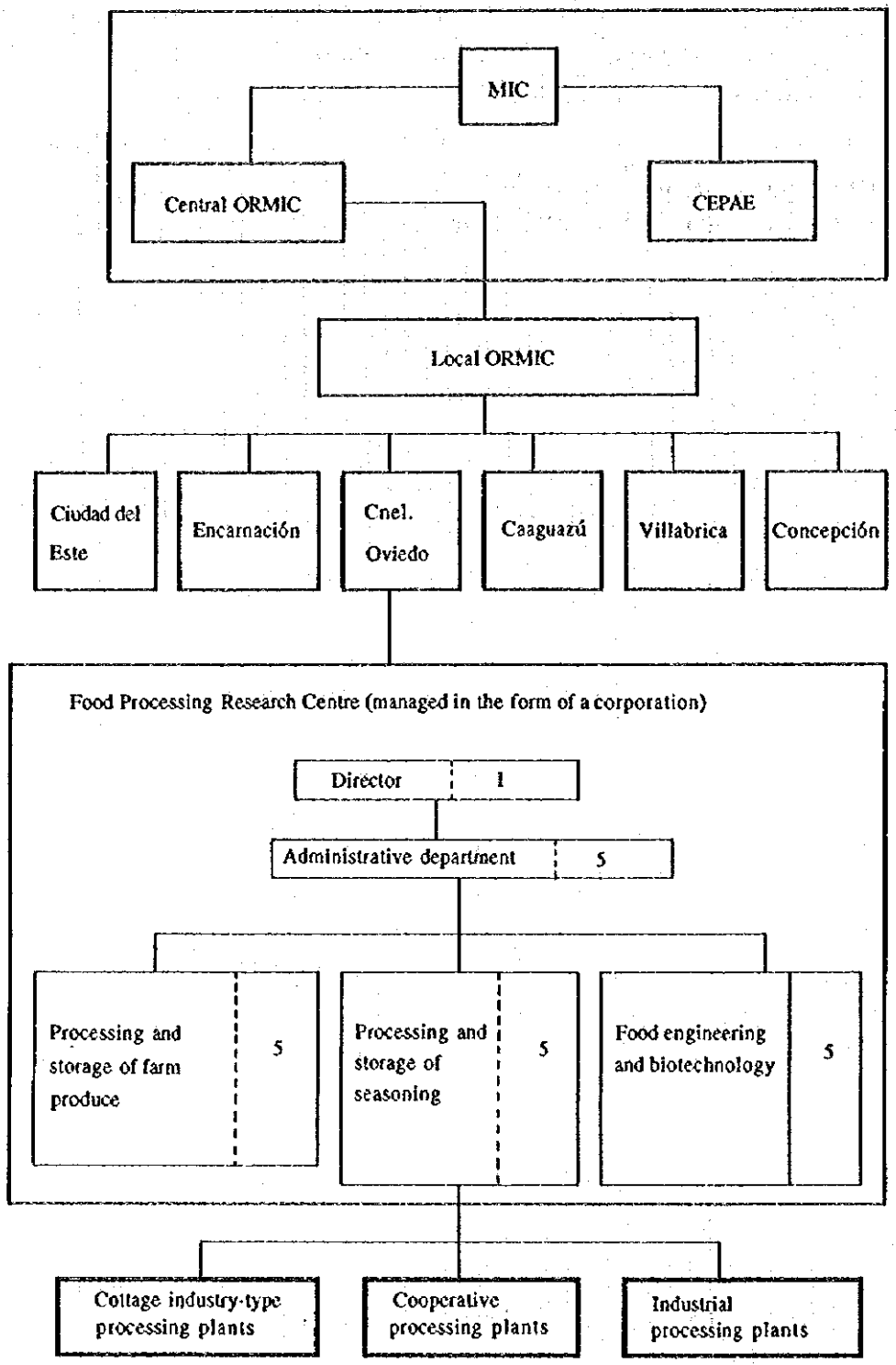
② If commercialization is possible, non-commercialized farm products which have been wasted in the past will become marketable..

③ New employment opportunities will be created in rural areas.

④ Collective processing and cottage industry-type processing will lead to an improvement in farm household income.

⑤ Food processing research will help increase export items.

Figure 7.2.5.1 Organizational system of the Food Processing Research Centre



7.2.6 Farmer support project

1) Basic concept

The basic rationale of the farmer support programme for promoting regional agriculture is as follows.

① Research on agricultural technology development will develop farm produce fit for local production to provide technical assistance on activities ranging from production to sales.

② Existing farmers' organizations will be consolidated. In areas where such organizations have not been organized, the establishment of new organizations or participation in existing ones will be encouraged.

③ Education of farmers will equip farmers with the ability to correctly understand and solve various problems concerning their organizations and agricultural production activities as well as their own subsistence.

④ Agricultural credit will be extended by CAH and others. Farmers to be covered by the project total 28,600 households (2,600 organizations) organized as farmers approved by MAG, farmers' schools, and other model farm households. Agricultural credit will extend finance to farmers designated by the Ministry of Agriculture and Livestock, farmers' schools, and other farmers, with the premise of organizing farmers.

2) Farmer support project

(1) Research on agricultural technology development

Agricultural research will be closely related to local communities. Agricultural research institutes will offer consultancy for farmers to identify problems at the local level and conduct research to solve them. They will also train superior researchers to ensure that technological development will meet the needs of local farmers. The plan includes the following elements:

① "food processing research" for technological development on processing and preserving farm produce (see 7.2.5);

② "basic research on mulberry and silkworm varieties" to promote community-based sericulture (see 7.2.2); and

③ "research for medicinal herb cultivation" to protect rare plant species (see ANEXO 7.2.6.1 for details).

In order to provide technical guidance for local farmers, a cultivation technology guidance manual will be distributed for locally cultivated crops. The structure of the local liaison council is presented in GRAFICO A 7.2.6.1.

a) Direct cost of the project

Gs 2,979 million (see CUADRO A 7.2.6.1 for details).

b) Benefits

By releasing the results of research to local farmers it will be possible to promote technical development that is closely suited to the region.

(2) Fostering and reinforcing farmers' organizations

a) Organization of farmers

Small-scale farmers are traditionally self-centred, and this tends to impede their organization in terms of technical diffusion, purchasing activities, and mutual aid. Therefore, farmers will be organized into cooperatives and committees by INCOOP in cooperation with the Department of Agricultural Extension (Direccion de Extension Agricola: DEAG) of the Ministry of Agriculture and Livestock, CAH, and others. The measures are as follows.

① In order to facilitate the organization of farmers, INCOOP will make efforts to expand membership of existing cooperatives through the production and sale of farm produce. The establishment of new cooperatives will also be encouraged.

② Farming households will be organized around the nucleus of farmers approved by the MAG and model small-scale farms designated by farmers' schools. Such measures will lead to the solution of problems facing small-scale farmers (early leaving of compulsory education, underdeveloped technology for agricultural production, lack of means and channels for sales, poverty, etc.). The facilities presented in Table 7.2.6.1 will be established as leading facilities for promoting the organization of farmers. In operating these facilities, the Organization Promotion Office of INCOOP, in cooperation and consultation with related organs and the local liaison council, will prepare measures to be implemented for the organization of farmers and the enhancement of organizations.

b) Method of promoting organization

① Guidance and education will be provided for farmers' schools and committees organized locally to enhance organization and encourage participation in cooperatives.

② Local cooperatives will serve to enhance organizations by providing guidance on establishing cooperative systems among farmers and developing human resources.

③ Cooperation will be ensured between agricultural authorities and cooperatives in each department in order to promote local agriculture.

④ Joint efforts between public and private entities will promote the enhancement of organization through leadership education in 13 training centres and adult education of farmers in 26 training centres (see Table 7.2.6.1, GRAFICO A 7.2.6.2-3).

⑤ Self-help by farmers will be encouraged as much as possible to secure the autonomy of local communities.

⑥ Individual crop subcommittees will be created in local cooperatives in order to

exchange local information and develop technology for crop diversification. Training for this purpose will be conducted by training centres.

The details of organizational enhancement efforts are presented in GRAFICO A 7.2.6.4.

Table 7.2.6.1 System of guidance for organization of farmers and organizational enhancement

Facilities utilized	Departmental facilities (13 departments excluding Central)	Local facilities (13 departments excluding Central)
	Training centres (including farmer organization centres) (13 locations)	Research centres (including information centres) (26 locations)
Managing body, scale of facilities	Department (508 m²) 100m²	INCOOP (248 m²) 60 m²
Operating body	Organization Promotion Office, INCOOP	INCOOP, local cooperatives
Purpose of use, function of facilities	Organization of farmers, organizational enhancement Consultancy for farmers Installation of equipment for guidance activities	Information on agriculture (technology, production, and sales) Lifestyle information (lifestyle improvement, etc.) Installation of information equipment
Details of guidance	Promotion of organization and guidance projects	Organization, information to farmers
Cooperating agencies	INCOOP, DEAG, CAH, farmers' schools, local leaders, local administration agencies, local liaison council	INCOOP, DEAG, CAH, financial institutions, local leaders, farmers' schools, local administration agencies, local liaison council

c) Direct cost of the project

Gs 9,887 million (see CUADRO A 7.2.6.1 for details).

d) Benefits

① The conditions for production and sales of farm produce will be improved through organization.

② Training and lessons on agricultural technology in groups will help improve the ability of farmers.

③ Programme proposals and cost burdens will be simpler.

(3) Farmer education

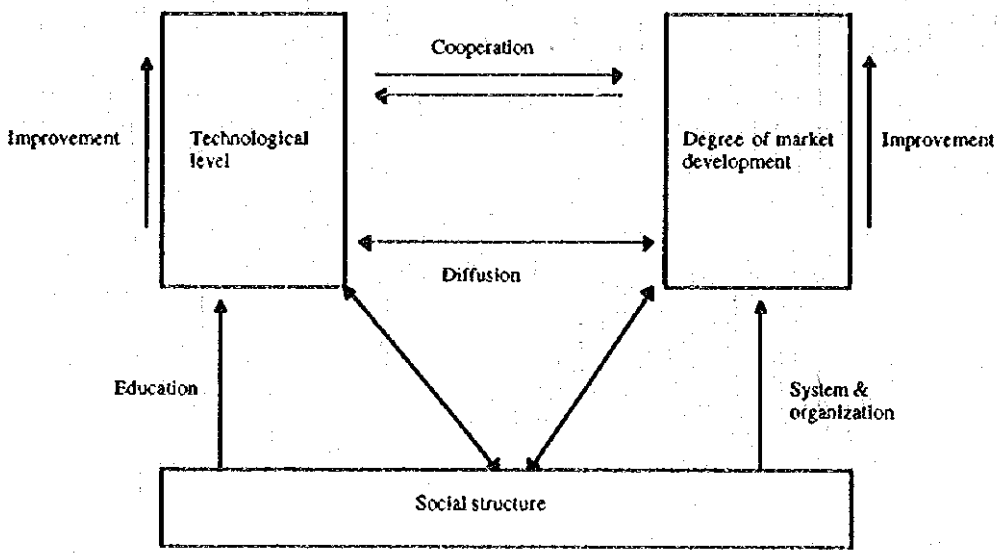
a) Diffusion of agricultural technology

In developing agricultural technology, a sufficient balance will be kept between technological standards and the development level of the market. However, this relationship will be limited to cases that have basic knowledge and ability to digest and absorb the technology provided for farmers. But only 13% of households have ever received guidance on agricultural technology, and the majority have yet to be targeted by diffusion activities. Therefore, technology transfer to small-scale farmers can only be achieved in the long term through the comprehensive provision of basic education.

In order to improve adaptability on the market side, the government as well as trade and industrial organizations will adopt active development measures concerning market organization and systems. The diffusion of agricultural production technology will never succeed unless farmers are educated on production technology and a market economy is developed in order to ensure a smooth relationship between producers and the market.

Figure 7.2.6.1 illustrates education and diffusion on the integration of production and sales of agricultural produce.

Figure 7.2.6.1 Economic growth and the diffusion of technology



b) Farmer education

Most small-scale farmers, dispersed over a wide area, live in self-sufficiency without any communication or exchanges of information among themselves. Under the current market economy, however, even small-scale farmers require a stable self-supply of farm produce for home consumption as well as increased production of cash crops. Although the hunting culture of the Guaranís teaches them how to cull farm produce, they do not know how to create it. In view of this situation, local farmers will be enabled to live under a market economy through long-term, extensive basic education.

Taking these facts into consideration, farmer education will be provided in the following manner.

① For the sake of efficiency, the education of small-scale farmers will be provided in farmers' organization.s

② The education of individual farmers will include leadership training and diffusion to farmers' organizations.

③ The national government, cooperatives, and diffusion agencies are to be the major protagonists in providing farmer education. The training of local leaders will be closely related to existing systems run by the government, including farmers' schools.

c) Details of the plan

(a) Short-term education

① Leader education (local cooperatives, DEAG, local leaders including farmers' schools) consists of education for the organization of farmers, agricultural technology for organizational enhancement, farm management, joint operation, and development of a spirit of mutual assistance and others in order to help improve the ability of organized farmers.

② Organized farmers will be provided with awareness-raising education, including basic education.

③ The education of local farmers will be provided through experience and audio-visual equipment in forms such as practice and training on agricultural technology, in order to encourage participation in production activities. Participation in farmers' organizations will also be encouraged.

(b) Long-term education

① Adult education to improve the ability of farmers and education on lifestyle improvement (including health and sanitation) are the primary components of long-term education.

② Highly specialized education including agricultural technology, management, and socio-economic activities to meet local needs will be provided for leaders.

③ Education will be given in adapting to sophisticated agricultural technology for production and sales accompanying crop diversification.

The system of farmer education and the facilities to be used are presented in Figure 7.2.6.2.

(c) Studies on educational systems

In the busy seasons (sowing and harvesting), small-scale farmers depend on school-age child labour for agricultural production. Therefore, the educational system will be changed so that holidays may be granted in harvesting and other seasons. Systems will be studied.

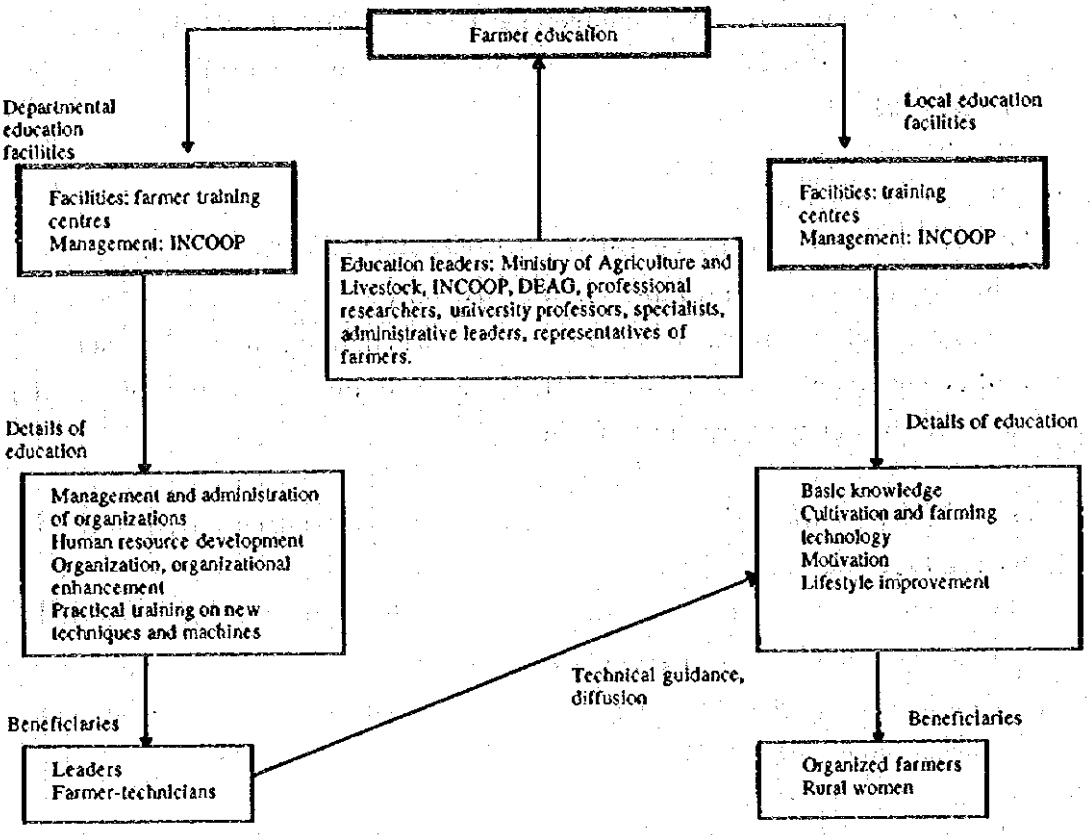
d) Direct cost of the project

Gs 15,803 million (see CUADRO 7.2.6.1 for details).

e) Benefits

Farmer education will heighten a spirit of mutual aid among farmers by revitalizing agricultural production activities. It will also contribute to the promotion of measures for agricultural development.

Figure 7.2.6.2 The system of education for farmers and the facilities used



(4) Agricultural credit

The Agricultural Sector Reinforcement Project (PG-P8), financed by a loan extended by the Japanese government, was completed in August 1996. The two-step loan, which accounted for about 61.7% of PG-P8, was extended by the National Development Bank (Banco Nacional de Fomento: BNF) to cooperatives and farming households all over the country, and these are now making regular repayments. The amount thus repaid enters the OECF special account in BNF to be used for repayments to OECF and the administrative expenses of BNF, as well as middle- to long-term finance in the form of a revolving fund. Through an agreement with OECF, the revolving fund, which can meet the needs of about 40,000 farming households, has been in operation since September 1995 (a year ahead of schedule) and is highly evaluated. However, the fund has not satisfied the huge financial need.

The agricultural credit plan will expand the scheme of 100 model "farmers' schools" (finca escuela: "school" is synonymous with "household") implemented by IDB through DINCAP. The plan covers the 2,250 small-scale farming households to be supported, as shown in Figure 7.2.6.3-4 (of the 2,600 households, 100 are covered by IDB, and 260 are model small-scale farmers for farmland conservation, to be discussed later).

Some of the individual projects presented in this chapter are suited to loans, and the following is an example of model agricultural credit in terms of indirect support for small-scale farmers' self-help efforts related to the most urgent and important of these projects.

(1) Details of the plan

a) Establishment of farmers' schools

For 1,500 of the 1,600 farmers' schools selected and supported by DINCAP ("schools" being synonymous with small-scale farmers), superior seeds will be purchased, working animals (two cows) and dairy cows will be introduced, and technological support will be provided. As leaders, these farmers' schools will provide opportunities for neighbouring farmers participating in newly established farmers' organizations (committees: organization of farmers to be implemented by FDC, as discussed later) to gain experience and acquire technology. Such organizations will be provided with agricultural credit. This type of support will further expand the number of beneficiaries through effective use of revolving funds, leading to reinforcement of small-scale farmers (see Figure 7.2.6.5).

b) Model case of agricultural credit

The amounts and costs presented in the model case below are incorporated in individual projects presented in this chapter. The implementation system is based on the project implementation system described in Chapter 9. In addition, measures will be taken to make DINCAP responsible for elements of a highly public character which will be integrated with agricultural credit to improve effectiveness (farmers' schools, improvement of farm roads, drinking water, plant quarantine, analysis of pesticide residue, the Food Processing Research Centre, and so on).

(a) CAH (support for small-scale farmers through farmers' organizations and users' organizations)

- Picudo eradication
- Crop diversification
- Promotion of apiculture
- Promotion of sericulture
- Farmland conservation (contour farming, green manure cultivation, non-tillage cultivation)
- Processing and distribution of farm produce (collection and shipment centres, macadamia nut, bitter orange, jam, marmalade, milk processing, milk collection, public markets)

(b) FDC (to upgrade model farmers and the farmers' organizations based on them to IFI level and to provide information to their members as well as to existing cooperatives)

- Organization of farmers (registration of new farmers' organizations, guidance on accounting and management for newly established organizations, agricultural credit and technical support)
- Information centres (wireless equipment, audio-visual teaching materials)

CAH and FDC, both under the control of the Ministry of Agriculture and Livestock, will be in charge of this agricultural credit model. Special deregulation measures will be taken so that both agencies may open separate special accounts to provide indirect support for self-help efforts by small-scale farmers, by extending limits on long-term, low-interest loans.

(2) Direct cost of the project

Gs 83,153 million (see CUADRO A 7.2.6.1-2 for details).

(3) Benefits

If the advanced agriculture promoted by farmers' schools and farmers' organizations based on them, and the farm roads and drinking water developed by DINCAP are given priority in implementation according to arrangements with MOPC, etc., this will facilitate the integrated development of agriculture and rural areas. If similar effects extend to peripheral zones, integrated development will be made possible in the whole Study Area. Paraguayan officials express great expectations for this agricultural credit scheme, saying "This example of model agricultural credit could pave the way to such integrated development".

Other cases of agricultural credit include an expansion of the agricultural aspects of PG-P8 implemented by BNF, which has accumulated experience in agricultural finance through that project. New elements to be added to PG-P8 include livestock for nutritional improvement and farm produce processing to increase added value within the framework of MERCOSUR. Beneficiaries include about 6,000 small-scale farming households with land certificates.

20% (49,600 households) of small-scale farmers are expected to benefit directly from this type of agricultural credit (including those who have already received credit from BNF). Utilization of revolving funds from these loans would expand the beneficiaries to over 50% of small-scale farmers. This would contribute to improving the incomes and lifestyles of small-scale farmers, eventually increasing their competitiveness on MERCOSUR markets.

Figure 7.2.6.3 The process of supporting small-scale farmers based on model small-scale farms

1. Small-scale farmers to be supported: creation of model small-scale farmers (core farmers)

(1) Farmers approved by MAG

(2) Farmers' schools

(3) Other model farmers (ethnic German, Japanese immigrant farms and other advanced farmers)

2. Organization of farmers and organizational enhancement

(1) Creation of farmers' organizations (e.g. committees and agricultural cooperatives) revolving around the core model farms

(2) Operational enhancement of existing committees and cooperatives

3. Extension of agricultural credit and technical support – indirect support (foreign loans envisaged)

(1) Support for model small-scale farmers

(2) Support for farmers' organizations (including WID)

(3) Expansion of beneficiaries through farmers' organizations and utilization of revolving funds via such organizations – progressive support for farmers covered

(Flow chart)

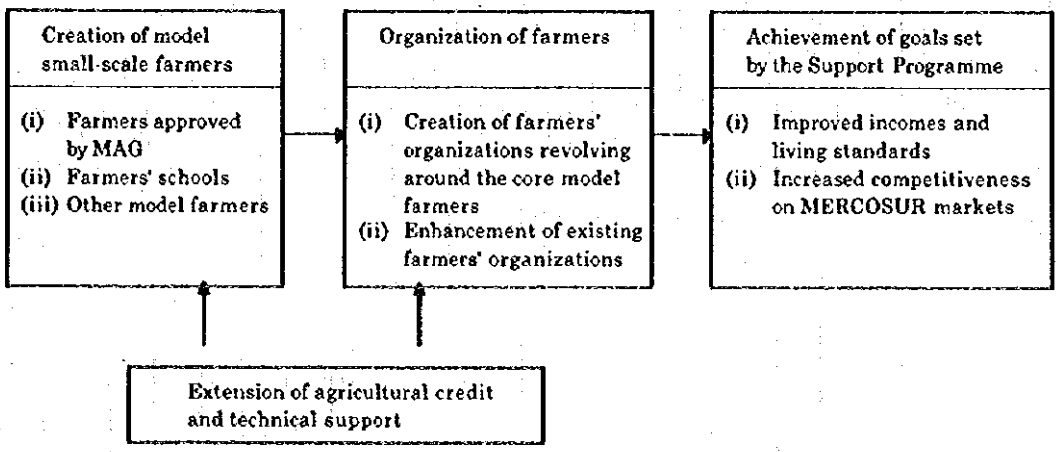
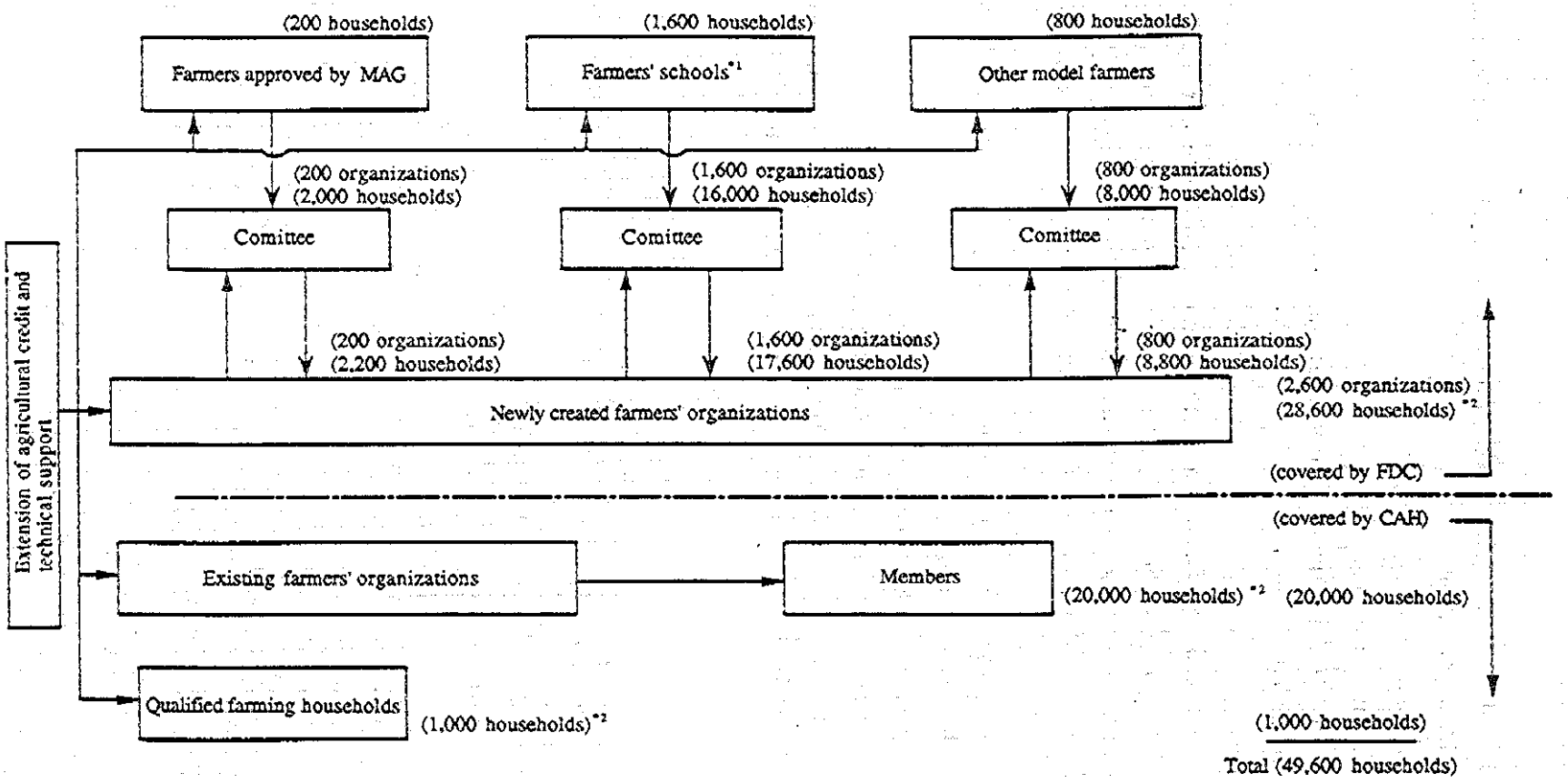


Figure 7.2.6.4 Flowchart of agricultural credit loans

(⟶ organization, ⟶ agricultural credit)



Notes:

1. 100 of the 1,600 households will be covered by DINCAP via funding from IDB. DINCAP will also be responsible for selecting and supporting farmers' schools.
2. By utilizing revolving funds, agricultural credit will be extended to about 250,000 small-scale farmers. useholds.

7.3 Agricultural and rural infrastructure improvement projects

Reclaiming farmland, constructing irrigation facilities and roads, and improving the living environment of farmers (drinking water, electricity, etc.) will not be possible without technical and budgetary support from national, departmental, and district governments. Related legislature will have to be prepared in order to implement agricultural and rural infrastructure improvement correctly and smoothly.

As a way of revitalizing the agricultural activities of small-scale farmers, the utilization of abundant electric energy should also be considered. For example, low-priced energy could be supplied for specific agricultural purposes such as irrigation pumps. As for dry field irrigation facilities, three-phase electricity is to be introduced as a power source, but it is not available to the majority of farmers. For this reason, new electric cables will have to be laid and connected with existing three-phase cables. In view of the huge cost of laying electric cables, this should be considered as a public project subject to financial support from the government.

7.3.1 Agricultural infrastructure improvement project

1) Details of the project

(1) Farmland improvement

a) Conversion to annual crop (soybean) cultivating land

As described in 7.2.1, natural grassland will be converted to soybean cultivating land (with wheat as a secondary crop; see Table 7.2.1.1). The total area to be converted is 69,000 hectares (10 hectares x 6,900 households = 69,000 hectares; see 7.2.1 for details).

b) Conversion to forage fields

In order to improve self-sufficiency in coarse forage, 26,300 hectares of natural grassland and fallow land will be converted to forage fields (see 7.2.2 and CUADRO A 7.2.2.7 and A 7.3.1.2). Of the 26,300 hectares, grassland accounts for 1,100 hectares and fallow land for 25,200 hectares.

c) Method of land improvement

Lime and phosphate materials will be applied for the purpose of soil improvement, along with ploughing by disk plough, and harrowing and grading by disk harrow. One kilometre of farm road will be constructed as access for every square kilometre of land area. For the 25,200 hectares of fallow land to be converted to forage fields, no agricultural materials or mechanical work such as ploughing will be applied.

(2) Grassland improvement

In order to develop grassland necessary for the promotion of dairy farming,

35,700 hectares of natural grassland will be converted to improved grassland (see 7.2.2 and CUADRO A 7.2.2.7 and 7.3.1.2).

Phosphate materials will be applied for the purpose of soil improvement, along with ploughing by disk plough, and harrowing and grading by disk harrow. 500 metres of farm road will be constructed as access for every square kilometre of land area. Fences and water troughs will be established in each area.

Colonial, estrella, brachiaria, and other types will be introduced to improve pasture.

(3) Irrigation facilities plan

In the irrigation facilities plan, comprehensive analysis needs to be made of various factors such as topography, soil, climate, river flow volumes (water resources), distribution, markets, and labour, and the area of the plan needs to be ascertained. In particular, there is a deficiency in hydrological data, and such data must be gathered continuously after installing suitable metering instruments in suitable locations.

Furthermore, with a view to conserving the environment, the extractable water amount should be determined for each river and studies and settings made for each volume of water use (water rights).

The development area is discussed in detail in 7.2.1.

a) Paddy field irrigation facilities

Irrigation facilities include water diversion facilities and waterways from rivers and streams. These facilities will be constructed as follows, with pumped irrigation planned in certain areas.

① Water diversion facilities: diversion using sandbags, a common existing technique.

② Waterways: earth canals, with principal and secondary waterways and principal drains properly distributed.

The area of newly developed paddy fields is to be 30,000 hectares (20 hectares x 1,500 households = 30,000 hectares).

b) Dry field irrigation facilities

In order to ensure crop diversification, cultivation of appropriate crops at appropriate times, quality improvement and increased yields, irrigation facilities will be constructed mainly for vegetable cultivation. The area of irrigated land to be developed will be 435 hectares (total area for tomatoes and carrots appearing in the "planned (commercial crops)" column in 2) Non-commercial crops, Table 7.2.1.1). Small-scale fixed concrete dam and pumping facilities will be constructed at appropriate places to ensure efficient use of water resources and facilities.

(4) Farm road plan

a) Maintenance of farm roads

Most existing farm roads are unpaved. Insufficient maintenance often makes their surfaces weak and impassable after rain has fallen (see Table 4.2.3.1). As a result, the delivery of farm produce to markets is impeded as well as the transportation of daily necessities. In view of this situation, motor graders will be introduced to ensure proper maintenance. The total length of roads covered by the plan is about 14,000 kilometres excluding national highways (see ANEXO 7.3.1 for details).

b) Construction of new farm roads

Although there is a regional imbalance in terms of road density (CUADRO A 4.2.3.1), farm roads have been constructed at intervals of about 2 kilometres in the settlements of small-scale farmers. The figure corresponds to 500 metres per square kilometre. The final goal is to improve this to 1 kilometre per square kilometre in order to ensure smooth delivery of agricultural production materials and farm produce. In view of Paraguay's budgetary scale and construction capacity, however, 2,000 kilometres of farm roads (100km/year x 20 years) will be constructed by 2017. Priority zones for farm road construction will be determined in close consultation with MOPC, the agency in charge of road construction in general.

2) Direct cost of the project

Gs 347,989 million (see CUADRO A 7.3.1.1 for details).

3) Benefits

① Farmland improvement and grassland improvement will aid the development of mechanized agriculture by scale enlargement.

② Paddy field irrigation facilities will be promoted by converting permanently flooded areas, utilized sparsely so far, to paddy fields. Thus, the effective use of the national land will be promoted.

③ Dry field irrigation facilities will make it possible to move away from the dependency on natural water for agricultural water and to cultivate appropriate crops at appropriate times.

④ Farm roads will facilitate transportation of farm produce regardless of weather conditions by proper maintenance of farm roads. In addition, a stable supply of daily commodities (including agricultural materials) will be ensured.

7.3.2 Rural infrastructure improvement project

1) Details of the project

(1) Drinking water facility plan

Drinking water is an important element in BHN and needs to be secured quickly. Very few farming households in rural areas have access to drinking water supplied from waterworks constructed by SENASA.

Drinking water will be supplied to 30% of small-scale farming households by the target year of 2017 (see ANEXO 7.3.2 for details). Deep wells and simple water tanks will be installed at 4,600 places, serving groups of 20 households each.

(2) Electrification plan

Based on the National Electrification Plan prepared by ANDE, rural electrification has been making steady progress. Electrification focused on rural areas will continue to be implemented for the additional purpose of improving the welfare of the local population. Priority will be given to non-electrified settlements.

Since electrification is a profit-making enterprise by ANDE, no costs will be provided for it in the plan, in expectation of active investment by ANDE.

Nonetheless, the cost of laying three-phase electric cables required for dry field irrigation will be included in the plan.

(3) Dry brick facilities

Medium- and small domestic animals kept by small-scale farmers and rodents that eat stored grains must be prevented from entering farmhouses. Also, earth floors need to be improved to stop flooding during rainfall. For these purposes, the project plans to utilize dry bricks (sun-dried bricks) made from soil and cement. Dry brick facilities will be constructed in 70 central villages in the 14 departments included in the Study Area.

(4) Primary and secondary education facilities

45 primary and secondary schools will be established in each of the new settlements (settlement starting in or after 1990; see ANEXO 7.3.2 for details).

2) Direct cost of the project

Gs 144,290 million (see CUADRO A 7.3.2.1 for details).

3) Benefits

① Drinking water facilities will reduce diseases caused by water unfit for drinking in rural areas. The creation of water sources near housing areas will relieve women and children of the heavy burden of carrying water.

② Electrification plan will improve work efficiency because it will be possible to switch motors on and off automatically.

③ Dry brick facilities will increase amenities in rural areas by improving sanitation for the poorest of small-scale farmers.

④ Primary and secondary education facilities will provide more education opportunities for the school-age children of small-scale farmers.

7.4 Measures for environmental conservation

7.4.1 Measures for environmental conservation

1) Basic concept

The OAS summit held in December 1996 on the theme of "sustainable development" adopted the Santa Cruz Declaration, emphasizing "the right to lead a healthy and productive life based on nature and harmony". However, it also incorporates the opinion of Latin American states that "sustainable development should not stand on the premise that every country has the same level of development, the same capacity, and the same development model".

In Paraguay, the strategy and related action plans for environmental conservation have been made explicit in order to ensure proper implementation. However, their completion still needs a long period of time. Therefore, as described in section 4.7, "an approach that prioritizes environmental problems and ensures progressive development" is needed in order to implement efficient environmental measures under constraints on human and financial resources. It has been argued that it is particularly important to increase farmers' awareness of "forest resources and farmland conservation".

The implementation of the project will consider the points stated above. Phase I measures will start with teaching small-scale farmers the importance of environmental conservation. Medium- and long-term measures to be implemented in Phases II and III can be described as integrated environmental conservation measures.

2) Short-term measures

Short-term environmental measures include narrow-range, low-cost measures on problems affecting individual farmers.

(1) Implementation of action plans presented by SSERNMA of the Ministry of Agriculture and Livestock which can be realized in the short term.

(2) Definition of the targets of environmental measures according to the level of development.

(3) Public education for environmental conservation

① 29 environmental protection and conservation areas (608,550 hectares) have been established in the Study Area, including those that are currently at the proposal stage. Buffer zones have been established around 13 of these areas, in which farmers live and practice farming. Public education activities will be important. Measures against soil erosion are particularly important in buffer zones and surrounding areas, both largely consisting of sloping land.

The rapid loss of forests in the Study Area means the loss of precious assets in environmental preservation. Some of the inhabitants of the area disregard the need for forest preservation, insisting that forests are of no value except for useful timber. Development of unexploited land by landowners as a measure against illegal penetration by landless farmers is also an important factor in the loss of forests.

Many laws and regulations related to environmental conservation were promulgated after the publication of the new Constitution in 1992. Most inhabitants ignore the content of such laws and regulation.

In order to address these problems, it is important to heighten the inhabitants' awareness of environmental conservation as well as their respect for legal provisions. To this end, readily understandable pamphlets will be prepared and distributed among the inhabitants.

② Most small-scale farmers purchase agrochemicals mainly from sales personnel of agrochemical companies, who virtually control the selection of pesticides. Therefore, public education activities will be conducted with respect to prohibited agrochemicals, pesticides, and herbicides, proper use, impact on soil and water quality, etc., in addition to the technical guidance manuals prepared by agriculture supporting agencies.

③ Direct cost of the project

Gs 1,906 million (see CUADRO A 7.4.1.1 for details).

④ Benefits

The adverse impact on environmental protection/preservation areas and forest resources will be reduced by improving the inhabitants' awareness of environmental preservation.

3) Medium- to long-term measures

Medium- to long-term measures do not address environmental problems at the level of individual farmers, but rather problems affecting third parties. In this context, environmental problems should be addressed not only by small-scale farmers and agricultural protagonists, but also by society as a whole. In any case, the challenge is overwhelming and requires long-term efforts. In short, environmental problems must be addressed by the whole nation from a long-term viewpoint.

(1) The action plans presented by SSERNMA will be brought to fruition.

(2) Environmental problems are a function of per capita income. In this connection, incomes need to be increased.

(3) Long-term measures need to be taken with a view to reducing poverty, improving educational standards, developing and diffusing proper technology, etc.