

4.3 Proposed Development Schedule

The development schedule of C/D centers has been formulated in accordance with the basic approaches as follows;

Implementation of Pilot Project

The implementation of Pilot Project or the development of pilot C/D center in San Isidro by renovating PETHOSAM is planned to be synchronized with the development schedule of the new wholesale market and the renovation of the facility is scheduled to be in the later half in 2002 (Table A.1.4-6). The operation of the center is to be started from the beginning of 2001. The preparatory period before operation is for about 1.5 years from the middle of 1999 to the end of 2000 (Preparatory Stage). The major project activities during the period include: 1) establishment and management of Steering Committee for the development of the center, 2) trial operation of cooperative collection and shipment at PETHOSAM, 3) institutional training to potential users and related personnel and organizations for the period of 1.5 years in the Preparatory Stage, 4) continuous guidance to and organization of users group, 5) arrangement for operation and management of the center and 6) establishment and management of steering committee for operation and management (O&M) of the center. Such activities should better be coordinated and/or implemented by the sub-project office which is to be established for the development and operation of C/D centers in the valley region. The overall schedule is shown in Table A.1.4-6.

Development of C/D Centers in Other Major Producing Areas

In accordance with the basic approaches, the operation of C/D centers in other major producing areas is planned to be started in two phases after 2 years of the Preparatory Stage commencing from the beginning of 2000. In the present study, the development schedules in individual major producing areas has been determined by assessing the readiness for the development of C/D center at current stage in the areas. The assessment criteria for the readiness include: 1) existence of facility for use as C/D, 2) production volumes of subject commodities in target collection areas, 3) current marketing system, 4) results of the discussion meeting on the development concepts (intention of representatives of farmers groups expressed etc.), 5) coverage of existing farmers organization, 6) activities of supporting organization and intention of local government, 7) existence of movement for cooperative collection and shipment and 8) construction cost per ton of product collected at the full development stage. In addition, the regional distribution of centers in the 1st phase development is also taken into account. The results of the assessment of the current readiness are presented in Table A.1.4-7 and the proposed development schedule for the individual major producing areas are:

1st Phase Development: Samaipata, Vallegrande & Saipina C/D Center

Construction Works: In 2002

Start of Operation: Beginning of 2003

2nd Phase Development: Mairana, Pampa Grande & Comarapa C/D Center

Construction Works: In 2003

Start of Operation: Beginning of 2004

The proposed development schedules are rather tentative nature based on the assessment of the current status and the review of the schedules is to be made during the Preparatory Stage when the institutional training to and organization of users group is envisaged as is the case in the Pilot Project.

4.4 Estimation of Target Collection and Distribution Volumes

4.4.1 Projection of Production and Marketing Volumes in Valley Region

(1) Target Commodities

Among the major crops produced in the major producing areas, cereals and beans generally have established marketing channels or domestically consumed in and around the areas and major commodities being shipped to wholesale markets are potatoes, vegetables and fruits. Accordingly, potatoes, vegetables and fruits are selected as target commodities for collection under the present plan.

(2) Projection of Production and Marketing Volumes in Major Producing Areas

Future annual production volumes of the target commodities in the individual major producing areas are estimated for the period from 2000 when the construction of Pilot Project will start to 2010 when all C/D centers will reach the full operation stage by applying the following assumptions.

Production Volumes in 2000

- As discussed in Section 2.4, assumed that any irrigation development will not be implemented and no appreciable production increase will be realized by 2000 and the current production volumes are taken as the same in 2000.

Production Volumes from 2001 to 2005

- Assumed that except for the target areas having the on-going irrigation project (Comarapa and Saipina Area), the production levels will remain at the current levels(see Section 2.4).
- The future expansion of production volumes expected from the on-going irrigation project in Comarapa and Saipina Area are estimated in accordance with the crop production plan of Comarapa-Saipina-San Rafael Irrigation Project as shown in Table A.1.4-8. The irrigation development under the project is shown in Section 2.4 and summarized as follows;

Major Producing Area	Rehabilitation Area(ha)	Expansion Area(ha)	Total(ha)
Comarapa Area	194	288	482
Saipina Area	1,561	302	1,863
Total	1,755	590	2,345

Production Volume from 2006 to 2010

- Assumed that the small scale irrigation projects in Comarapa and Vallegrande Area will be implemented and the full development will be

achieved in 2008 and 2010, respectively. The irrigation projects are San Juan del Potrero Irrigation Project in Comarapa Area and Torreywayko and Casas Viejas Irrigation Project in Vallegrande Area. The new irrigated areas under the projects are 30 ha, 66 ha and 213 ha, respectively for San Juan del Potrero, Torreywayko and Casas Viejas and Irrigation Project (see Table A.1.1-6). The expansion of production volumes due to irrigation development in the Areas are estimated as shown in Table A.1.4-9.

- Assumed that in Vallegrande Area where the municipal government has strong intention to promote fruit production the production volume of fruits will increase to 150 % of the current levels by 2010 through: 1) the expansion of fruit growing areas due to expansion of irrigated areas and 2) the impacts of the establishment of a collection and distribution center including the impacts of technical extension provided under the Project.
- Assumed for the present plan that in Samaipata Area where the municipal government has strong intention to promote fruit production the production volume of fruits will increase to 150 % of the current levels by 2010 through the impacts of the establishment of a collection and distribution center including the impacts of technical extension provided under the Project.
- Assumed for the present plan that the 10 % increase of productivity of crops from the current levels will be achieved at the 6th year after the start of operation of C/D center in all the major producing areas through the impacts of the establishment of improved collection and distribution systems including the impacts of technical extension provided under the Project.

For the estimation of the future marketing volumes, the commercialization rates of the target commodities are assumed area-wisely and by stage-wise in accordance with the development schedule of C/D centers as follows;

From year 2000 to 2004	Current commercialization rates in each major producing areas.
From 2005 to 2010	Assumed that the rates will be improved at the 5th year after the start of operation of C/D center in each major producing areas

The commercialization rates in the individual major producing areas assumed in the present Study are shown in Table A.1.4-10 and summarized as follows;

Commercialization Rate(%) in Samaipata, Mairana, Comarapa & Vallegrande Area

For initial 4 years of operation:	Potato 80 %, vegetables & fruits 85 %
After 5th year of operation:	Potato 85 %, vegetables & fruits 90 %

Commercialization Rate(%) in Pampa Grande, San Isidro & Saipina Area

For initial 4 years of operation:	Potato 90 %, vegetables & fruits 85 %
After 5th year of operation:	Potato, vegetables & fruits 90 %

On the basis of the projected production volumes in the major producing areas and by applying the commercialization rates assumed for the areas in each province in the valley region, the production and marketing volumes of the target commodities in the region are estimated/projected as shown in Table A.1.4-11. The same in each province in 2010 are as summarized below.

Projected Production & Marketing Volumes of Fruits & Vegetables in 2010

(unit: 1,000t)

	Florida Province	Caballero	Vallegrande	Valley Region
Production Volume(t)	47.4	54.1	42.8	144.6
Marketing Volume(t)	42.4	48.5	37.3	128.2

4.4.2 Estimation of Target Collection and Distribution Volumes

The target collection and distribution volumes will increase gradually with the dissemination of the advantage of the use of C/D center for marketing among farmers and the expansion of the number of users through the institutional guidance. While, the present marketing system and spatial distribution of growing areas or irrigated areas in individual target areas for collection will affect the collection volume. Accordingly, the target collection and distribution volumes in the individual target areas for collection are estimated area-wisely by applying the following assumptions;

- Target collection rates are planned to reach at the full scale in the 5th year after the construction of centers, and
- Target collection volumes in each year after start of operation are estimated based on the assumptions on: 1) improvement in commercialization rates, 2) rates of collection by a center to total commercialization volumes of products and 3) target collection rates (commercialization rates x rate of collection); as shown in Table A.1.4-10.

The annual target collection volumes to the full development/operation stage after the start of operation of a C/D center in each target area are estimated in accordance with the development schedule of C/D centers as shown in Table A.1.4-12. The estimated total target collection volumes at the full operation stage and the year when collection volumes reach the full operation level are as shown in the following table.

Estimated Target Collection Volumes at Full Operation Stage

Collection Area	Volumes(t)	Full Operation in	Collection Area	Volumes(t)	Collection Volumes(t)
San Isidro	11,030	2006	Mairana	7,200	2009
Samaipata	6,350	2010	Pampa Grande	12,540	2009
Vallegrande	12,420	2010	Comarapa	7,110	2009
Saipina	14,300	2008			

4.5 Organizational Set-up for Development of Collection and Distribution Centers

On the basis of the study on the combination of the developer of products collection and distribution centers (C/D center) and the management and administrative organization of them, it is proposed that the development of the C/D centers shall be implemented by the Section Municipal Government with the financial support of FDC based on the request of concerned OTBs. Assuming the said financial arrangement for the development and the establishment of Project Office and Sub-Project Office, the proposed organizational set-up for the development of the C/D centers which also indicates major functions and

activities of individual institutions is formulated as illustrated in Figure A.1.4-9. The organizational set-up consists of the Project Office, the Sub-Project Office, Steering Committee for Development of C/D, municipal government, FDC, OTBs, producers in the target areas of collection and existing farmers organizations.

5 OPERATION AND MANAGEMENT PLAN OF PRODUCTS COLLECTION AND DISTRIBUTION CENTERS

5.1 Proposed Products Collection and Distribution System

5.1.1 Proposed Products Collection and Distribution System

As the cooperative marketing system of fruits and vegetables has never been successfully introduced in the major producing areas and experiences and capability of farmers and farmers organization on the system are limited, the establishment of cooperative collection and distribution system in products collection and distribution centers (C/D centers) should be promoted in two stages: 1) Initial Stage for about the first 5 years after the start of operation of the center - introduction of cooperative collection and shipment operated and managed by existing farmers organizations or management body having experiences in marketing of subject commodities and 2) Advanced Stage from about 6th year and on after the start of operation - establishment of cooperative collection, shipment and selling operated and managed by farmers group organized for cooperative marketing purpose and introduction of production planning in order to meet market demand for timing of shipment, volume of commodities and quality and forms of packing of commodities.

For the study of cooperative marketing system to be introduced in the C/D centers, the discussion on the same with municipal government and representatives of farmers and farmers groups and agriculture institutions in the major producing areas have been made. On the basis of the results of the discussion, the collection and distribution systems to be introduced in each stage are proposed as illustrated in Figure A.1.5-1 and as follows;

Initial Stage: 1st to 5th Year after Construction/Start of Operation

Field selection	Preliminary selection at fields and removal of unmarketable products, packing in box, bamboo basket or plastic bag as practiced presently; gradual use of standard container & revolving containers
Shipment to collection center	Shipment to collection center by farmers employing hired truck or own truck
Selection/grading	Cooperative selection & grading at collection center, into 2 to 3 grades as presently practiced or into grades demanded by destination markets
Packing	At initial operation stage: packing in box, bamboo basket or plastic bag as practiced presently Gradual use of containers demanded by destination markets or mutually decided between a C/D center & markets
Shipment to market	Cooperative shipment employing transporter
Selling and delivery	Selling individual goods separately at market under the name of C/D center
Terms of transaction	Cash selling or other methods mutually agreed

Operation/Management Costs To be financed with fees collected from users(users fees) in principle

Advanced Stage: 6th Year and on after Construction/Start of Operation

Field selection	Preliminary selection at fields and removal of unmarketable products, packing in revolving container
Shipment to collection center	Shipment to collection center by farmers by hired truck or own truck
Selection/grading	Cooperative selection & grading at collection center, into grades demanded by destination markets
Packing	Packing in carton box or revolving container demanded by destination markets or mutually agreed between a C/D center and markets
Shipment to market	Cooperative shipment employing transporter
Selling and delivery	Cooperative selling of all commodities at market under the name of users group(Collection Center Users Cooperative)
Terms of transaction	Cash selling or other methods mutually agreed
Operation/Management Costs	To be financed with fees collected from users(users fees) in principle

5.1.2 Major Functions of Products Collection and Distribution Center

The major functions of the C/D centers in the Initial Stage for about 5 years from the start of operation are cooperative collection & shipment and individual selling, providing market information to users, providing production information to markets and technical and institutional guidance to producers/users as follows;

Cooperative Collection & Shipment and Individual Selling

The functions consist of: 1) products collection delivered by producers, 2) counting volumes or measuring weight of products delivered, 3) selection/grading by a C/D center (under the supervision of producers if demanded) and packing into containers currently used or ones demanded by markets. Gradual use of standard containers, improved wooden boxes or revolving containers will be promoted. All the products packed at the center are shipped to destination markets in cooperation by employing transporters. At markets, a representative of a C/D center stationed at the markets or coming to the markets delivers and sell products under the name of C/D center. Products of individual producers are sold separately to buyers(to wholesalers in general).

Collection of Users Fee and Accounting

After collection of users fee and deducting transportation costs from sales amount, balances are paid to individual producers upon receipt of payment from buyers.

Providing Marketing Information to Users

Providing market information received from new wholesale market and other market information collected from other sources to users. In addition to such market information, more practical information obtained through marketing operation of a C/D center will be provided. Such information will include: market preference for quality & maturity, market preference or demand for grading/size, market demand for timing and volumes etc.

Providing Production Information to Markets

Aiming at the establishment of close business relation with markets, production information in the target areas for products collection is to be collected by a C/D center and shipped to destination markets. Production information will include monthly cropped area and estimated monthly production volumes.

Institutional Training and Technical Extension

In the proposed strengthening plan for institutional training and technical extension in Section 6, the institutional training by a C/D center after the start of the operation of the same and the operation of demonstration plots and field extension activities by extension personnel stationed in the center are programmed. In addition, day-to-day guidance on marketing aspects will be provided by the center. The center will be utilized as a nuclear place for institutional training and technical extension in the target areas of products collection.

Maintenance of Properties of C/D Center

Maintenance of C/D center, vehicles and equipment

In the Advanced Stage from about the 6th year after the start of operation, the following functions are envisaged to be introduced in addition to the above functions.

Cooperative Selling & Joint Accounting

Products collected and packed in the center are shipped to destination markets and are sold altogether to buyers under the name of users group (Collection Center Users Cooperative). Sales amount are shared by volume or weight of products of individual producers by employing joint accounting system.

Introduction of Production Planning

Gradual introduction of production planning is envisaged in the Advanced Stage when the cooperative marketing system is established in a C/D center.

5.2 Proposed Operation and Management System and Organization Set-up

In accordance with the proposed stage-wise introduction of the products collection and distribution system in Section 5.1, the operation and management (O&M) system of C/D centers is proposed to be established in two stages, O&M system for the Initial Stage and the same for the Advanced Stage; as substantial time required for organizing users group of a C/D center for O&M by beneficiaries and lack of manpower resources for O&M within producers and in order to ensure successful initial operation of a C/D center. The

proposed operation and management(O&M) system of C/D centers and the organization set-up for the same are discussed in the following sections.

5.2.1 Proposed Operation and Management System in Initial Stage

Initial Stage for about 5 years after the start of operation of a C/D center, the O&M of the center is entrusted to existing farmers organizations such as ASOFRUT and EMCA under the contract between the municipal government and the organizations(the management body) as illustrated in Figure A.1.5-2. The overall organization set-up for the O&M of the centers covering all the major producing areas formulated on the basis of the discussion with the representatives of municipal government, farmers organizations and related institutions is shown in Figure A.1.5-3.

The major functions and activities of the institutions composing organizational set-up are shown in Table A.1.5-1. The outlines of the same are as follows;

- The management body shall fulfill the functions of the C/D center as discussed in Section 5.1.2 under the guidance and support of the Sub-Project Office, Steering Committee and municipal government and related institutions providing institutional and technical guidance (CIAT, CAISY and CAICO). In addition, the management shall perform general managerial functions including preparation and submission of an annual operation plan, an annual performance report and basic data for prescription of users fees. The users fees shall be determined taking into account of O&M costs and amortization costs of the center.
- The Municipal Government through the Steering Committee and under the support of the Sub-Project Office prepare the guidelines for the O&M of the C/D center, establish the official regulations for users and prescribe users fees to members and non-members. The proposed rules and regulations for users are presented in Table A.1.5-2.
- The Municipal Government as well as the management body shall give guidance to the users on the following points:
 - a) C/D center will rarely have functions for controlling price fluctuations caused by over supply of products,
 - b) The more farmers use the center, the more benefit will be realized, and
 - c) Improvement of products' quality as well as production technology of all the users is essential for successful O&M of C/D centers.

For the smooth operation of C/D centers immediately after the development and to ensure the introduction of the envisaged cooperative collection and distribution system from an earlier stage, the integrated guidance and support of the related institutions will be essential during the period from 1.5 to 2 years prior to the development of the centers to the beginning of the Initial Stage. Such guidance and support include the same provided by the Sub-Project Office and other related institutions, the institutional training programs proposed in Section 6.2 and technical assistance discussed in Section 6.5 as shown in the proposed integrated approaches for the same illustrated in Figure A.1.5-4.

In addition, the Sub-Project Office, municipal government and the management body should promote the establishment of users cooperative through intensive guidance to users as the institutional training plans proposed in Section 6 during the Initial Stage.

When the users establish a new users' organization with legal personality, the management body shall hand over the O&M of the C/D center to the new users' organization with the concurrence of the Municipal Government and the O&M of the same moves to the Advanced Stage.

5.2.2 Proposed Operation and Management System in Advanced Stage

In the Advanced Stage after terminating the Initial Stage, the O&M of the C/D centers is executed by a farmers organization itself established newly and all the functions and activities related with the O&M of the centers including institutional training and technical extension are to be performed by the organization. Accordingly, it is recommended that the C/D center should be leased to the organization with concessionary terms.

(1) Organization of Collection Center Users Cooperative

While a farmers organization having the status of a juridical person can be organized in accordance with either the Cooperative Law or the Civil Code, it is recommended that the organization should be organized as a service cooperative of "Collection Center Users Cooperative (tentative name)" under the Cooperative Law because the principal activities of the subject cooperative are the O&M of a C/D center. In accordance with the Cooperative Law, the following procedures are requisite for the establishment of the Collection Center Users Cooperative;

- General assembly of the promoters (Not less than 10 persons);
- Record of the general assembly signed by the attendants and certified by a notary public, etc.;
- Text of the by-laws.

For the authorization and legal registration, the cooperative is to be qualified by the National Council of Cooperative through the social-economic studies on the conditions, possibilities, working fields and operation plans of the cooperative. The management of the cooperative is performed by the general assembly of the members, the board of directors, the manager and the committee stipulated by-laws.

(2) Proposed Operation and Management System in Advanced Stage

In the Stage, the O&M of the C/D centers are executed by the management body established within the Cooperative as shown in Figure A.1.5-2. The functions and activities of the Cooperative are enumerated in Table A.5-1. It is recommended that the economic activities of the cooperative must strictly be limited to the operation of the C/D center only as shown in the Table. Other economic activities such as purchasing and credit should be considered after setting the operation of C/D center on its right path.

While the C/D center is for the members of the cooperative, the utilization of non-members should be allowed to certain extent. The proposed rules and regulations for users in the Advanced Stage are presented in Table A.1.5-2.

5.3 Operation Plans of Products Collection and Distribution Centers

5.3.1 Operation Plans

(1) Assumptions

The operation plans of individual C/D centers have been formulated on the basis of the following assumptions.

Target Collection and Distribution Volumes

Assumed that the target collection and distribution volumes of the C/D centers will gradually increase from the start of operation and the target collection rates will reach at the full scale in the 5th year as shown in the estimated target collection and distribution volumes presented in Table A.1.4-12.

Destination Markets

Assumed that all the products are sold at wholesale markets.

Net Producers Prices of Products

The net producers prices of products (selling prices at a wholesale market - transportation costs) are estimated based on the prevailing selling prices at Abasto Market in 1998 as follows;

Products	Prices(US\$/t)	Products	Prices(US\$/t)
Potatoes	220	Green Pepper	205
Tomato	135	Beans/Peas	435
Lettuce	100	Peach/Plum	420
Choclo	285	Citrus	135

Weighted Average Net Producers Prices of Vegetables and Fruits

The weighted average net unit producers prices of vegetables and fruits are estimated on the basis of the target collection volumes in the full operation stage as shown in Table A.1.5-3.

Estimated Annual Handling Amounts

The annual handling amount of the individual C/D centers estimated from the target collection and distribution volumes and the net producers prices are presented in Table A.1.5-4. The same in the full operation stage are summarized below.

C/D Center	Amount	Year	C/D Center	Amount	Year
San Isidro	2,214	2006	Mairana	1,538	2009
Samaipata	1,392	2010	Pampa Grande	2,468	2009
Vallegrande	3,622	2010	Comarapa	1,622	2009
Saipina	2,943	2008	Overall	15,799	2010

Remarks: Year when the full operation achieved

Users Fees

Users fees to be collected by C/D centers are determined based on: 1) currently prevailing commission rates for consignment sales of 5 to 10 % , 2) proportion of cooperative selection/grading costs to the overall net unit producers price because selection/grading costs currently born by producers will be saved under the proposed collection and distribution system of the Project and 3) examination of projected cash flows of individual C/D centers; as shown in Table A.1.5-5. Users fees collected at the C/D centers are calculated as follows;

$$\text{Annual users fees collected} = \text{Annual handling amounts(US\$)} \times \text{Users fees(\%)} / 100$$

Management and Administration Costs of C/D Centers

Management and administration costs of C/D Centers are estimated as shown in Table A.1.5.6.

Annual Operation Costs

The operation costs of the C/D centers consist of: 1) fixed costs including management and administration costs, institutional training and technical extension costs, operation & maintenance costs and depreciation costs and 2) variable costs including products loading & un-loading costs, selection & packing costs and miscellaneous costs for operation of C/D centers. The estimated annual operation costs of the C/D centers are shown in Table A.1.5-7.

(2) Operation Plans of Products Collection and Distribution Centers

The operation plans of the individual C/D centers are prepared as presented in Table A.1.5-7 and as summarized in Table A.1.5-8 assuming that the operation of the centers is to be solely financed with the users fees carried collected by levying O&M fees on users(users fees). However, because of the gradual expansion of the target collection volumes at the centers and the gradual increase of users fees collected, the operation of the centers will suffer deficits in "Users Fees - Operation Costs not including depreciation costs" in the initial years varying from 1 to 4 years; 1 year for San Isidro and Saipina C/D center, 2 years for Vallegrande, Mairana, Pampa Grande and Comarapa C/D center and 4 years for Samaipata C/D center because primarily of limitation in collection volumes in the initial years as shown in Table A.1.5-8. Thereafter, all the centers will be soundly operated and generate surplus from the operation. It is recommended that the initial operation deficits are made up for by the municipal governments under loan arrangement with the C/D centers.

5.3.2 Projected Cash Flow

The financial evaluation of the development and operation of C/D centers is made by examining the projected cash flows as shown in Table A.1.5-9 by assuming the operation plans in Section 5.3.1 and by assuming that the initial investment costs(Table A. 1.5-7) and the initial operation deficits will be financed by the outer sources, by municipal governments for the former and under loan arrangement by the same for the latter. Table A.1.5-8 shows the summary results of the cash flow analyses. Under the said assumption, Vallegrande, Saipina, Pampa Grande and Comarapa C/D centers will be soundly operated and the replacement/reconstruction of the centers will be made with the

reserved funds of annual operation surplus. In case of San Isidro and Samaipata C/D center, the input of other funds will be required to finance apart or most of the replacement costs which will become due earlier because of the use of existing facilities. Similarly, a part of the replacement costs of Mairana C/D center will have to be financed from the other sources as shown in the Tables.

6. PROPOSED PLANS FOR INSTITUTIONAL TRAINING AND TECHNICAL EXTENSION IN MAJOR PRODUCING AREAS

6.1 Proposed Approaches for Formulation of Strengthening Plans

The provision of intensive institutional training and technical extension to farmers and other related personnel is essential for the introduction and establishment of cooperative collection and distribution system in the major producing areas. In institutional aspects, while the importance and necessity of this Project including the collection centers and the wholesale market have been understood gradually by a part of farmers in the Study area through the field studies, particularly through the implementation of the PCM workshop, demonstration and study tour, the awareness of overwhelm majority of farmers is still in low level in terms of cooperative collecting and shipping activities. Because the farmers who joined to the cooperative marketing/shipping in the past have some fear and suspicion to cooperative activities due to their bitter past experience and all the rest farmers are not necessarily show their positive attitude toward participating in such marketing activities. Furthermore, it also become clear through the Study that almost all farmers recognize needs for improvement of production and post-harvest technologies of vegetables and fruits.

To ensure the efficient and effective institution training and technical extension provided to target groups, such training and extension programs should better be provided by establishing a project office responsible for both development and initial operation stages of C/D centers. Accordingly, the present plan is formulated assuming such a project office will be established prior to the commencement of development of the centers.

The proposed approaches for the strengthening of institutional training and technical extension are as follows;

- Institutional training and technical extension should be provided under the project by prefecture government including CIAT, municipal government, ASOHRUT and NGO including CAISY and through foreign technical assistance, if any,
- A task force team for training and extension should be organized by the project(prefecture government), municipal government and related institutions in each major producing areas and training and extension should be provided to related farmers and personnel prior to the establishment of a products collection and distribution center,
- After the establishment of the center, training and extension should be intensified by placing the center as a central place for the provision of such services,
- Institutional training and technical extension programs should cover aspects of production technologies, quality controls, grading and standardization, cooperative marketing system, market information and demand, institutional strengthening and farmers organization. Institutional training and technical extension should better be executed by placing emphasis on practical training including on-the-job training.

- Effective use of the proposed Pilot Project in San Isidro for on-the-job training of candidate management staff of other C/D centers and of farmers in other major producing areas.
- Technical assistance of a foreign country or countries should better be sought to ensure early realization of the fruits of the proposed strengthening plans.

6.2 Proposed Plans for Institutional Training and Technical Extension

6.2.1 Proposed Plans for Institutional Training

Aiming at realization of effective and efficient use of C/D centers from the initial sage of operation, the institutional training programs are planned to be held prior to the development of a C/D center and to be implemented in three stages in accordance with the development stage of the center; Preparatory Stage for 1.5 to 2 years prior to the development of the center, Initial Stage for the period of about five years after the same and Advanced Stage from 6th year on after the development. The proposed programs for the institutional training include training courses and on-the-job training in the Pilot Project and C/D centers as presented in Table A.1.6-1. The outlines of the programs are as follows;

(1) Institutional Training Programs in Preparatory Stage

The institutional training programs in the Preparatory Stage consist of the following three programs.

1) General Training Programs/Mass Guidance

Objectives

To disseminate necessity of C/D center and merit of its use and to promote effective and efficient use of it through positive participation of vegetables and fruits producers.

Target Groups

All vegetables and fruits producers in target areas of C/D centers

Subjects of Training

- Necessity of C/D center and the merit of its use.
- Function of C/D center and its operation methods.
- Relation between new wholesale market and C/D center.
- Necessity of Collection Center Users Cooperative.

Methods of Training

- Preparation and distribution of leaflets etc.
- Explanation meetings and workshops to OTBs concerned.
- Study tours to advanced agricultural marketing area including the Pilot Project in San Isidro.

2) Training Programs

Objects

To train advanced farmers who will become key personnel to organize and develop Collection Center Users Cooperative.

Target Groups

Advanced producers of vegetables and fruits nominated by OTBs concerned.

Subjects of Training

- Related matters of C/D center; necessity and merit of center, functions, etc.
- Related matters of cooperative shipping and selling; concept of cooperative, cooperative's law, legal procedures for establishing cooperative, budget & accounting of cooperative, right & duty of members.
- Related matters of cooperative shipping and selling, concept & merits of cooperative shipping & selling, procedures & rules, accounting system etc..

Methods of Training

- Lecture and practical exercise.
- Study tours to advanced agricultural marketing area including the Pilot Project in San Isidro.

3) On-The-Job Training at Pilot Project

As the availability of manpower resources having experiences in marketing of vegetable and fruits is limited, the recruiting of management staff for C/D centers will be the urgent requirements of the proposed management organization (ASOHRUT etc.). Accordingly, during the Preparatory Stage of 1.5 to 2.5 years prior to the development of C/D centers, on-the-job training at the Pilot Project in San Isidro of candidate management staff for C/D centers in other major producing areas is programmed in accordance with the development schedule of individual C/D centers as follows;

Objects

To recruit management staff of C/D centers.

Target Groups

Candidates for management staff of C/D centers.

Subjects & Method of Training

All aspects of operation & management of C/D center through on-the-job training at the Pilot Project for the period of 6 months to 1 year.

(2) Institutional Training Programs in Initial Stage

In addition to the promotion of the establishment of Collection Center Users Cooperative through guidance and training, the recruitment of management staff of the Cooperative is

the primary objective of the institutional training in the Initial Stage. The institutional training in the Stage for about 5 years after the development of a C/D center is programmed to be implemented as one of main functions of the C/D center as follows;

1) Mass Guidance

Continuation of mass guidance program to all potential users of a C/D center on need basis with similar objectives, target groups and training methods with the similar program in the Initial Stage.

2) Short Training Programs

Continuation of training programs for advanced farmers on need basis with similar objectives, target groups and training methods with the similar program in the Initial Stage.

3) Recruiting Management Staff of Cooperative

Objectives

To train management staff of Cooperative in operation and management of the organization.

Subject of Training

- Operation and management of cooperative.
- Budget and accounting system of cooperative.
- Operation and management of C/D center.

Method of Training

Training shall be implemented as practically as possible and key staff of the cooperative or candidates for the same should engage in operation of C/D center for a half year or longer together with the management staff of the center before handing over of the management of it in the Advanced Stage.

- Lecture and practical exercises.
- On-the-job training in C/D center.

(3) Institutional Training Programs in Advanced Stage

The institutional training program in the Advanced Stage will be held on need basis and should be as follows.

Objectives

To operate and manage C/D center smoothly by the Collection Center Users Cooperative itself and to introduce a full-scale cooperative shipping and selling system as early as possible.

Target Groups

Members and staff of the Collection Center Users Cooperative

Subjects of Training

- Full-scale cooperative shipping and selling system and its merit.
- Procedures and rules for full-scale cooperative shipping and selling.
- Accounting system for full-scale cooperative shipping and selling.
- Recording and book keeping system by using computer.

Methods of Training

- Lecture and practical exercise.
- Study tours to advanced agricultural marketing area.

6.2.2 Proposed Plans for Technical Extension

The proposed programs include preliminary survey, verification trial, demonstration plot, staff training, farmer training, mass guidance, study tour and periodical and day-to-day guidance and trials by the management of C/D center as presented in Table A.1.6-2. The outlines of major programs are as follows;

(1) Preliminary Survey

Preliminary survey is to identify constraints for vegetable and fruit production and experimental needs for the same in the subject major producing areas and to be carried out prior to the development of C/D center by CIAT. The findings of the survey are to be used for the review of the overall implementation schedules proposed under the present study.

(2) Verification Trial

Objectives

To test adaptability of recommended technologies to site specific conditions in the subject major producing areas. Findings of the trials are demonstrated to farmers at demonstration plots.

Subjects of Trial

Trial elements will include variety, seed quality, fertilization, plant protection, crop rotation etc.

Methods & Extension Components

The trials are to be carried out in farmers fields. During the trials, farmers field days are to be held to explain and disseminate recommended technologies by inviting representative farmers in the surroundings.

(3) Demonstration Plot

Objectives

Demonstration of recommended technologies/farming practices in fields operated by farmers themselves under the guidance and support of extension personnel.

Subjects of Demonstration

Technologies/farming practices will be packaged ones or element such as variety, qualified seed and fertilization. Demonstration of cropping pattern is also an essential practices to be demonstrated.

Methods & Extension Components

Demonstration plots are to be operated by farmers themselves under the guidance and support of extension personnel. During the demonstration, farmers field days are to be held to explain and disseminate recommended technologies by inviting representative farmers in the surroundings.

(4) Staff Training(Induction Training)

Objectives

Training of extension personnel prior to assignment.

Target Groups

Extension personnel assigned at C/D center & candidate for the same. Other personnel engaged in extension services in major producing areas.

Subjects of Training

- Farming technologies, post-harvest & marketing technologies
- Group dynamics & extension methods
- Marketing system, production planning etc.

Methods of Training

The program will consists of lecture and discussion in class and field training and is to be held at RRC. However, as the number of extension personnel is limited at the initial stage of the development of C/D centers, the practical induction training of extension personnel will have to be carried out through intensive on-the-job training by RRC.

(5) Staff Training(Refresher Training)

Objectives

Refresher training of extension personnel assigned at C/D centers.

Target Groups

Extension personnel assigned at C/D center and other personnel engaged in extension services in major producing areas.

Subjects of Training(on need basis)

- Farming technologies, post-harvest & marketing technologies
- Group dynamics & extension methods
- Marketing system, production planning etc.

Methods of Training

The program will consist of lecture and discussion in class and field training and is to be held at RRC. However, as the number of extension personnel is limited at the initial stage of the development of C/D centers, the practical induction training of extension personnel will have to be carried out through intensive on-the-job training by RRC.

(6) Farmers Training

Objectives

Aiming at recruiting farmers in major producing areas who are expected to become leading farmers and cores in field extension activities in the areas.

Target Groups

Candidates for leading farmers in target areas of C/D centers.

Subjects of Training

- Farming technologies, post-harvest & marketing technologies
- Group dynamics
- Marketing system, production planning etc.

Methods of Training

The program will consist of lecture and discussion in class and field practical training including visit to fields of advanced farmers and verification trials and demonstration plots under operation, if any. For farmer training, 2 types of training program, short course of 1 day and normal course 3 days, are proposed. In the former, training on specific issues will be held and in the latter more general training will be carried out.

6.3 Proposed Organizational Set-up and Implementation Schedules for Institutional Training and Technical Extension

6.3.1 Proposed Organizational Set-up

The proposed system for the implementation of institutional training consists of 1) implementation of the institutional training programs in the Preparatory Stage for 1.5 to 2 years prior to the development of C/D center by the project office and 2) the programs in the Initial Stage and Advanced Stage by the C/D center. The proposed system for the implementation of technical extension programs consists of 1) experimental, training and survey activities by CIAT, 2) field extension activities primarily by extension personnel and 3) guidance and trials on marketing aspects by the Project and the management of C/D center. The proposed system and organizational set-up for the implementation are as shown in Figure A.1.6-1.

As shown in the figure, the experimental activities, training/recruiting of extension personnel and farmers technical training are to be covered by 4 Regional Research Center(RRC) of CIAT under the contract with the project office(prefecture government). The target major producing areas by individual RRCs is proposed as follows;

RRC	Target Major Producing Areas
RRC Samaipata	Samaipata Area
RRC Mairana	Mairana Area
RRC San Isidro	Pampa Grande, San Isidro, Comarapa & Saipina Area
RRC Vallegrande	Vallegrande Area

As the coverage areas of RRC San Isidro and Vallegrande are substantially large, the strengthening of technical/research staff will be required in the centers. The number of new research staff required will be 2 for San Isidro and 1 for Vallegrande.

The field extension activities should be by extension personnel recruited newly for the purposes and should be executed under the guidance of CIAT. The guidance and trials on marketing aspects prior to development of C/D center should be by the project office and after the development by the management of C/D center in cooperation with ASOFRUT, CAISY, EMCA, CIAT and other related institutions.

6.3.2 Proposed Implementation Schedules

The proposed implementation schedules for the institutional training and technical extension programs are illustrated in Table A.1.6-3. Among the proposed programs, some institutional training programs, preliminary survey and induction training of extension personnel should be implemented prior to the development of C/D center. The proposed schedules of technical extension programs are to be reviewed based on the findings of the preliminary survey and the annual programs are to be updated through the annual review of the program schedule.

6.4 Estimated Costs for Institutional Training and Technical Extension

The costs required for the proposed institutional training and technical extension include: 1) program costs under institutional training and technical extension and 2) personnel expenses for extension personnel and, 3) personnel expenses for new research staff and administration costs of CIAT. The estimated program costs for the institutional training and technical extension are presented in Table A.1.6-4 and 6-5, respectively. The program costs for the institutional training and technical extension are estimated in accordance with the development schedule of individual C/D centers as shown in Table A.1.6-6. The overall costs of the programs for the period of 10 years from 1999 to 2008 is estimated at about US\$ 1 million as shown in Table A.1.6-7.

The programs by CIAT from the beginning to the 5th year after the start of operation of C/D centers should be implemented under the financial support of the Project, while the same from the 6th year should be implemented as the activities of CIAT himself. The program costs for field extension activities for the initial 4 to 6 years until the operation of C/D centers generate sufficient surplus to cover the costs are to be born by the project. However, from the 6th year after the start of operation of C/D center or when the operation of C/D generate sufficient surplus, the program costs are to be expended from the operation costs of the center. The costs for guidance and trials on marketing aspects by the management of C/D center are to be expended from the operation costs of the center from the beginning. The proposed financial arrangement for the implementation of

the institutional training and technical extension programs are shown in Table A.1.6-6 and summarized below.

Programs	Development Stages	Financial Sources
Institutional Training	In Preparatory Stage	Under the project budget
	In Initial & Advanced Stage	Operation costs of C/D center
Extension Programs by CIAT	For initial 6 years	Under the project budget
	From the 7th year	Implemented as CIAT activities
Field Extension Programs	For initial 4 to 6 years	Under the project budget
	After initial years	Operation costs of C/D center
Guidance/Trials on Marketing Aspects	After initial years	Operation costs of C/D center

Assuming the said financial arrangement for the implementation of institutional training and technical extension programs, the annual budget requirements by the project for the implementation of the programs for the period of 1999 to 2008 are estimated as shown in Table A.1.6-8 and the overall program costs for the period to be born by the project are as summarized in the following table.

Estimated Overall Programs Costs To Be Born by Project

Programs	Estimated Costs(US\$ 1,000)
Institutional Training Programs	234.9
Technical Extension Programs	615.4
Total	850.3

6.5 Needs for Technical Assistance

In the valley region, marketing of fruits and vegetables has been carried out either by farmers themselves or through small intermediaries and any farmers organizations have no successful experiences in the operation of cooperative marketing to date. While the O&M of C/D centers will be entrusted to existing farmers organizations in the Initial Stage, these existing organizations also have not any remarkable experiences in agricultural marketing including cooperative collection and shipping of products. Accordingly, to ensure the successful O&M of C/D centers, the existing farmers organizations should be strengthened and amplified in terms of technical aspects on agricultural marketing by making efficient use of the pilot C/D center in San Isidro. Furthermore, the realization of the following technical assistance to the existing farmers organizations and the users groups(or Collection Center Users Cooperative) to be established is highly desirable for the same purposes, particularly during the Preparatory and Initial Stage of C/D centers.

(1) Technical Assistance of Experienced Farmers Organizations such as CAISY

CAISY has a lot of experiences in organization and management of cooperative and cooperative marketing. The existing farmers organization and the users groups should ask technical assistance to CAISY to transfer technical know-how for the organization and management of cooperative and the operation of cooperative marketing.

(2) Technical Assistance of Foreign Countries

In the Advanced Stage, the C/D centers will introduce the full-scale cooperative shipment and selling system to operate the centers more efficiently and effectively. However, no organizations or nobody in Santa Cruz have knowledge and experiences in the cooperative marketing system at present. It is strongly recommended, therefore, that the Project Office should ask technical assistance of developed countries to dispatch the following technical advisors on agricultural marketing.

Technical Assistance Required for Management of C/D Centers

Advisor	Specialty	Number	Period
Short-term Advisor B	Cooperative C/D, Marketing	1	2000 - 1 year
Long-term Advisor D	Cooperative C/D, sales	1	2000 - 2005 5 years
Long-term Advisor E	Quality control/ standardization, Cooperative C/D accounting	1	2000 - 2002 2 years

Remark:

The necessary number of foreign technical advisors for the Project is 6 (A~F in the order of their scheduled assignment). Three of them (B, D & E) for the C/D centers are shown above.

7. OVERALL IMPLEMENTATION PLAN

7.1 Organizational Set-up for Project Implementation

Under the present Project, the development of C/D centers shall be done by municipal governments and the O&M of the centers shall be under the jurisdiction of the municipal governments at the Initial Stage and executed by farmers group, Collection Center Users Cooperative, at the Advanced Stage. However, the intensive guidance and support of the prefecture government is inevitable for the development and operation of C/D centers. For the purposes, the establishment of the Project Office (Project Office No.1) in Santa Cruz and the Sub-Project Office in the Pilot Project site in San Isidro by the prefecture government is proposed at the initial stage of project implementation. The main function of the project office is to promote the improvement of marketing system of the products in Santa Cruz Department in cooperation with Santa Cruz Municipal Government. The major functions of the sub-project office are: 1) to provide guidance and support for the development and operation of C/D centers and to monitor the same and 2) to provide institutional training and technical extension services in cooperation with CIAT and other related institutions. The project organizations should better be established in 1999 and be operated until 2008; by the time when the O&M of all the C/D centers will be handed over to Collection Center Users Cooperative. The proposed organizational set-up of the project office and the sub-project office and the estimated administration costs for the same are as shown in Table A.1.7-1.

The development and operation of C/D centers under the Project are to be performed by several institutions. The related institutions include the Project and Sub-Project Office, municipal government, steering committee for development and operation & management of the centers, users/users group and management body and other institutions such as ASOFRUT, CIAT and others. The overall organizational set-up for the development and operation of C/D centers are summarized as illustrated in Figure A.1.7-1.

7.2 Overall Implementation Plan and Estimated Costs

The overall implementation plans which cover the development schedules of C/D centers, the implementation schedules for institutional training and technical extension programs and the schedules for the organizational set-up and indicate the related implementation agencies are formulated in accordance with the stage-wise development of C/D centers as shown in Table A.1.7-2. The chronological major activities or functions to be performed by the related institutions are summarized in Table A.1.7-3.

The costs for the project implementation which should be accommodated in the annual budget of the project office include; 1) institutional training and technical extension programs costs, 2) administration costs of the Project Offices. The estimated overall costs for the project implementation are as estimated as shown in Table A.1.7-4. The same for the period of 10 years from 1999 to 2008 are estimated at US\$ 2.1 million.

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ANNEX 1

FIGURES & TABLES

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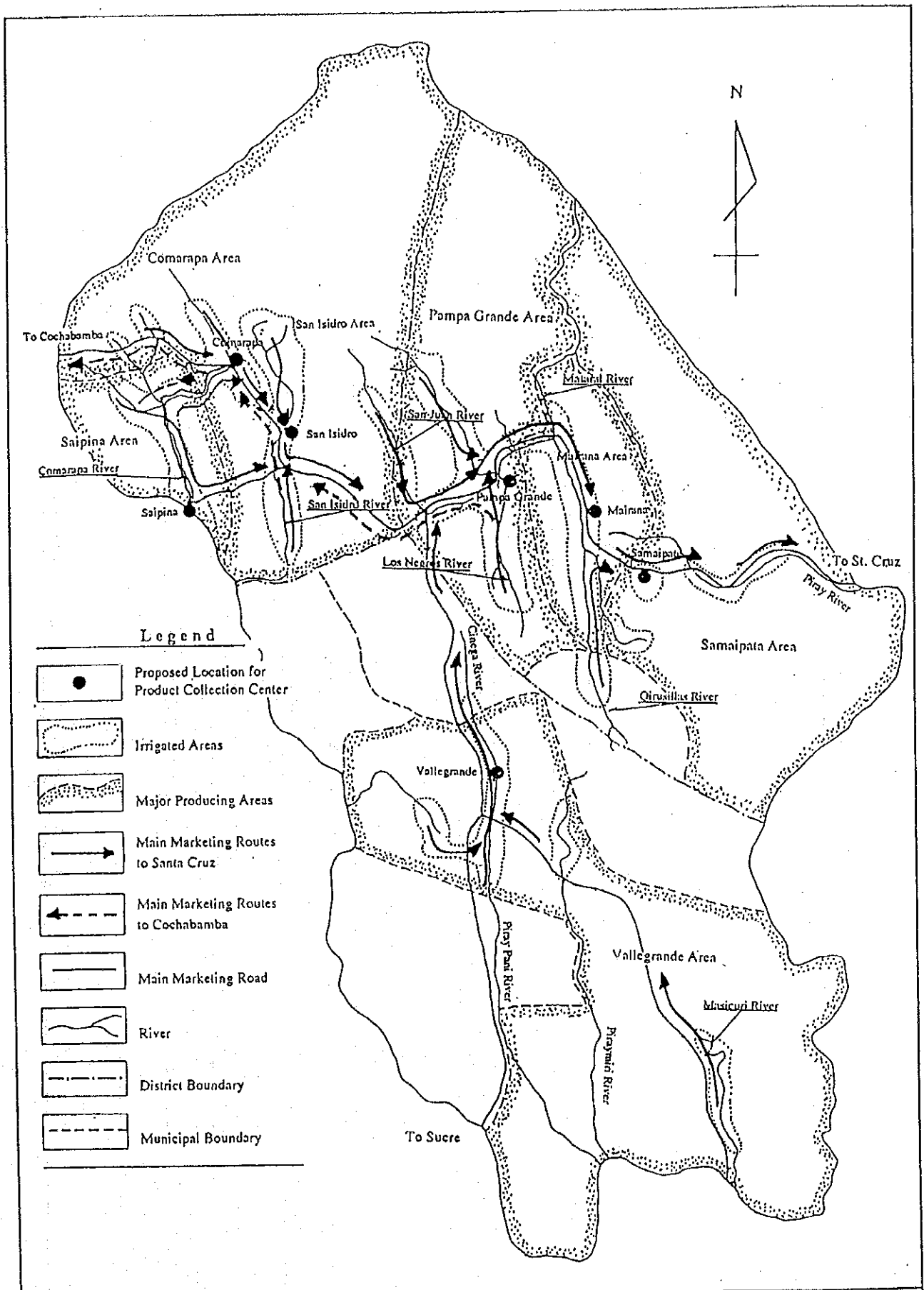


Fig. A.1.2-1 MAJOR PRODUCING AREAS OF FRUITS AND VEGETABLES

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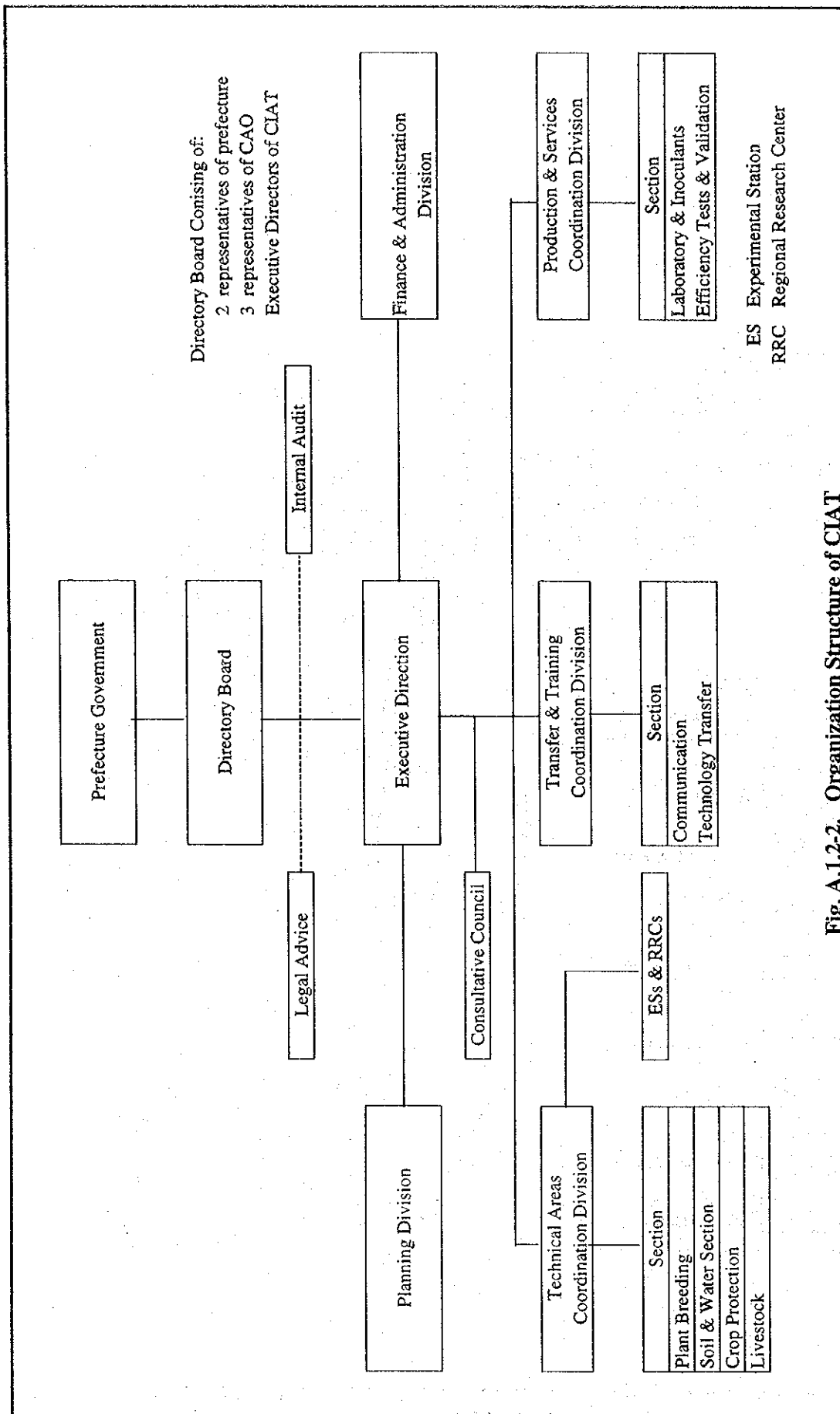
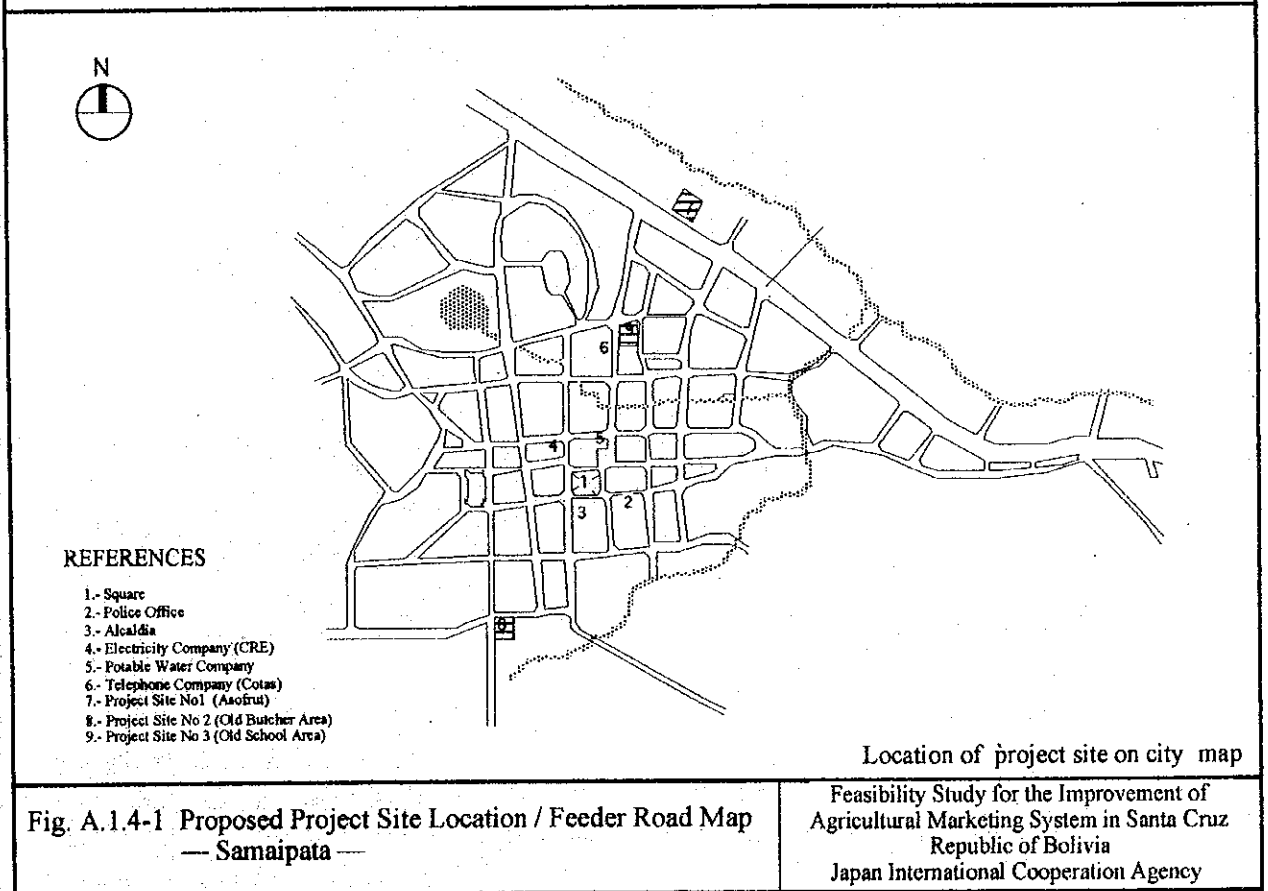
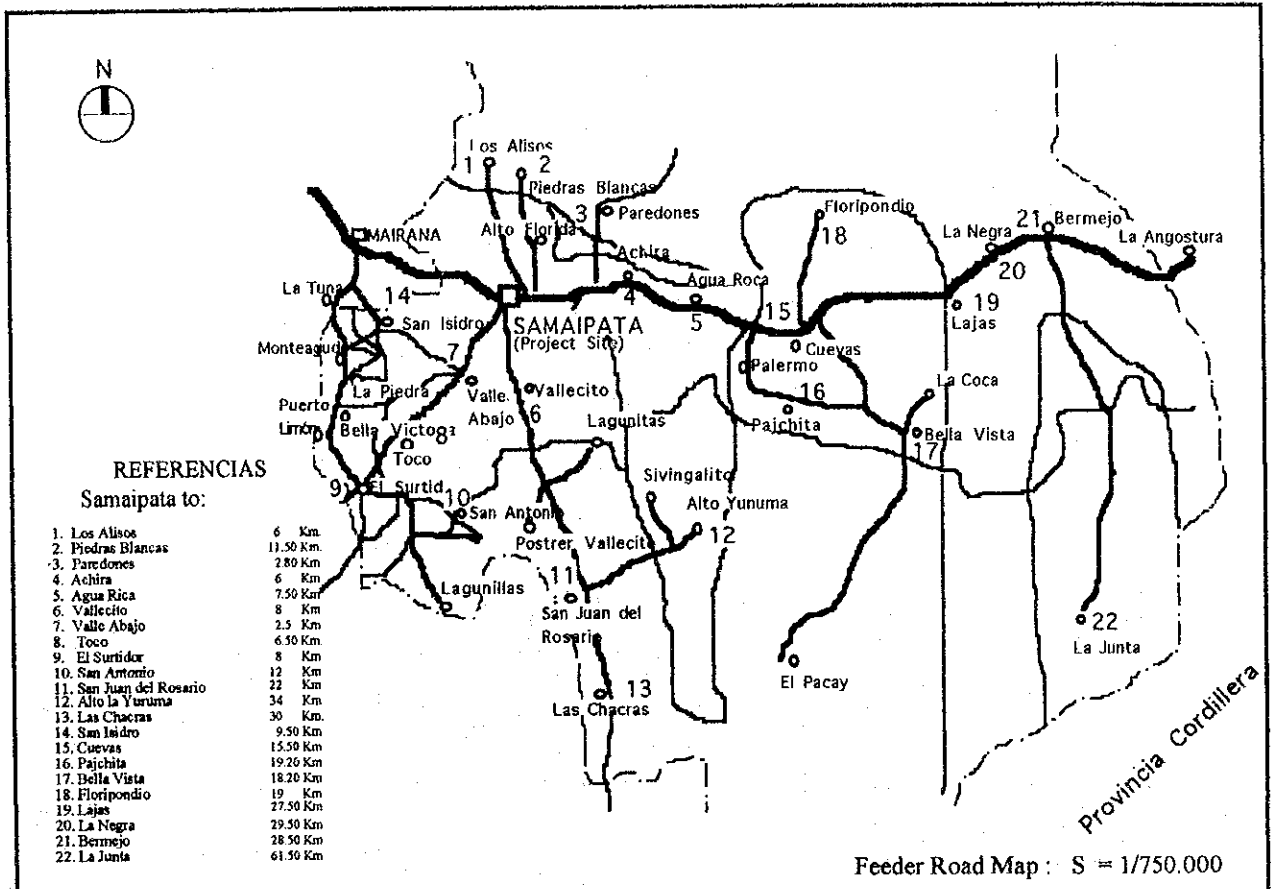


Fig. A.1.2-2. Organization Structure of CIAT



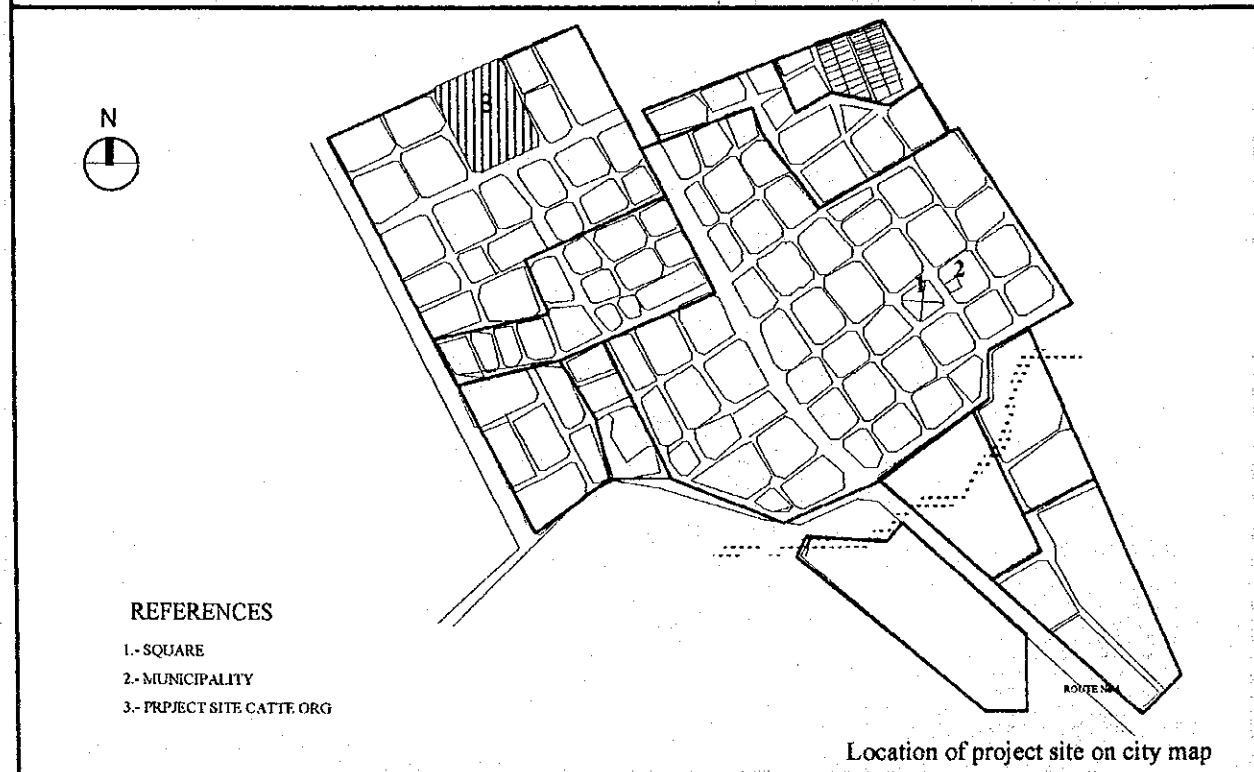
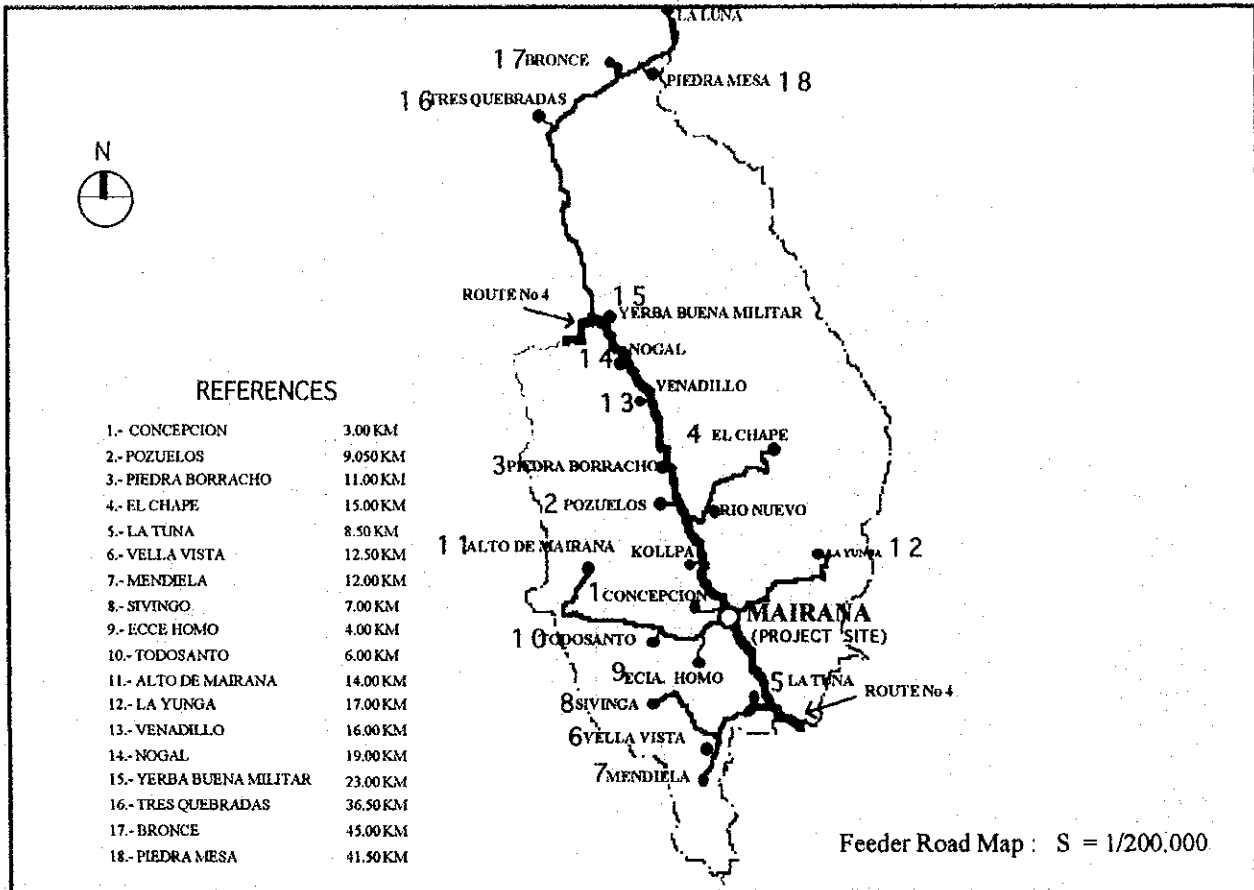
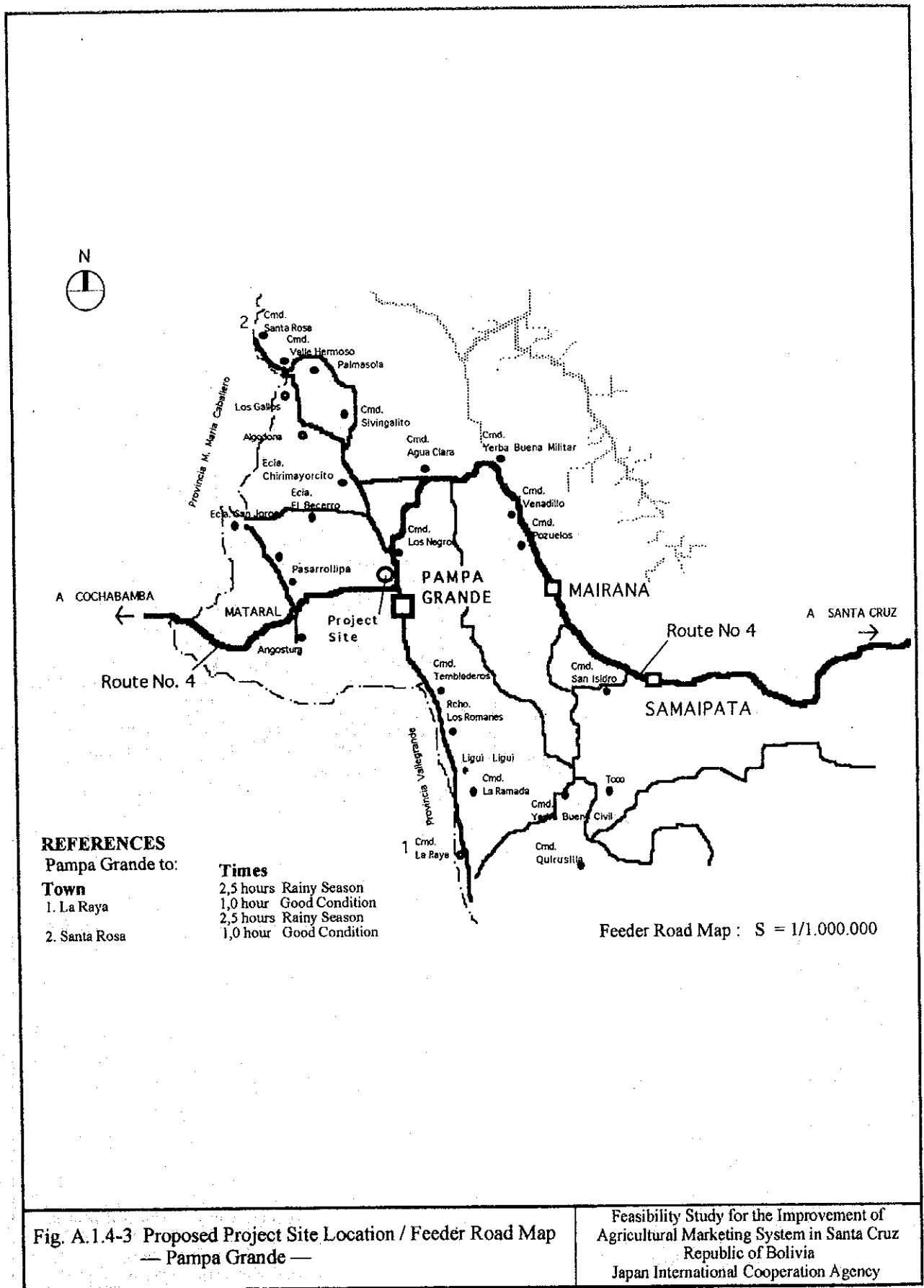


Fig. A.1.4-2 Proposed Project Site Location / Feeder Road Map
— Mairana —

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REFERENCES
Pampa Grande to:

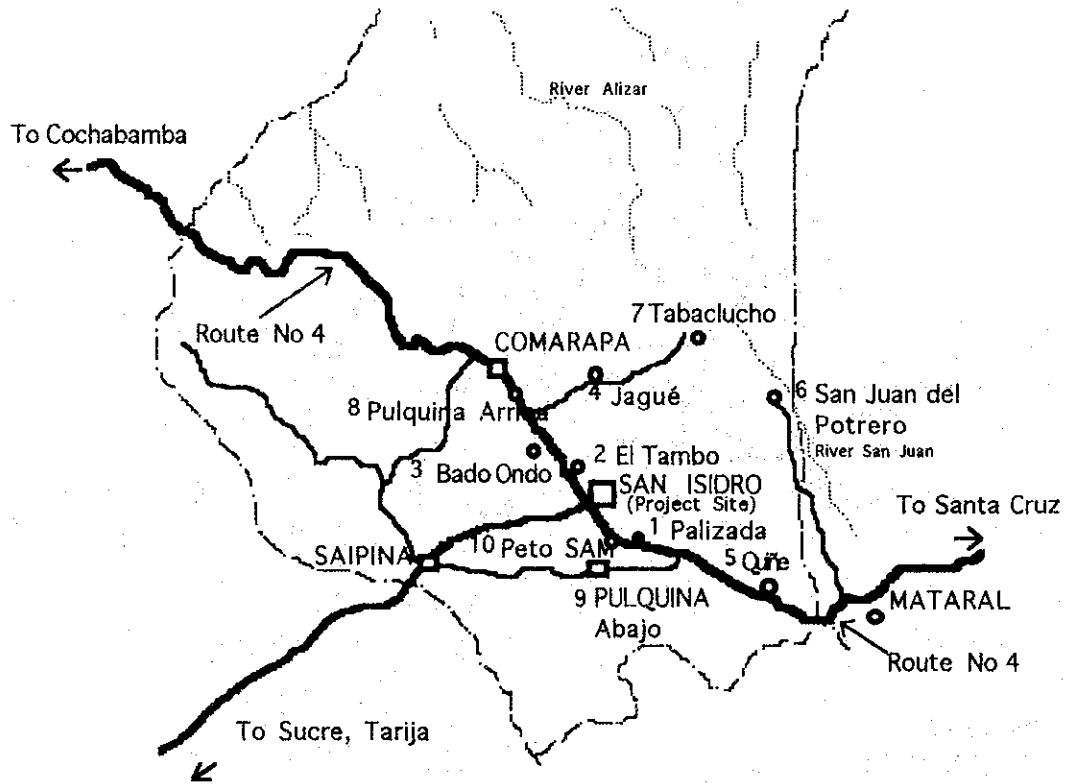
- Town**
1. La Raya
2. Santa Rosa

Times	
2,5 hours	Rainy Season
1,0 hour	Good Condition
2,5 hours	Rainy Season
1,0 hour	Good Condition

Feeder Road Map : S = 1/1.000.000

Fig. A.1.4-3 Proposed Project Site Location / Feeder Road Map
— Pampa Grande —

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Feeder Road Map : S = 1/750.000

REFERENCES

San Isidro to:

Town	Times
1. Palizada Sur	15 min.
2. El Tambo	10 min.
3. Bado Ondo	20 min.
4. Jague	1 hour
5. Quiñe	30 min.
6. San Juan del Potrero	2 hours
7. Tablaeicho	1 hour
9. Pulquina arriba	1 hour
10. Pulquina abajo	10 min.

Fig. A.1.4-4 Feeder Road Map
— San Isidro —

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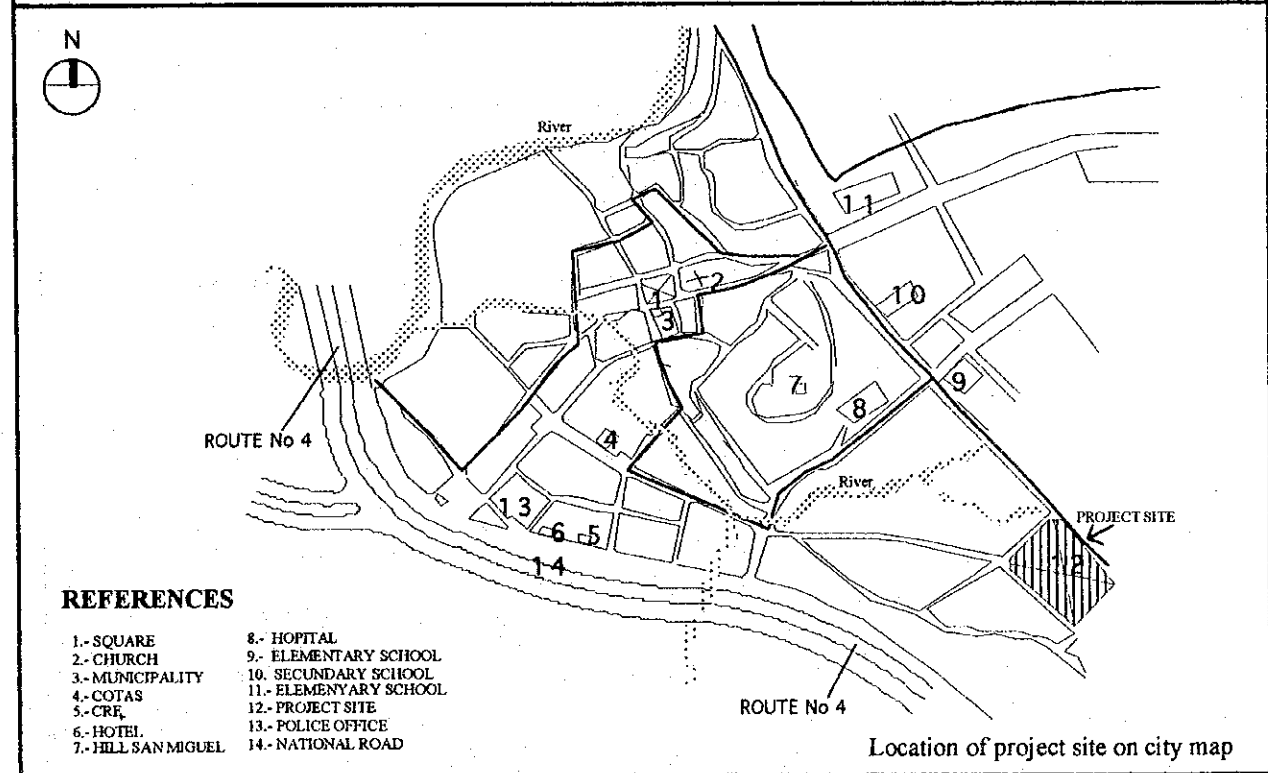
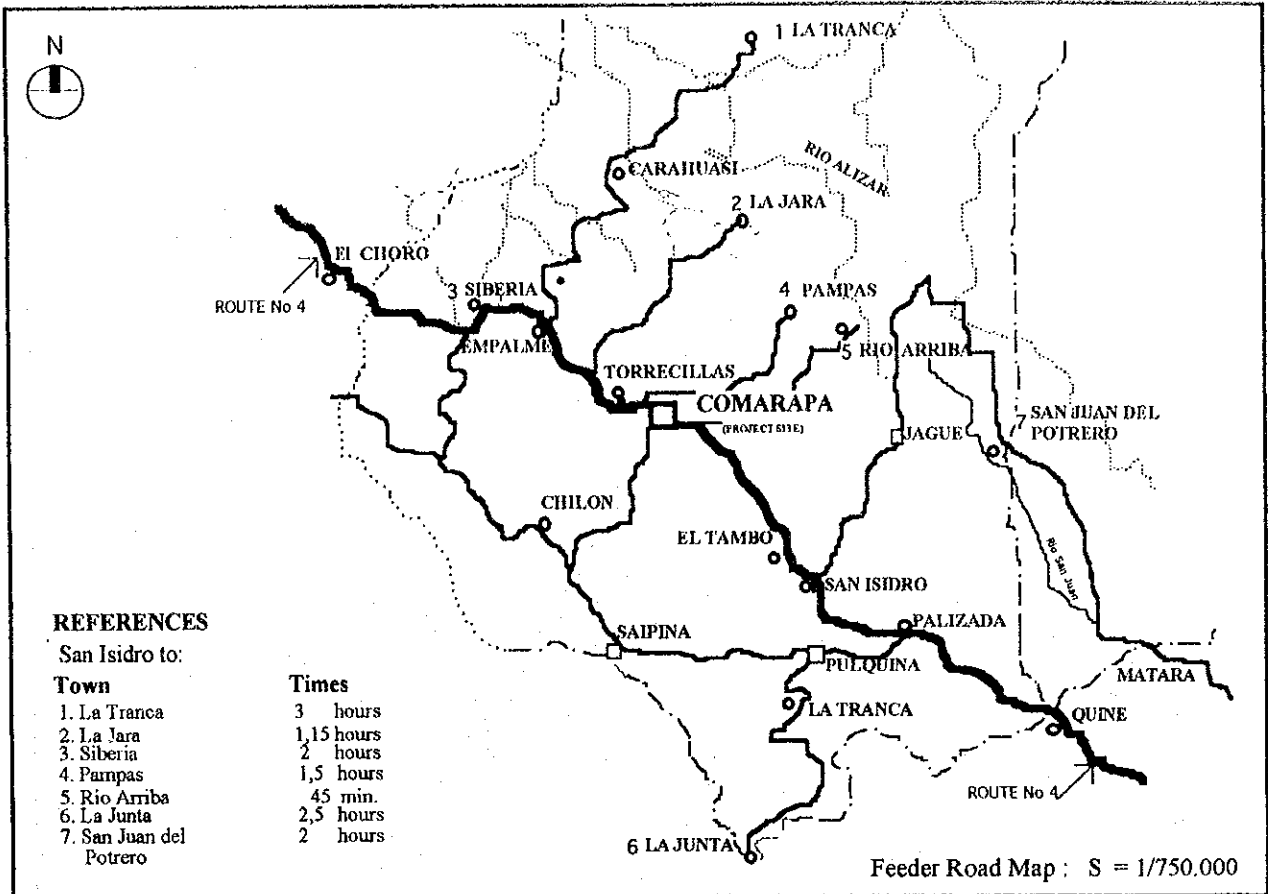


Fig. A.1.4-5 Proposed Project Site Location / Feeder Road Map
 — Comarapa —

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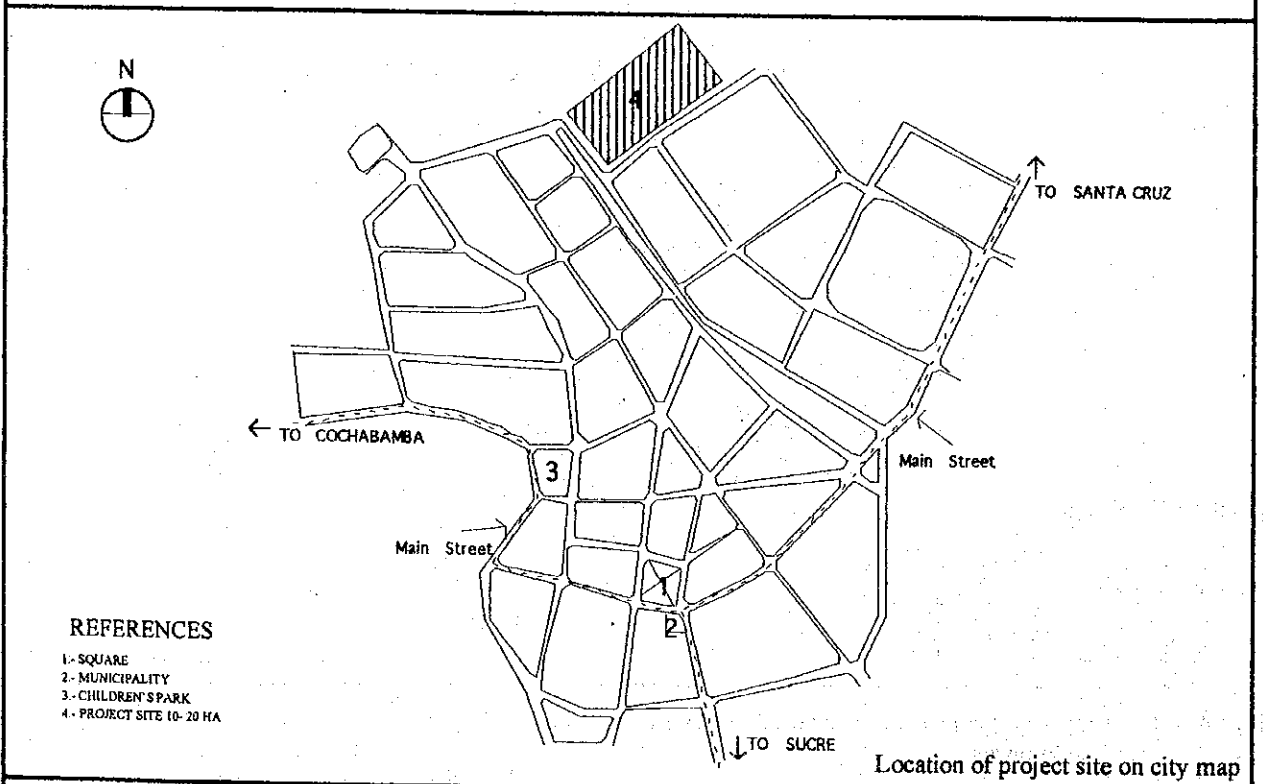
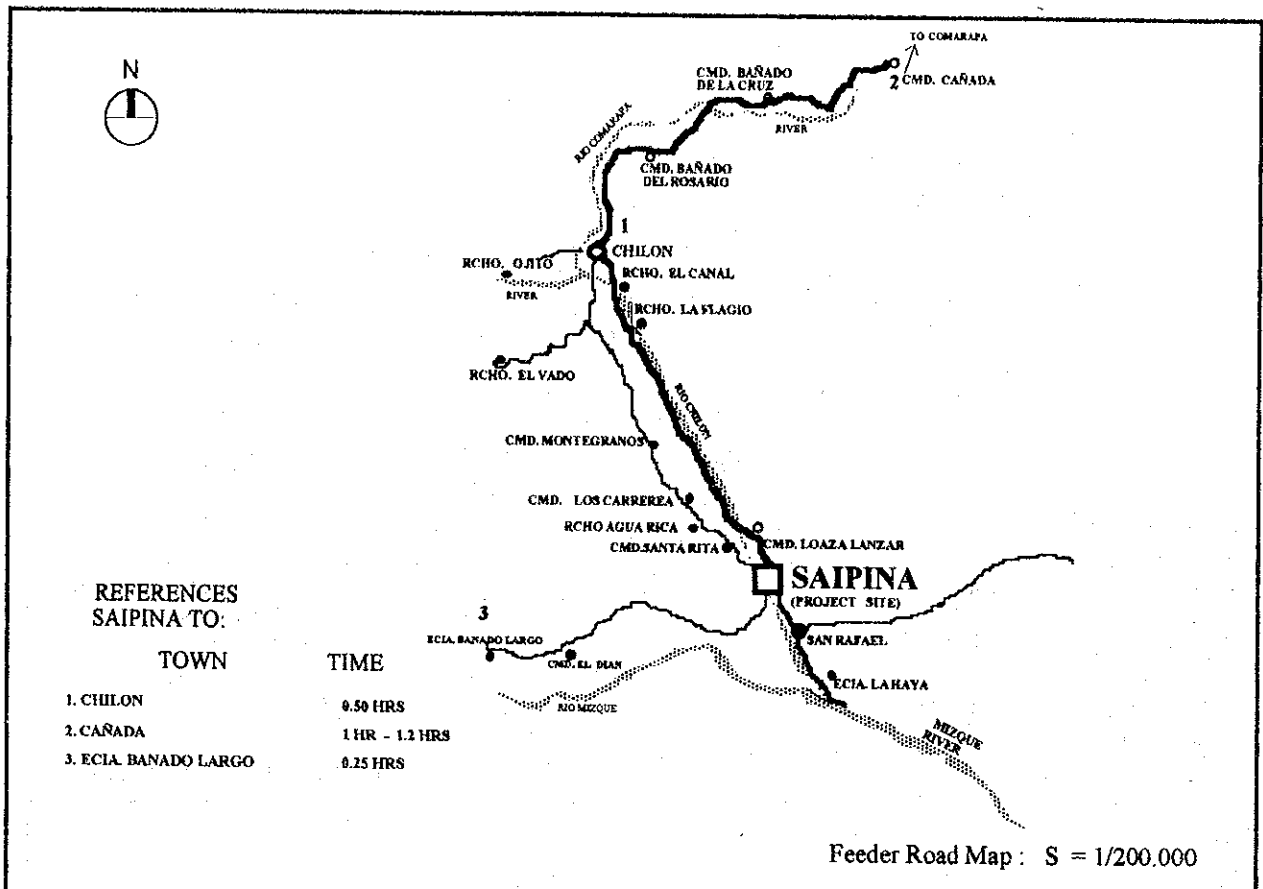


Fig. A.1.4-6 Proposed Project Site Location / Feeder Road Map — Saipina —

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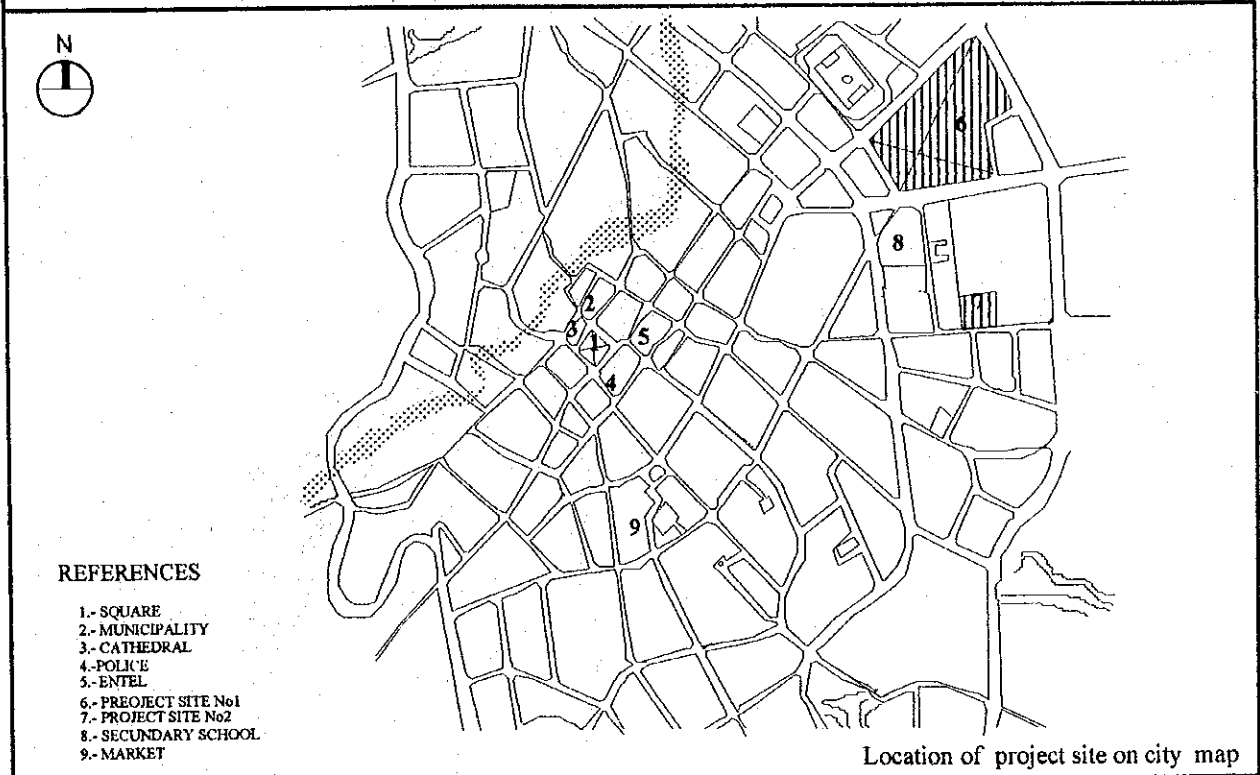
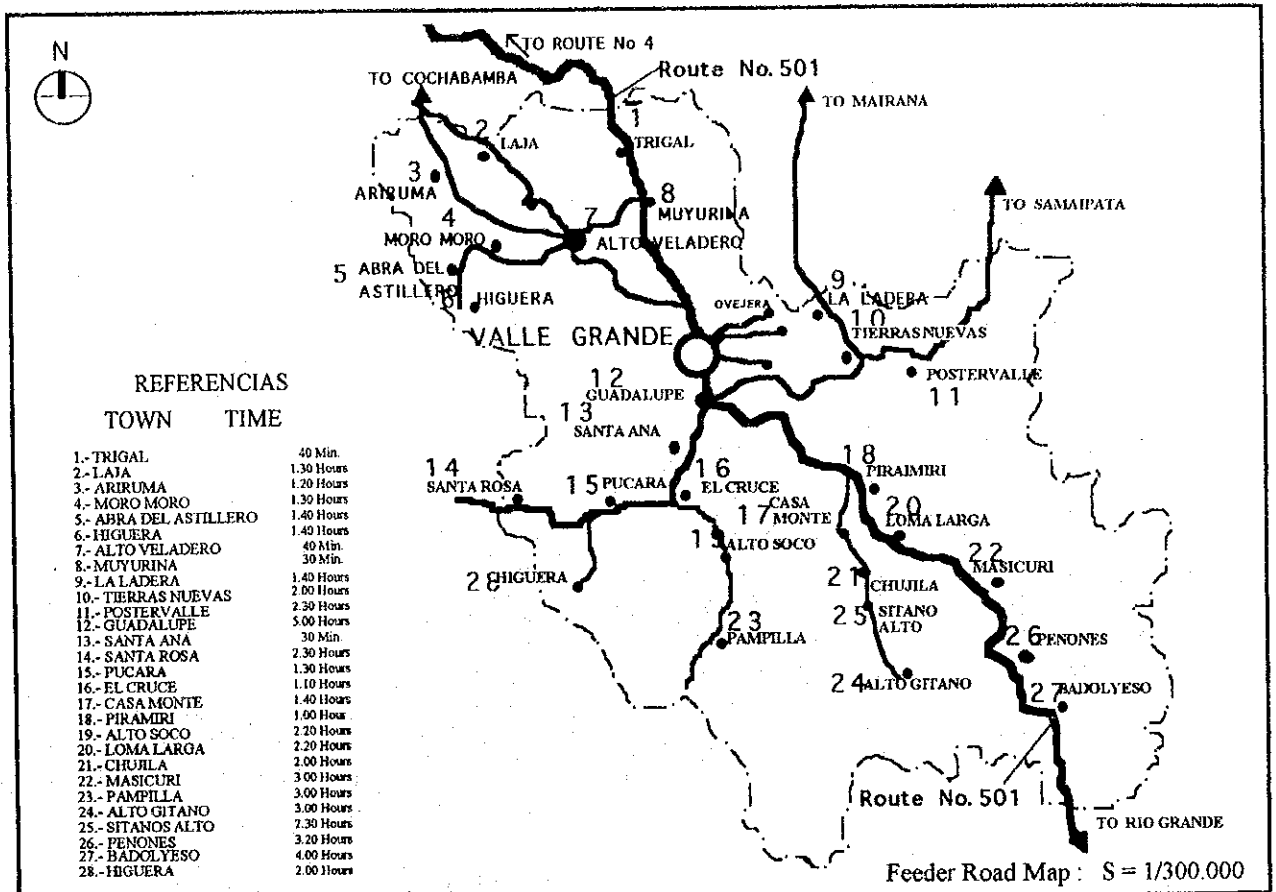


Fig. A.1.4-7 Proposed Project Site Location / Feeder Road Map
— Valle Grande —

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Japan International Cooperation Agency

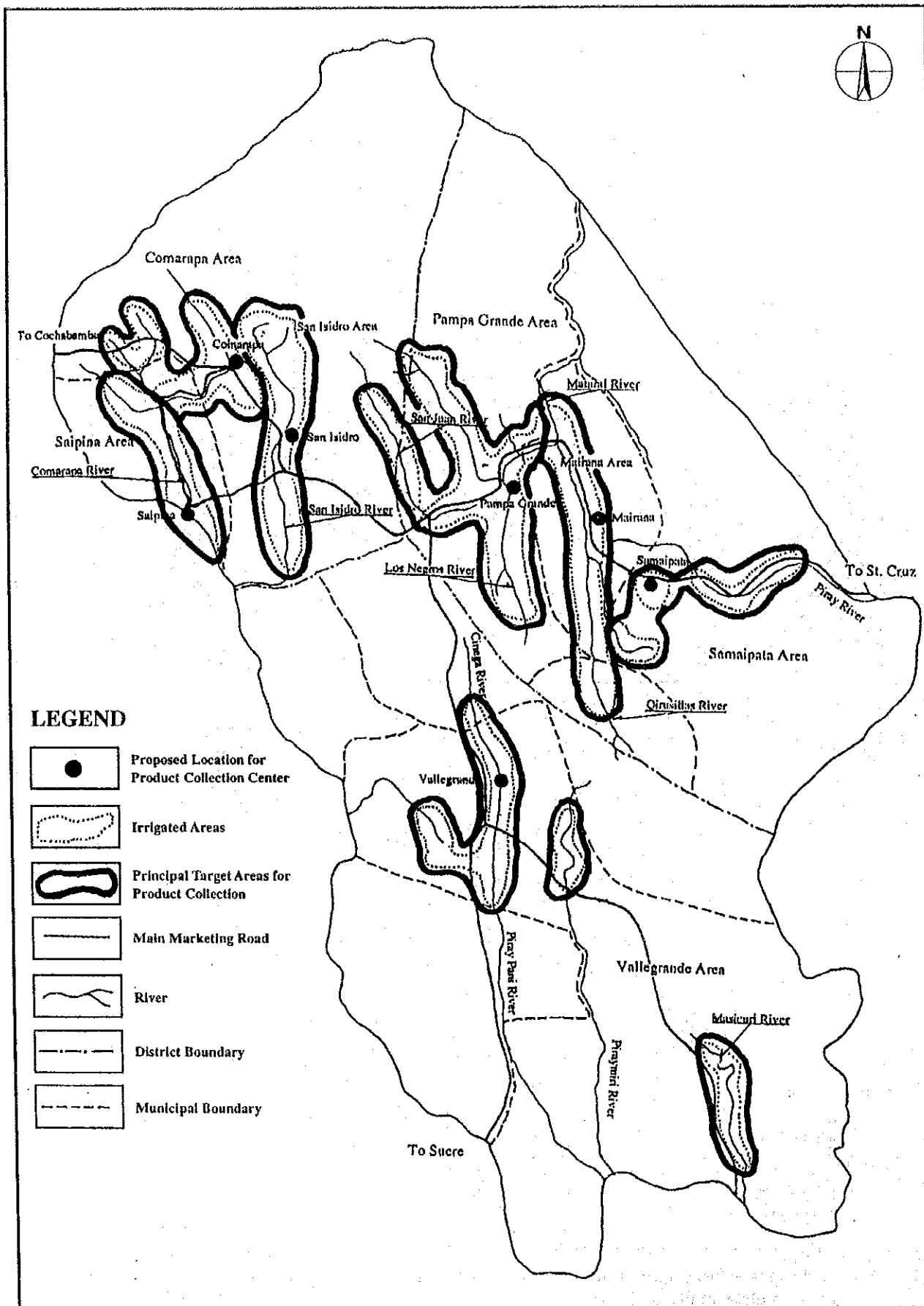


Fig. A.1.4-8 Target Areas for Products Collection

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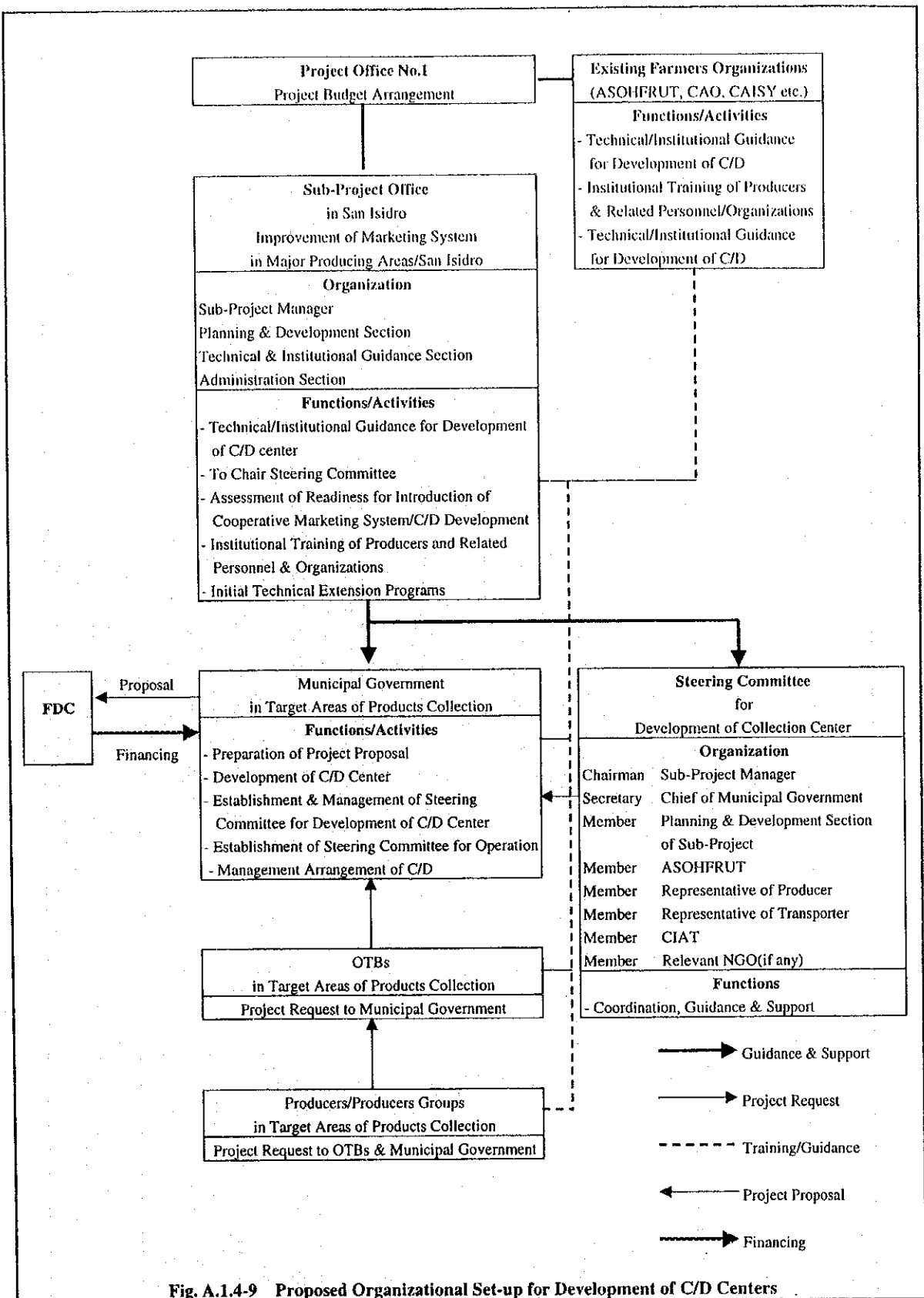


Fig. A.1.4-9 Proposed Organizational Set-up for Development of C/D Centers

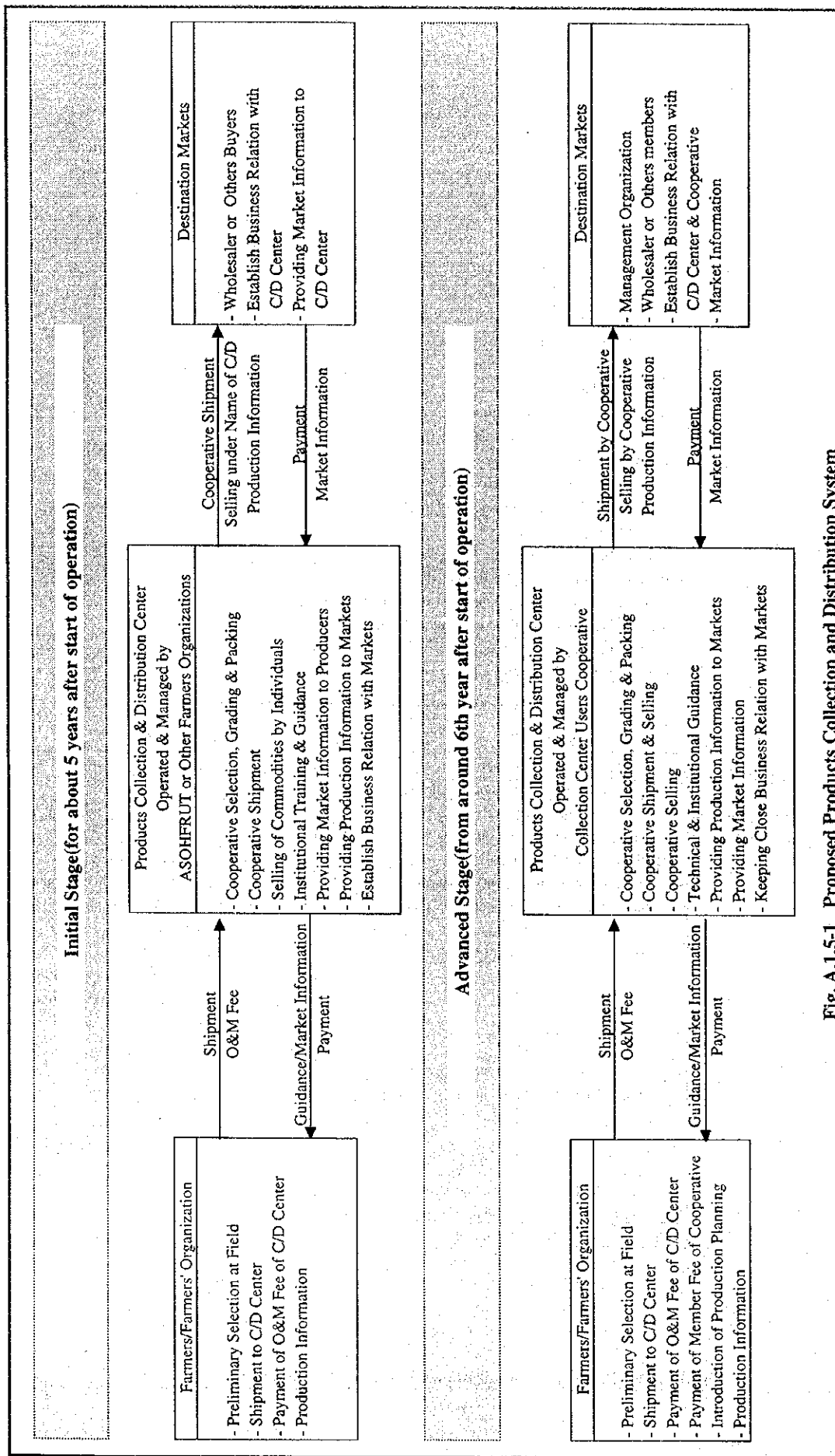


Fig. A.1.5-1 Proposed Products Collection and Distribution System

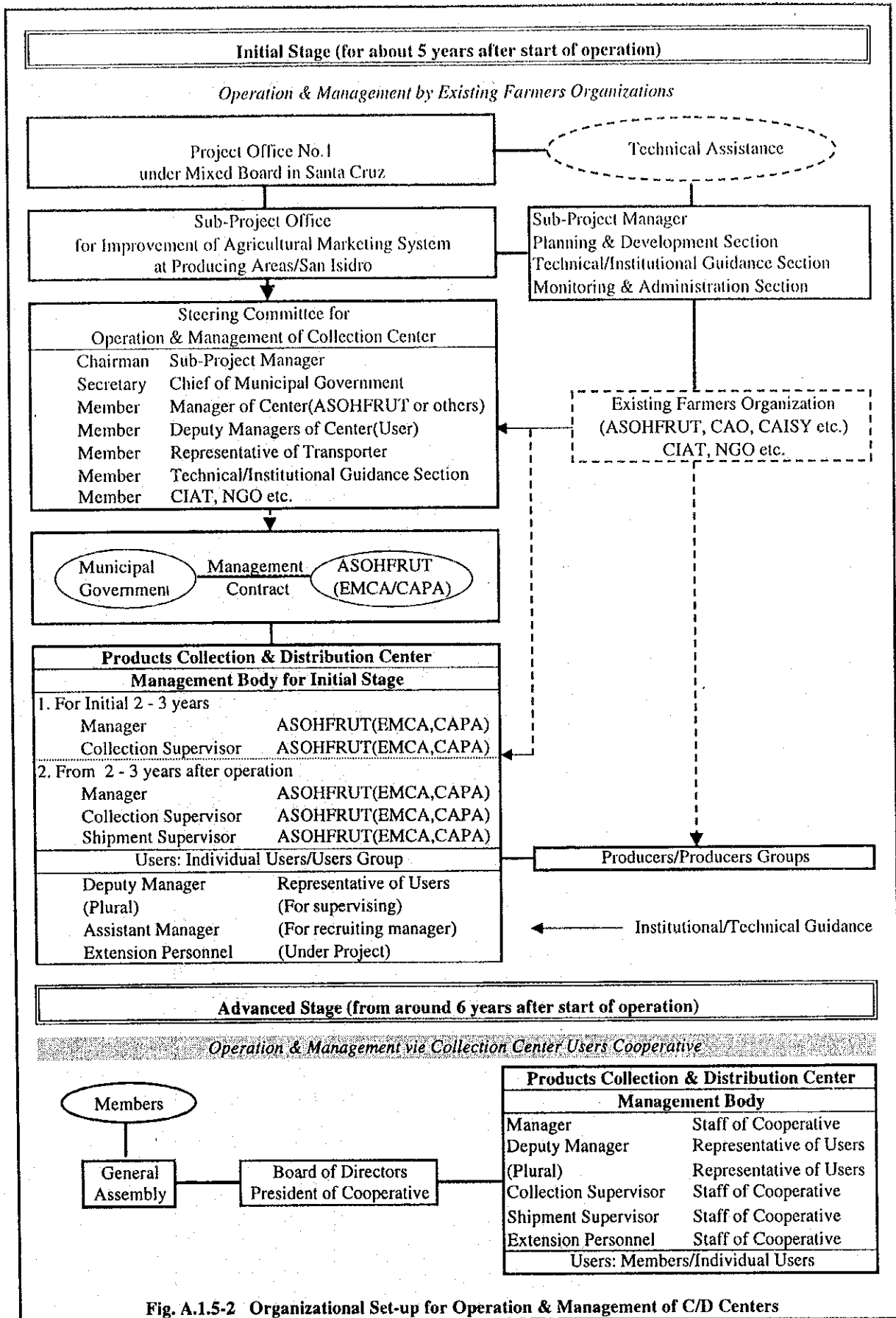


Fig. A.1.5-2 Organizational Set-up for Operation & Management of C/D Centers

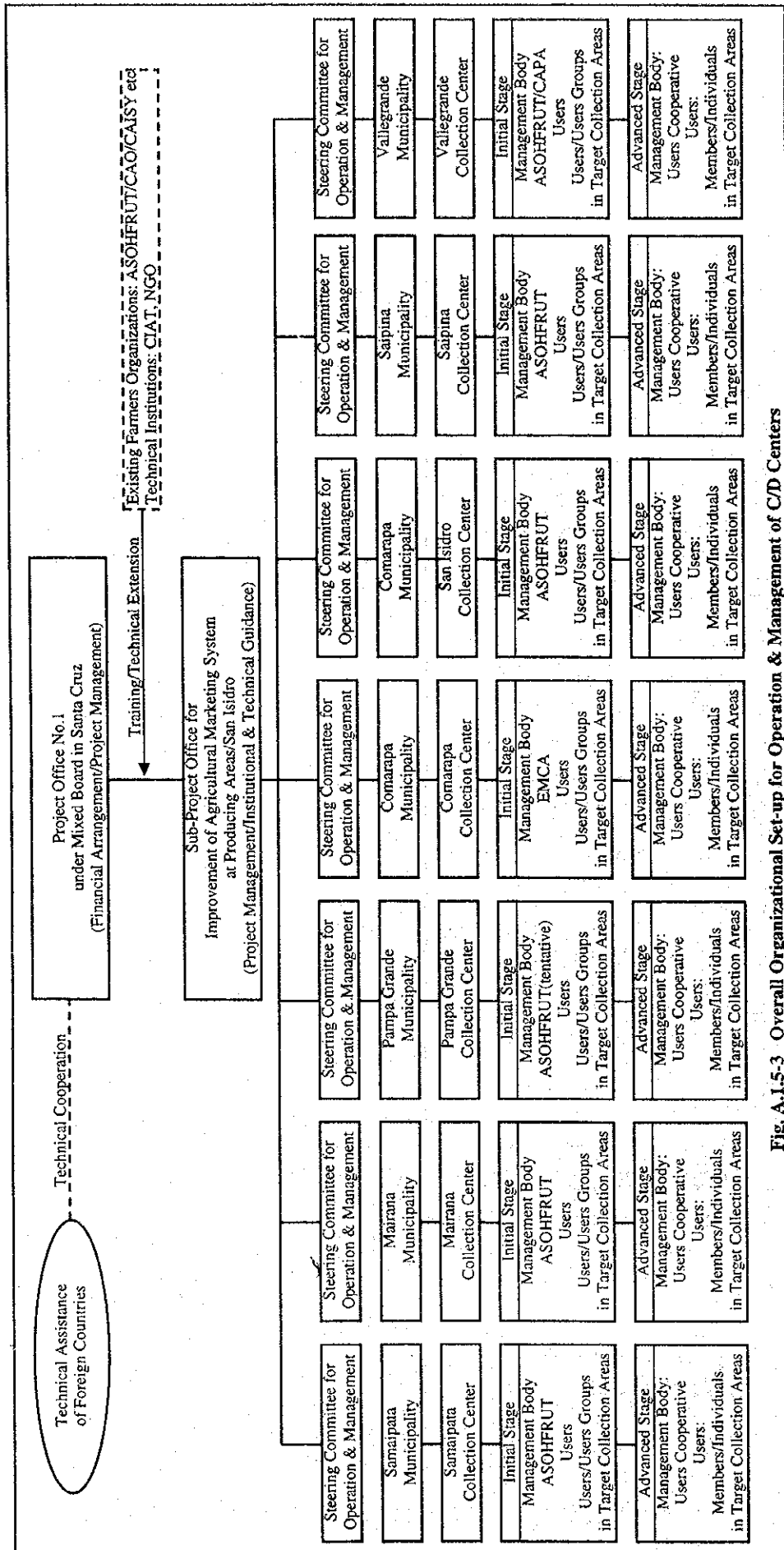


Fig. A.1.5-3 Overall Organizational Set-up for Operation & Management of C/D Centers

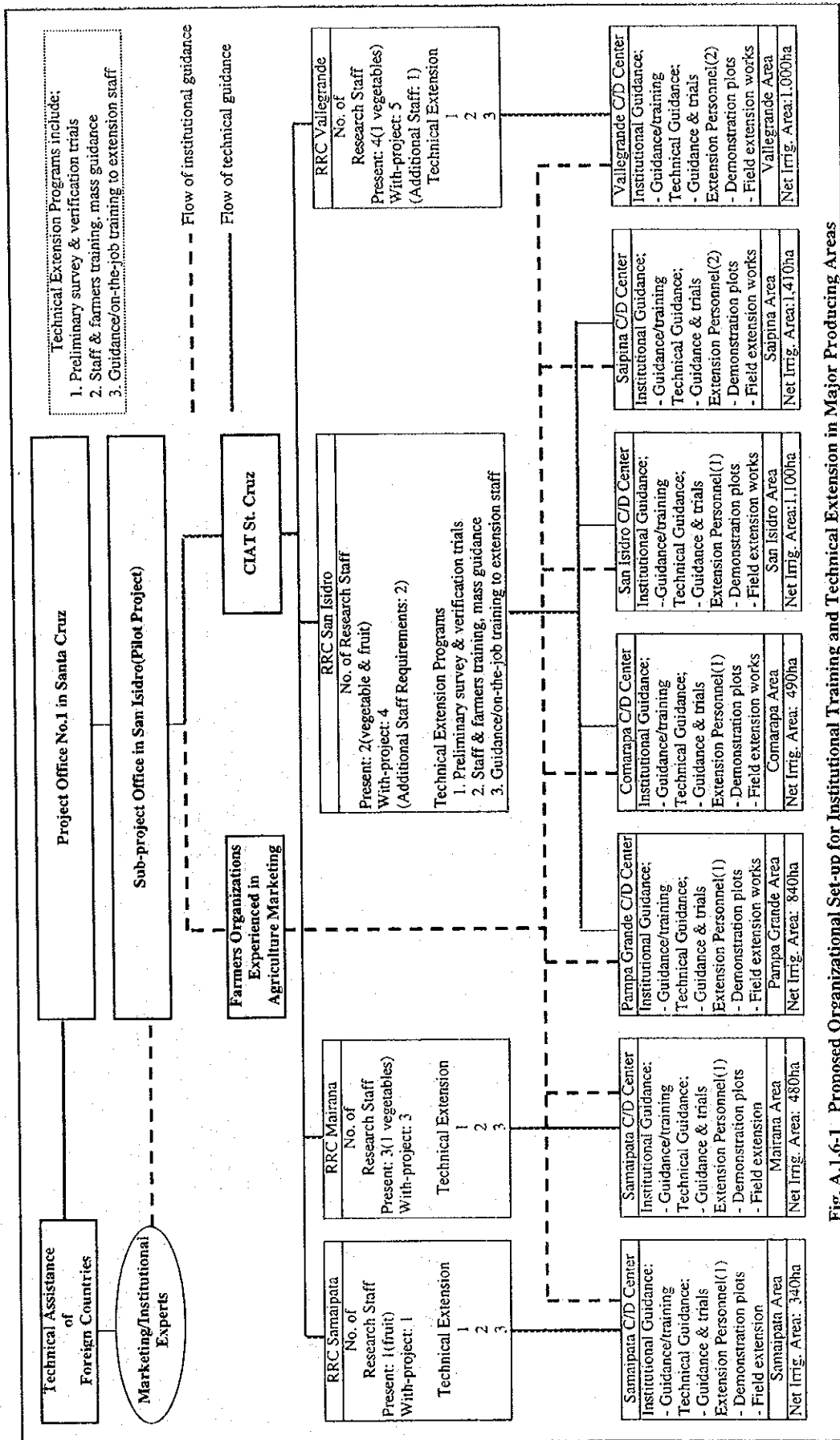


Fig. A.1.6-1 Proposed Organizational Set-up for Institutional Training and Technical Extension in Major Producing Areas

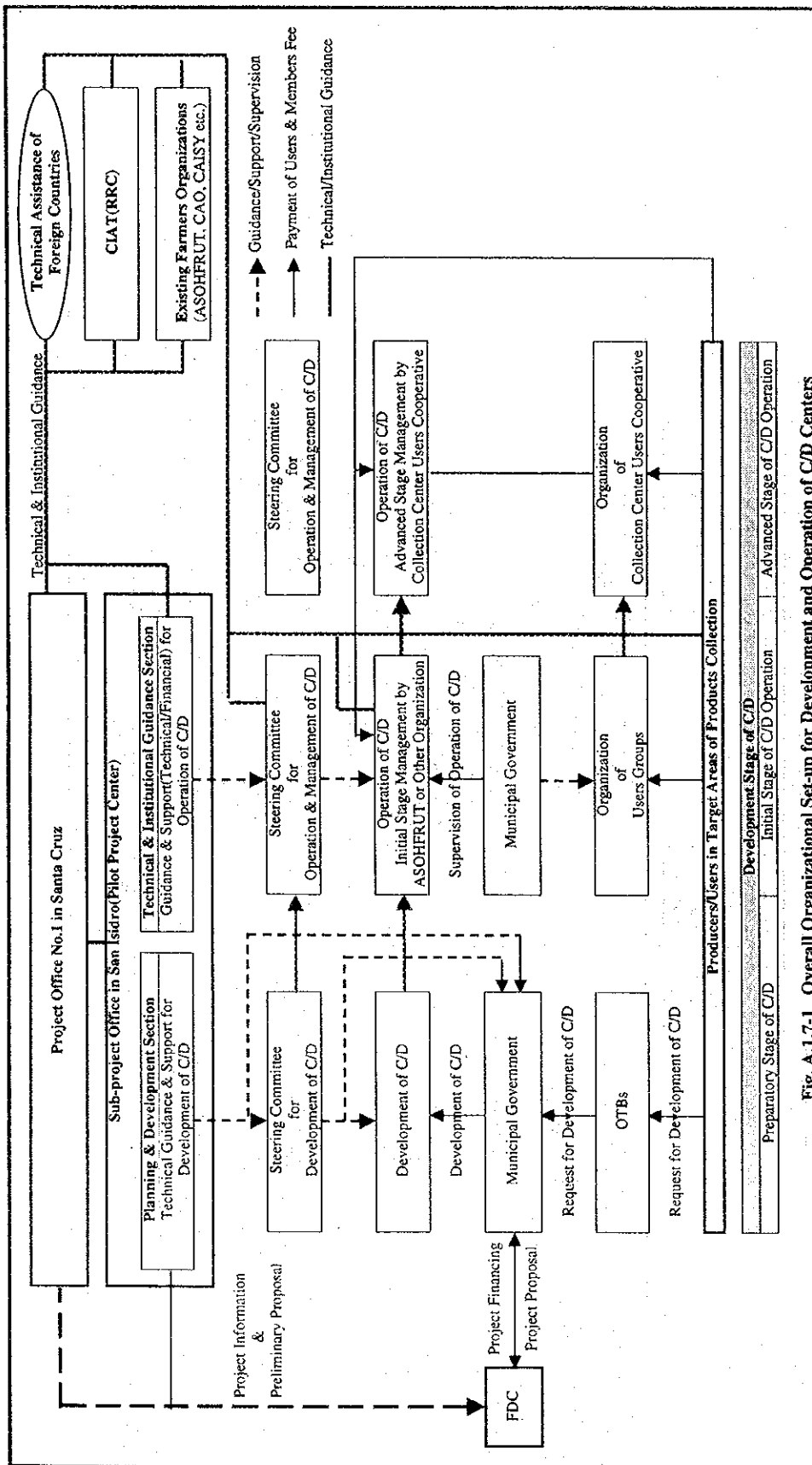


Fig. A.1.7-1 Overall Organizational Set-up for Development and Operation of C/D Centers

Table A.1.1-1 Shares of Santa Cruz Department in Country's Cropped Area and Crop Production from 1992/93 to 1996/97

Crops	1992 - 93		1993 - 94		1994 - 95		1995 - 96		1996 - 97		Average of 1992/93 - 1996/97	
	Cropped Area (%)	Production (%)	Cropped Area (%)	Production (%)	Cropped Area (%)	Production (%)	Cropped Area (%)	Production (%)	Cropped Area (%)	Production (%)	Cropped Area (%)	Production (%)
1. Cereals & Beans												
Maize	29	49	30	51	33	55	34	53	36	54	33	53
Wheat	46	67	34	43	44	63	42	41	49	62	44	57
Rice	67	74	72	78	68	79	67	82	66	74	68	78
Others	22	66	16	44	23	64	25	64	26	65	22	62
Sub-total	38	60	36	56	39	63	39	62	42	61	39	61
2. Vegetables												
Tomato	67	81	69	83	74	87	70	82	72	85	70	84
Peas	2	5	2	5	2	4	2	4	2	4	2	4
Sub-total	7	39	8	40	10	48	9	40	10	46	9	43
3. Tuber Crops												
Potatoes	3	5	3	6	4	8	4	8	4	8	4	7
Cassava	47	50	46	54	45	55	46	55	47	56	46	54
Sub-total	11	20	11	21	12	24	13	22	13	22	12	22
4. Fruits												
Banana/Plantain	26	27	28	31	26	25	26	26	26	26	27	27
Grape	2	2	2	2	3	3	4	4	4	3	3	3
Sub-total	24	26	26	29	24	24	25	26	25	25	25	26
5. Industrial Crops												
Soybeans	96	97	97	97	98	98	98	98	98	98	98	98
Sunflower	100	100	100	100	100	100	100	100	100	100	100	100
Sugarcane	80	77	80	80	81	81	83	83	83	82	81	81
Cotton	98	98	99	99	99	99	99	99	99	99	99	99
Groundnut	28	28	28	26	26	23	27	27	25	25	27	26
Sub-total	90	79	93	83	95	85	95	86	96	85	94	84
6. Others	1	0	1	1	1	1	1	1	1	1	1	1
Total	45	60	48	65	55	68	56	68	59	67	53	66

Remarks 1: "Others" in "1. Cereals & Beans" include sorghum, barley, & oat

Remarks 2: "6. Others" include alfalfa & coffee

Source: Anuario Estadístico 1997, INE

Table A.1.1-2 Present Land Use by Province

Province	Land Use Category										Irrigated Areas (ha)
	Cultivated Land		Temporary			Pasture Land			Others	Total	
	Area	Proportion(%)	Cultivated Land	Fallow Land	Pasture Land	Pasture Land	Others				
1. Florida	Area(ha)	13,014	4.4	11,915	1,674	12,832	50,361	77,881	1,317		
	Proportion(%)	16.7	-	15.3	2.1	16.5	64.7	100	14		
2. Caballero	Area(ha)	4,113	1.4	3,620	1,070	26,582	10,707	42,472	3,362		
	Proportion(%)	9.7	-	8.5	2.5	62.6	25.2	100	36		
3. Vallegrande	Area(ha)	13,066	4.4	12,774	6,574	31,028	67,685	118,353	1,832		
	Proportion(%)	11.0	-	11	6	26	57	100	19		
Valley Region Total	Area(ha)	30,193	10.2	28,309	9,318	70,442	128,753	238,706	6,511		
	Proportion(%)	12.6	-	11.9	3.9	29.5	53.9	100	69		
4. Cordillera	Area(ha)	30,868	10.4	30,478	20,120	268,084	699,765	1,018,837	2,675		
	Proportion(%)	3.0	-	3.0	2.0	26.3	68.7	100	28		
5. Chiquitos	Area(ha)	9,329	3.1	8,879	8,524	227,421	431,850	677,124	0		
	Proportion(%)	1.4	-	1.3	1.3	33.6	63.8	100	0		
6. Ichilo	Area(ha)	31,270	10.5	28,848	75,196	38,693	74,924	220,083	250		
	Proportion(%)	14.2	-	13.1	34.2	17.6	34.0	100	3		
7. Santiestevan	Area(ha)	39,198	13.2	17,319	48,676	72,616	28,513	189,003	0		
	Proportion(%)	20.7	-	9.2	25.8	38.4	15.1	100	0		
8. Warnes	Area(ha)	35,593	12.0	22,509	9,431	42,620	25,798	113,442	0		
	Proportion(%)	31.4	-	19.8	8.3	37.6	22.7	100	0		
9. Andres Ibanez	Area(ha)	69,480	23.4	59,550	22,744	45,115	93,144	230,483	0		
	Proportion(%)	30.1	-	25.8	9.9	19.6	40.4	100	0		
10. Other provinces Total	Area(ha)	21,131	7.1	14,660	112,454	1,206,906	1,264,958	2,605,449	30		
	Proportion(%)	0.8	-	0.6	4.3	46.3	48.6	100	0		
Department Total	Area(ha)	297,255	100.0	238,861	315,781	2,042,339	2,876,458	5,531,833	9,466		
	Proportion(%)	5.4	-	4.3	5.7	36.9	52.0	100	100		

Remarks 1: Cultivated Land --- Including permanently cultivated land and temporary cultivated land

Remarks 2: Irrigated Areas --- Irrigation command areas under canal system; source: Plan General de Riego, Department Santa Cruz, CODECRUZ, 1994

Source: Bolivia Anuario Estadístico del Sector Rural, 1994, Grupo DRU

Table A.1.1-3 Existing Irrigation Projects in Santa Cruz Department

Province	Municipality	Project Name	Water Resources	Gross Irrigation Command Area(ha)	No. of Beneficiaries	Irrigated Area per Beneficiary(ha)	
Florida	Quirusillas	Quirusillas Irrigation Project	Mataral River	100	67	1.5	
	Mairana	Filadelfia/Mendiola	Mataral River	317	140	2.3	
	Pampa Grande	Santa Rosa/Palmasola	Mataral River	200	67	3.0	
	Pampa Grande	Valle Hermoso/Algodonal	Los Negros River	700	633	1.1	
	Pampa Grande	Los Negros & others					
Pampa Grande Municipal Total				900	700	1.3	
Province Total				1,317	907	1.5	
Caballero	Comarapa	Pulquina Arriba	San Isidro River	298	199	1.5	
		Moco Moco	San Isidro River	40	27	1.5	
		El Tunal	San Isidro River	50	33	1.5	
		San Isidro	San Isidro River	589	500	1.2	
		Pulquina Abajo	San Isidro River	150	100	1.5	
		Butron	San Isidro River	100	67	1.5	
		San Isidro Area Total			1,227	926	1.3
	Comarapa/Rio Arriba	Comarapa River		194	91	2.1	
		La Canada	Comarapa River	147	98	1.5	
		San Juan del Potrero	San Juan River	150	60	2.5	
		Comarapa Municipal Total			1,718	1,175	1.5
	Saipina	Banados	Comarapa River	244	253	1.0	
		Chilon/Montegrando	Comarapa River	980	759	1.3	
		Saipina/San Rafael	Comarapa River	420	227	1.9	
	Saipina Municipal Total				1,644	1,239	1.3
	Province Total				3,362	2,414	1.4
	Vallegrande	Trigal	Torre Wayckho	Cinega River	60	46	1.3
El Trigal			Cinega River	42	28	1.5	
San Juan del Chaco			Cinega River	125	47	2.7	
Cochabambita			Cinega River	30	20	1.5	
Pampa Rendonda			Cinega River	50	33	1.5	
Trigal Municipal Total			307	174	1.8		
Vallegrande		Casas Viejas	Cinega River	10	46	0.2	
		Mankallpa	Cinega River	50	23	2.2	
		Murillo-San Ieronimo	Cinega River	100	30	3.3	
		Vallegrande	Cinega River	20	20	1.0	
		Canada del Sauce	Cinega River	10	13	0.8	
		Estancia Huayo	Cinega River	70	47	1.5	
		Huasa Canada	Cinega River	30	20	1.5	
		Cuevas	Cinega River	20	27	0.7	
		Temporal	Cinega River	30	27	1.1	
		Huantas	Cinega River	120	80	1.5	
		Guadalupe	Piraipani River	50	30	1.7	
		San Lorenzo	Piraipani River	35	23	1.5	
		Palmitas	Piraipani River	40	27	1.5	
		Naranjos	Mizque River	10	13	0.8	
		Chanara	Mizque River	40	29	1.4	
		Santa Ana	Santa Rosa River	30	60	0.5	
		Santa Rosa	Santa Rosa River	60	40	1.5	
		Piraymiri-Minas	Piraimiri River	160	107	1.5	
		Piraymiri Abajo	Piraimiri River	50	33	1.5	
		Masicuri	Masicuri River	60	40	1.5	
		San Blas-Ramada-La Raya	Tembladera River	80	53	1.5	
		Arenales	Masicuri River	50	33	1.5	
		Penones/Toco-Lajas	Masicuri River	20	6	3.3	
Bado el Yeso	Masicuri River	10	3	3.3			
Vallegrande Municipal Total				1,155	830	1.4	
Moro Moro	Pampa Negra	Cinega River	60	45	1.3		
	Tunila	Mizque River	20	13	1.5		
	Moro-moro Municipal Total			80	58	1.4	
Pucara	Huertas	Piraipani River	120	40	3.0		
	Salsipuedes	Santa Rosa River	20	6	3.3		
	Pampilla	Santa Elena	150	100	9.3		
Pucara Municipal Total				290	146	2.0	
Province Total				1,832	1,208	1.5	
Valley Region Total				6,511	4,529	1.4	
Cordillera	-	Parapeti River & others	-	2,675	1,486	1.8	
Ichilo	-	Yapacani River	Yapacani River	250	2	125.0	
German Busch	-	Paraguay River	Paraguay River	30	30	1.0	
Santa Cruz Total				9,466	6,047	1.6	

Remarks 1: Project with canal irrigation system; source: Plan General de Riego, Department Santa Cruz, CORDECRUZ, 1994

Remarks 2: "Mairana, Filadelfia/Mendiola" include pumping irrigation area

Source: Plan General de Riego, Department Santa Cruz, CORDECRUZ, 1994 and data presented by PRICRUZ

Table A.1.1-4 Estimated Current Cropped Areas and Crop Production in Valley Region by Province(1997)

Crops	Florida Province				Caballero Province				Vallegrande Province				Total Valley Region	
	Cropped Area (ha)	Share(%)	Production (000t)	Share(%)	Cropped Area (ha)	Share(%)	Production (000t)	Share(%)	Cropped Area (ha)	Share(%)	Production (000t)	Share(%)	Cropped Area (ha)	Production (000t)
1. Cereals & Beans														
Maize	15,000	47	33.0	47	2,000	6	4.4	6	15,000	47	33.0	47	32,000	70.4
Wheat					800	24	1.0	25	2,500	76	3.0	75	3,300	4.0
Beans	1,000	67	1.5	65					500	33	0.8	35	1,500	2.3
Others	500	53	0.5	50	150	16	0.2	20	300	32	0.3	30	950	1.0
Sub-total	16,500	44	35.0	45	2,950	8	5.6	7	18,300	48	37.1	48	37,750	77.7
2. Vegetables														
Potatoes	1,300	27	15.0	28	1,470	31	16.7	31	2,000	42	22.0	41	4,770	53.7
Tomato	500	33	8.5	34	750	50	12.8	51	250	17	3.8	15	1,500	25.1
Lettuce	400	100	8.0	100									400	8.0
Choclo					220	100	1.3	100					220	1.3
Others	550	28	4.4	28	1,040	54	7.7	49	350	18	3.5	22	1,940	15.6
Sub-total	2,750	31	35.9	35	3,480	39	38.5	37	2,600	29	29.3	28	8,830	103.7
3. Fruits														
Peach	250	56	2.5	56					200	44	2.0	44	450	4.5
Plum									100	100	1.0	100	100	1.0
Citrus	250	100	2.5	100									250	2.5
Others	170	33	1.7	33	40	8	0.4	8	300	59	3.0	59	510	5.1
Sub-total	670	51	6.7	51	40	3	0.4	3	600	46	6.0	46	1,310	13.1
4. Others														
Tobacco	550	100	0.8	100									550	0.8
Sugarcane	100	18	4.0	15	250	45	15.0	56	200	36	8.0	30	550	27.0
Sub-total	650	59	4.8	17	250	23	15.0	54	200	18	8.0	29	1,100	27.8
Total	20,570	-	82.4	-	6,720	-	59.5	-	21,700	-	80.4	-	48,990	222.3

Remarks 1: "Others" in 1. Cereals & Beans include groundnut & others

Remarks 2: "Others" in 2. Vegetables include green pepper, beans, peas, cabbage, onion, carrot etc.

Remarks 3: "Others" in 3. Fruits include plum, grapes, apple, cherimoya

Source:

Florida: Plan Participativo de Desarrollo Municipal Sostenible, 1997, Municipal de Samaipata

Data presented by CIAT & ASOFRUT, Mairana

Data presented by CIAT & municipal office, Pampa Grande

Caballero: Data presented by PRICRUZ

Estudio de Pre-factibilidad Proyecto Riego Puluquina Arriba-San Isidro-Puluquina Abajo, 1992, CORDECruz

Data presented by CIAT/ASOFRUT, San Isidro

Vallegrande: Plan Participativo de Desarrollo Municipal 1998 - 2002, Municipal de Vallegrande

Data presented by CIAT, Vallegrande

Table A.1.1-5 Current Annual Marketing Volumes and Destination Markets of Fruits and Vegetables Produced in Valley Region (1997)

Commodity	Items	Province			Valley Region Total
		Florida	Caballero	Vallegrande	
Potatoes	Production(t)	15,000	16,700	22,000	53,700
	Commercialization Rate(%)	85	90	80	85
	Marketing Volume(t)	12,750	15,030	17,600	45,380
	Destination Market: Share(%)				
	St. Cruz(%)	100	50	100	83
	Cochabamba(%)	0	50	0	17
	Local(%)	0	0	0	0
	Destination Market: Volume(t)				
	St. Cruz(t)	12,750	7,515	17,600	37,865
	Cochabamba(t)	0	7,515	0	7,515
Local(t)	0	0	0	0	
Tomato	Production(t)	8,500	12,800	3,800	25,100
	Commercialization Rate(%)	85	85	85	85
	Marketing Volume(t)	7,225	10,880	3,230	21,335
	Destination Market: Share(%)				
	St. Cruz(%)	90	20	95	55
	Cochabamba(%)	10	80	0	44
	Local(%)	0	0	5	1
	Destination Market: Volume(t)				
	St. Cruz(t)	6,503	2,176	3,069	11,747
	Cochabamba(t)	723	8,704	0	9,427
Local(t)	0	0	162	162	
Other Vegetables	Production(t)	12,400	9,000	3,500	24,900
	Commercialization Rate(%)	85	85	85	85
	Marketing Volume(t)	10,540	7,650	2,975	21,165
	Destination Market: Share(%)				
	St. Cruz(%)	80	60	95	75
	Cochabamba(%)	20	40	0	24
	Local(%)	0	0	5	1
	Destination Market: Volume(t)				
	St. Cruz(t)	8,432	4,590	2,826	15,848
	Cochabamba(t)	2,108	3,060	0	5,168
Local(t)	0	0	149	149	
Fruits	Production(t)	6,700	400	6,000	13,100
	Commercialization Rate(%)	85	85	85	85
	Marketing Volume(t)	5,695	340	5,100	11,135
	Destination Market: Share(%)				
	St. Cruz(%)	90	50	75	82
	Cochabamba(%)	0	50	0	2
	Local(%)	10	0	25	17
	Destination Market: Volume(t)				
	St. Cruz(t)	5,126	170	3,825	9,121
	Cochabamba(t)	0	170	0	170
Local(t)	570	0	1,275	1,845	
Total	Production(t)	42,600	38,900	35,300	116,800
	Commercialization Rate(%)	85	87	82	85
	Marketing Volume(t)	36,210	33,900	28,905	99,015
	Destination Market: Share(%)				
	St. Cruz(%)	91	43	95	75
	Cochabamba(%)	8	57	0	23
	Local(%)	2	0	5	2
	Destination Market: Volume(t)				
	St. Cruz(t)	32,810	14,451	27,320	74,581
	Cochabamba(t)	2,831	19,449	0	22,280
Local(t)	570	0	1,585	2,155	

Source: Results of study by JICA Study Team, 1998

Table A.1.1-6 Irrigation Development Plans in Santa Cruz Department

Province	Municipality	Project	Gross Irrigation Command Area(ha)		No. of Beneficiaries (households)	Present Status F/S in 1962 &
			Water Resources	Rehabilitation Expansion Total		
Florida	Mairana	Mairana Irrigation Project	317	1,425	1,742	740 assessed viable
	Caballero	Comarapa-Saipina-San Rafael Irrigation Project	1,755	590	2,345	638 Construction will start in Jan. 1999
Comarapa	San Juan del Potrero	Irrigation Project	150	30	180	F/S completed & assessed viable
	San Isidro	Irrigation Project	1,227	573	1,800	Pre-F/S in 1992 & assessed viable
Province Total			3,132	1,193	4,325	1,670
Vallegrande	Torrewayko	Irrigation Project	60	66	126	F/S completed & assessed viable
	Casas Viejas	Irrigation Project	10	213	223	F/S completed & assessed viable
Province Total			70	279	349	124
Valley Region Total			3,519	2,897	6,416	2,534
Cordillera	Taputa	Irrigation Project	89		89	F/S completed & assessed viable
	Igmiri - Aymini	Irrigation Project	48		48	F/S completed & assessed viable
	San Manuel	Irrigation Project	180		180	F/S completed & assessed viable
	Abapo - Izozog	Irrigation Project	2143		2143	F/S completed & assessed viable
	Tacuru	Irrigation Project	47		47	F/S completed & assessed viable
Province Total			2,615	108	2,615	636
Santa Cruz Department Total			6,134	2,897	9,031	3,170

Source: Plan General de Riego Department de Santa Cruz, 1996, Lahmeyer International-Arcotras-SID SRL.

Table A.1.2-1 Climatic Conditions in Major Producing Areas

Major Producing Area	Element	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	Annual Average
Samaipata	Monthly Rainfall (mm)	193	102	50	100	58	12	2	7	43	101	82	100	850
Mairana	Monthly Rainfall (mm)	194	85	38	86	37	6	1	1	25	56	113	84	726
	Maximum Temperature (°C)	29.9	27.7	28.9	28.8	26.5	26.1	25.8	25.7	29.2	29.2	28.5	28.8	27.9
	Minimum Temperature (°C)	17.0	16.9	16.5	13.8	12.3	13.1	13.6	11.1	15.2	17.2	17.1	18.2	15.2
	Mean Temperature (°C)	23.5	22.3	22.7	21.3	19.4	19.6	19.7	18.4	22.2	23.2	22.8	23.5	21.6
	Monthly Sunshine Hours (hrs)	173	181	166	208	214	200	225	169	212	206	195	201	2,350
Pampa Grande (Los Negros)	Monthly Rainfall (mm)	105	90	84	29	21	15	12	27	19	44	63	79	588
Comarapa	Monthly Rainfall (mm)	92	153	155	17	12	1	1	3	39	21	38	20	552
	Maximum Temperature (°C)	27.2	25.8	25.5	26.2	25.4	25.7	24.0	24.9	26.3	26.1	26.0	26.6	25.8
	Minimum Temperature (°C)	14.5	14.0	12.6	9.7	7.7	7.1	8.5	9.5	13.5	15.4	15.2	15.5	11.9
	Mean Temperature (°C)	20.8	19.9	19.1	17.9	16.5	16.4	16.2	17.2	19.9	20.8	20.6	21.0	226
Saipina	Monthly Rainfall (mm)	104	54	70	7	8	0	4	10	5	15	39	69	385
Vallegrande	Monthly Rainfall (mm)	125	132	77	14	6	2	1	3	53	51	32	34	530
	Maximum Temperature (°C)	24.0	22.7	22.0	22.5	21.8	22.6	22.4	22.0	24.9	25.0	23.5	24.9	23.2
	Minimum Temperature (°C)	13.6	13.7	13.3	11.3	9.2	8.6	9.2	9.3	11.5	12.4	13.1	14.6	11.7
	Mean Temperature (°C)	19.1	18.4	17.4	17.7	16.1	16.4	16.4	15.5	18.8	19.1	18.5	20.2	17.8

Source: Samaipata, Mairana, Comarapa, Saipina & Vallegrande: Servicio Nacional de Meteorología e Hidrología (Average of 1992 - 1997)

Source: Pampa Grande: Plan de Desarrollo Microregional de Florida, 1996, Dirección de Planificación, Prefectura del Dep. de St. Cruz

Table A.1.2-2 Features of Major Producing Areas: Socio-economic Aspects - 1/2

Samaipata Municipality		Capital: Samaipata	Area 3,060 km ²	Population Density: 3.0/km ²		
Population(1992)		Education(1992)		Economic Activity(1992)		
	No. %	Illiteracy Rate(%)		No. %		
Urban Population	2,735 30	- Male	19	Total Households	2,347 100	
Rural Population	6,407 70	- Female	33	Farm Household(assumed)	1,643 70	
Total Population	9,142 100	- Urban	14	Family Members per Household	3.9	
Male Population	4,903 54	- Rural	30	Population Employed in Agriculture		
Female Population	4,239 46	School Attendance Rate(%)		- Owner Farmer	3,595 69	
Distribution by Age	<15 42	- Elementary School	83	- Employed in Agriculture	1,009 19	
	15 - 64 54	- Secondary School	62	- Others	864 16	
	> 65 5			- Total	5,242 100	
Farm Household Economy(unit: Bs.)						
Farm Income						
	Crop Sector	Others	Non-farm Income	Total Income	Expenditures	Economic Surplus
Small Scale Farmer (<2.0ha)	13,265	722	8,993	22,980	13,141	9,839
Medium Scale Farmer(2.0-5.0ha)	10,833	943	2,190	13,966	9,408	4,558
Large Scale Farmer(.5.0ha)	20,483	5,266	11,211	36,960	18,015	18,945

Mairana Municipality		Capital: Mairana	Area 463 km ²	Population Density: 13.9/km ²		
Population(1992)		Education(1992)		Economic Activity(1992)		
	No. %	Illiteracy Rate(%)		No. %		
Urban Population	3,530 54	- Male	12	Total Households	1,697 100	
Rural Population	3,060 46	- Female	21	Farm Household	1,442 85	
Total Population	6,590 100	- Urban	12	Family Members per Household	3.8	
Male Population	3,395 52	- Rural	19	Population Employed in Agriculture		
Female Population	3,046 46	School Attendance Rate(%)		- Owner Farmer	2,136 60	
Distribution by Age	<15 40	- Elementary School	87	- Employed in Agriculture	599 17	
	15 - 64 56	- Secondary School	70	- Others	381 11	
	> 65 4			- Total	3,582 100	
Farm Household Economy(unit: Bs.)						
Farm Income						
	Crop Sector	Others	Non-farm Income	Total Income	Expenditures	Economic Surplus
Small Scale Farmer (<2.0ha)	10,381	429	1,197	12,007	6,989	5,018
Medium Scale Farmer(2.0-5.0ha)	13,614	0	3,500	17,114	9,816	7,298
Large Scale Farmer(.5.0ha)	22,243	12,341	2,330	36,914	11,560	25,354

Pampa Grande Municipality		Capital: Pampa Grande	Area 325 km ²	Population Density: 20.0/km ²		
Population(1992)		Education(1992)		Economic Activity(1992)		
	No. %	Illiteracy Rate(%)		No. %		
Urban Population	0 0	- Male	12	Total Households	1,904 100	
Rural Population	6,497 100	- Female	26	Farm Household	1,809 95	
Total Population	6,497 100	- Urban	-	Family Members per Household	3.4	
Male Population	3,508 54	- Rural	18	Population Employed in Agriculture		
Female Population	2,989 46	School Attendance Rate(%)		- Owner Farmer	2,779 61	
Distribution by Age	<15 41	- Elementary School	80	- Employed in Agriculture	585 13	
	15 - 64 55	- Secondary School	50	- Others	301 7	
	> 65 4			- Total	4,591 100	
Farm Household Economy(unit: Bs.)						
Farm Income						
	Crop Sector	Others	Non-farm Income	Total Income	Expenditures	Economic Surplus
Small Scale Farmer (<2.0ha)	19,830	200	6,119	26,149	11,082	15,067
Medium Scale Farmer(2.0-5.0ha)	27,597	25,792	1,000	54,389	22,684	31,705
Large Scale Farmer(.5.0ha)	48,656	1,167	6,333	56,156	41,632	14,524

Source: Population, Education & Economic activity: Indicators de Poblacion y Vivienda por Provincia y Seccion Municipal, Secretaria Departamental de Desarrollo Sostenible, 1996
 Farm Household Economy --- Results of Socio-economic Survey by JICA Study Team, 1998

Table A.1.2-2 Features of Major Producing Areas: Socio-economic Aspects - 2/2

Comarapa Municipality		Capital: Comarapa	Area 1,951 km ²	Population Density: 6.1/km ²			
Population(1992)		Education(1992)		Economic Activity(1992)			
	No.	%	Illiteracy Rate(%)		No.	%	
Urban Population	3,221	35	- Male	16	Total Households	3,388	144.354
Rural Population	8,625	94	- Female	36	Farm Household	2,880	85
Total Population	11,846	130	- Urban	15	Family Members per Household	3.5	
Male Population	6,087	67	- Rural	30	Population Employed in Agriculture		
Female Population	5,759	63	School Attendance Rate(%)		- Owner Farmer	4,188	80
Distribution by Age	<15	45	- Elementary School	85	- Employed in Agriculture	960	18
	15 - 64	51	- Secondary School	60	- Others	1,765	34
	> 65	4			- Total	7,071	135
Farm Household Economy(San Isidro; unit: Bs.)							
Farm Income							
	Crop Sector	Others	Non-farm Income	Total Income	Expenditures	Economic Surplus	
Small Scale Farmer (<2.0ha)	19,382	1,564	3,825	24,771	26,880	(2,109)	
Medium Scale Farmer(2.0-5.0ha)	46,830	4,795	11,653	63,278	20,300	42,978	
Large Scale Farmer(.5.0ha)	111,119	6,025	0	117,144	25,880	91,264	

Saipina Municipality		Capital: Saipina	Area 359 km ²	Population Density: 12.3/km ²			
Population(1992)		Education(1992)		Economic Activity(1992)			
	No.	%	Illiteracy Rate(%)		No.	%	
Urban Population	0	0	- Male	12	Total Households	1,124	66.2345
Rural Population	4,421	67	- Female	32	Farm Household	1,068	95
Total Population	4,421	67	- Urban	-	Family Members per Household	3.9	
Male Population	2,432	37	- Rural	21	Population Employed in Agriculture		
Female Population	1,989	30	School Attendance Rate(%)		- Owner Farmer	1,380	39
Distribution by Age	<15	45	- Elementary School	87	- Employed in Agriculture	524	15
	15 - 64	52	- Secondary School	64	- Others	729	20
	> 65	3			- Total	2,452	68
Farm Household Economy(San Isidro; unit: Bs.)							
Farm Income							
	Crop Sector	Others	Non-farm Income	Total Income	Expenditures	Economic Surplus	
Small Scale Farmer (<2.0ha)	21,430	400	2,020	23,850	10,474	13,376	
Medium Scale Farmer(2.0-5.0ha)	50,344	438	4,888	55,670	15,294	40,376	
Large Scale Farmer(.5.0ha)	113,106	0	0	113,106	50,039	63,067	

Vallegrande Municipality		Capital: Vallegrande	Area 2,702 km ²	Population Density: 6.2/km ²			
Population(1992)		Education(1992)		Economic Activity(1992)			
	No.	%	Illiteracy Rate(%)		No.	%	
Urban Population	6,341	98	- Male	14	Total Households	4,879	256.25
Rural Population	10,280	158	- Female	25	Farm Household	4,147	85
Total Population	16,621	256	- Urban	11	Family Members per Household	3.4	
Male Population	8,244	127	- Rural	24	Population Employed in Agriculture		
Female Population	8,377	129	School Attendance Rate(%)		- Owner Farmer	6,126	133
Distribution by Age	<15	41	- Elementary School	88	- Employed in Agriculture	614	13
	15 - 64	52	- Secondary School	75	- Others	3,444	75
	> 65	6			- Total	10,277	224
Farm Household Economy(San Isidro; unit: Bs.)							
Farm Income							
	Crop Sector	Others	Non-farm Income	Total Income	Expenditures	Economic Surplus	
Small Scale Farmer (<2.0ha)	19,597	19,436	1,171	40,204	10,567	29,637	
Medium Scale Farmer(2.0-5.0ha)	23,154	4,688	3,450	31,292	11,340	19,952	
Large Scale Farmer(.5.0ha)	42,145	4,780	4,800	51,725	41,285	10,440	

Source: Population, Education & Economic activity: Indicadores de Poblacion y Vivienda por Provincia y Seccion Municipal, Secretaria Departamental de Desarrollo Sostenible, 1996

Farm Household Economy --- Results of Socio-economic Survey by JICA Study Team, 1998

Table A.1.2-3 Estimated Existing Irrigated Areas in Major Producing Areas

Major Producing Areas Semaipata Area	Irrigation Project	Estimated Irrigated Areas by		Estimated Irrigated Areas by Pumping & Other Methods Irrigation Command Area (gross; ha)	Estimated Net Irrigation Command Area (net; ha)	Source/Remarks
		Estimated Irrigated Areas by Canal System Irrigation Command Area (gross; ha)	Estimated Irrigated Areas by Pumping & Other Methods Irrigation Command Area (gross; ha)			
Mairana Area	Filadelfia/Mendiola	317	120	400	340	Plan Participativo de Desarrollo Municipal Sostenible, 1997
	Quinusilas	100	(including pumping areas) (estimated equal to canal system)	(estimated at about 90%)	80	Plan General de Riego Departamento Santa Cruz, 1994, CORDECruz Findings of field survey
Area Total		417	120	480	480	Plan General de Riego Departamento Santa Cruz, 1994, CORDECruz
Pampa Grande Area	Los Negros, Valle Hermoso, Algodonal & others Santa Rosa/Palmasola	700	70 (estimated at 10% of canal system)	650 (estimated at about 85%)	190	Plan General de Riego Departamento Santa Cruz, 1994, CORDECruz
Area Total		200	20 (estimated at 10% of canal system)	190 (estimated at about 85%)	840	Plan General de Riego Departamento Santa Cruz, 1994, CORDECruz
Comarapa Area	Rio-Arriba	194	20 (estimated at 10% of canal system)	190 (estimated at about 90%)	190	Data presented by PRICRUZ
	La-Canada	147	15 (estimated at 10% of canal system)	150 (estimated at about 90%)	150	Plan General de Riego Departamento Santa Cruz, 1994, CORDECruz
	San Juan del Potrero	150	15 (estimated at 10% of canal system)	150 (estimated at about 90%)	150	Data presented by PRICRUZ
Area Total		491	50	490	490	
San Isidro Area	Pulquinaa Arriba, Moco Moco, El Tunal, San Isidro, Pulquina Abajo, Butron	1,227	-	1,100 (estimated at about 90%)	1,100	Plan General de Riego Departamento Santa Cruz, 1994, CORDECruz
Saipina Area	Banados	244	-	220 (estimated at about 90%)	220	Data presented by PRICRUZ
	Chilon	290	-	260 (estimated at about 90%)	260	Data presented by PRICRUZ
	Saipina/Monte Grande	613	-	550 (estimated at about 90%)	550	Data presented by PRICRUZ
	San Rafael	420	-	380 (estimated at about 90%)	380	Data presented by PRICRUZ
Area Total		1,567	-	1,410	1,410	
Vallegrande Area	Huantas & others (26 schemes in total)	1,155	-	1,000 (estimated at about 85%)	1,000	Plan General de Riego Departamento Santa Cruz, 1994, CORDECruz
Total Major Producing Areas					5,660	

Remarks 1: Estimated based on information presented in the source and findings of field survey
 Source: Plan General de Riego, Department Santa, Cruz, CORDECruz, 1994
 Remarks 2: Irrigated areas in Vallegrande Area -- see Table A.1.1-3

Table A.1.2-4 Features of Major Producing Areas: Production Aspects - Samaipata Area

1. General

Surface Area: 3,060 km ²	Related Institutions in the Area: CIAT Regional Research Station; ASOIFRUT Samaipata
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2. Present Land Use

Primary Crop Production Areas:	rainfed areas	Major Crops in Rainfed Areas:	maize, beans
Estimated Net Irrigated Areas:	340 ha	Estimated No. of Beneficiaries:	206
Averaged Irrigated Areas per Beneficiary:	1.7 ha	Primary Irrigation System:	pumping
Major Crops in Irrigated Areas:	potato, vegetable & fruit	Secondary Irrigation system:	small canal/pipe

3. Estimated Current Annual Cropped Area & Production

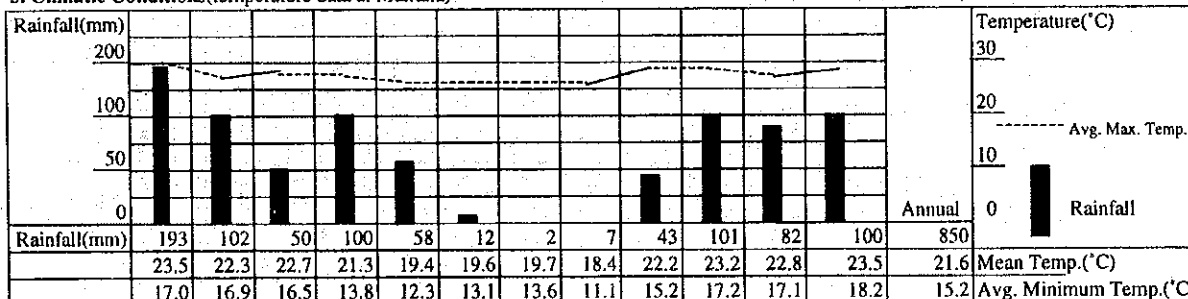
Crops	Cropped Area (ha)	Production (t)	Crops	Cropped Area (ha)	Production (t)	Remarks
1. Cereals & Beans			2. Vegetables			Others(cereals & beans) - groundnut etc.
Maize	2,900	6,380	Potatoes	470	5,170	
Beans	1,100	1,650	Tomato	70	1,050	
Wheat			Lettuce	50	1,000	
Others	50	50	Others	30	150	
Sub-total	4,050	8,080	Sub-total	620	7,370	Others(vegetables) - carrot, onion, peas
3. Fruits			4. Others			Others(fruits) - grape, plum, apple
Mandarin	70	700	Tobacco	760	1,060	
Orange	30	300	Others	80	3,200	
Peach	30	300	Sub-total	840	4,260	
Others	60	600				
Sub-total	190	1,900	Total	5,700	21,610	Others(others) - sugarcane etc.

4. Prevailing Cropping Calendar

Planting: ----- Harvesting: _____

Crops	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	Remarks
1. Potatoes				-----	-----	-----							Irrigation, tractor & disease restricting cropping season
2. Tomato							-----						
3. Lettuce									-----				Year round production practiced in limited scale
4. Carrot									-----				
5. Mandarin													Lack of storage facilities, unstable market price & fruit fly present constraints
6. Orange													
7. Peach													
8. Maize										-----			
9. Beans										-----			

5. Climatic Conditions (temperature data at Mairana)



Source: Servicio Nacional de Meteorología e Hidrología

Table A.1.2-5 Features of Major Producing Areas: Production Aspects - Mairana Area

1. General

Surface Area:	463 km ²	Related Institutions in the Area:	CIAT Regional Research Station; ASOHRUT Mairana
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2. Present Land Use

Primary Crop Production Areas:	rainfed areas	Major Crops in Rainfed Areas:	maize, beans
Estimated Net Irrigated Areas:	480 ha	Estimated No. of Beneficiaries:	140
Averaged Irrigated Areas per Beneficiary:	2.3 ha	Primary Irrigation System:	pumping
Major Crops in Irrigated Areas:	potato, vegetable & fruit	Secondary Irrigation system:	canal system

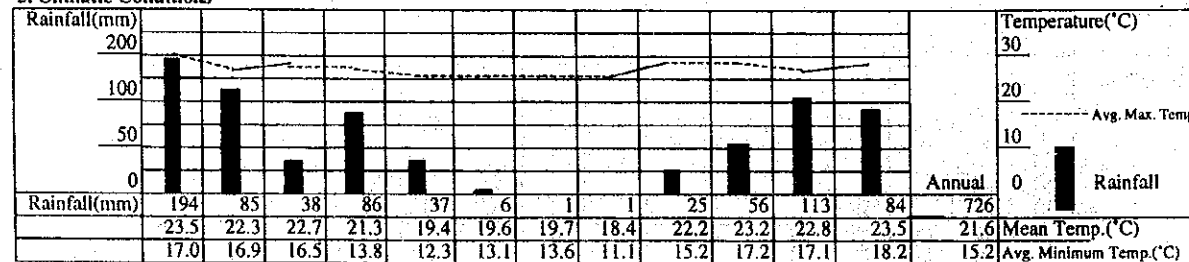
3. Estimated Current Annual Cropped Area & Production

Crops	Cropped Area (ha)	Production (t)	Crops	Cropped Area (ha)	Production (t)	Remarks
1. Cereals & Beans			2. Vegetables			Others(cereals & beans) - groundnut etc.
Maize	6,200	13,640	Potatoes	140	1,680	
Beans	700	1,050	Tomato	110	1,650	
Wheat			Lettuce	110	2,200	
Others	100	100	Others	100	1,000	
Sub-total	7,000	14,790	Sub-total	460	6,530	Others(vegetables) - carrot, green pepper
3. Fruits			4. Others			Others(fruits)
Peach	110	1,100	Tobacco	400	560	
Citrus	50	500	Others			
Grape	90	900	Sub-total	400	560	
Others						Others(others)
Sub-total	250	2,500	Total	8,110	24,380	

4. Prevailing Cropping Calendar

Crops	Planting: ----- Harvesting: _____												Remarks
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1. Potatoes													year round cultivation practiced
2. Tomato													major harvesting from Oct. to Mar. year round cultivation practiced
3. Lettuce													even distribution of production year round cultivation practiced
4. Carrot													major harvesting from May to Sept.
5. Others													year round cultivation practiced cabbage, cauliflower, broccoli
6. Peach/Plum													
7. Grape													
8. Mandarin													
9. Maize													
10. Beans													

5. Climatic Conditions



Source: Servicio Nacional de Meteorologia e Hydrogia

Table A.1.2-6 Features of Major Producing Areas: Production Aspects - Pampa Grande Area

1. General

Surface Area:	325 km ²	Related Institutions in the Area:	CIAT Regional Research Station; ASOFRUT Mairana
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2. Present Land Use

Primary Crop Production Areas:	rainfed areas	Major Crops in Rainfed Areas:	maize, beans
Estimated Net Irrigated Areas:	840 ha	Estimated No. of Beneficiaries:	700
Averaged Irrigated Areas per Beneficiary:	1.3 ha	Primary Irrigation System:	canal system
Major Crops in Irrigated Areas:	potato, vegetable & fruit	Secondary Irrigation system:	pumping

3. Estimated Current Annual Cropped Area & Production

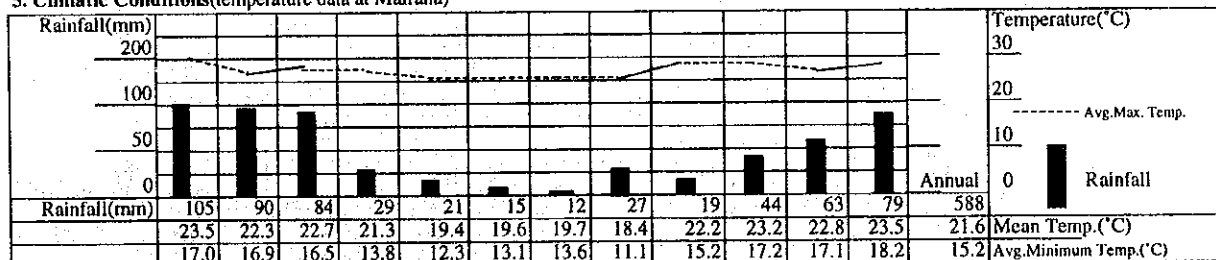
Crops	Cropped Area (ha)	Production (t)	Crops	Cropped Area (ha)	Production (t)	Remarks
1. Cereals & Beans			2. Vegetables			Others(cereals & beans) - groundnut etc.
Maize	2,500	5,500	Potatoes	300	3,600	
Beans	500	750	Tomato	240	4,080	Others(vegetables) - peas, green pepper
Wheat			Lettuce	240	4,800	
Others	100	100	Others	420	2,100	
Sub-total	3,100	6,350	Sub-total	1,200	14,580	
3. Fruits			4. Others			Others(fruits)
Peach	50	500	Tobacco			Others(others) - sugarcane
Citrus	80	800	Others	30	1,200	
Grape			Sub-total	30	1,200	
Others						
Sub-total	130	1,300	Total	4,460	23,430	

4. Prevailing Cropping Calendar

Planting: - - - - - Harvesting: _____

Crops	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	Remarks
1. Potatoes			- - - -				- - - -						Mar. - Jun.: Wecha variety Jul. - Oct.: Holland variety
2. Tomato	- - - -							- - - -					year round cultivation practiced indicating major growing season
3. Lettuce			- - - -	- - - -									year round cultivation practiced indicating major growing season
4. Green Pepper								- - - -					year round cultivation practiced indicating major growing season
5. Carrot/Onion			- - - -										one cropping season
6. Others	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	year round cultivation practiced cabbage, cauliflower, broccoli
7. Peach													
8. Orange													
9. Mandarin													
10. Maize													one cropping season; in non-irrigated areas
11. Beans													

5. Climatic Conditions (temperature data at Mairana)



Source: Servicio Nacional de Meteorología e Hidrología

Table A.1.2-7 Features of Major Producing Areas: Production Aspects - Comarapa Area

1. General

Surface Area:	1,951 km ²	Related Institutions in the Area:	PRICRUZ
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2. Present Land Use

Primary Crop Production Areas:	rainfed areas	Major Crops in Rainfed Areas:	maize, wheat
Estimated Net Irrigated Areas:	490 ha	Estimated No. of Beneficiaries:	249
Averaged Irrigated Areas per Beneficiary:	1.5 ha	Primary Irrigation System:	canal system
Major Crops in Irrigated Areas:	potato & vegetable	Secondary Irrigation system:	pumping

3. Estimated Current Annual Cropped Area & Production

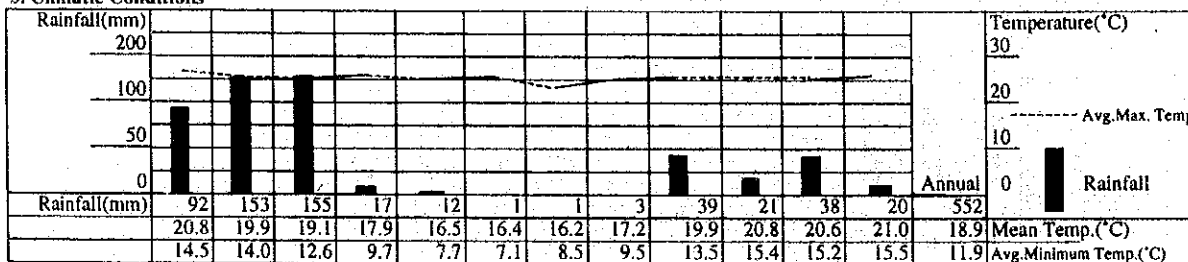
Crops	Cropped Area (ha)	Production (t)	Crops	Cropped Area (ha)	Production (t)	Remarks
1. Cereals & Beans			2. Vegetables			Others(cereals & beans) - groundnut etc.
Maize			Potatoes	290	3,190	
Beans			Tomato	100	1,700	
Wheat			Lettuce			
Others			Others	210	1,050	
Sub-total	n.a.	n.a.	Sub-total	600	5,940	Others(vegetables) - carrot, green pepper
3. Fruits			4. Others			Others(fruits)
Peach			Tobacco			Others(others)
Citrus			Others			
Grape			Sub-total	n.a.	n.a.	
Others	40	400				
Sub-total	40	400	Total	640	6,340	

4. Prevailing Cropping Calendar

Planting: ----- Harvesting: -----

Crops	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	Remarks
1. Potatoes			-----	-----			-----	-----					Mar/Apr - Jun/Jul:Wacha variety
2. Tomato							-----	-----					year round cultivation practiced indicating major growing season
3. Green Pepper			-----	-----									year round cultivation practiced indicating major growing season
4. Choclo						-----	-----						year round cultivation practiced indicating major growing season
5. Others													string beans, cabbage, carrot
6. Peach			-----	-----									early maturing variety late maturing variety
7. Strawberry							-----	-----					year round production indicating major growing season
8. Custard Apple													
9. Beans													generally non-irrigated areas
10. Wheat													

5. Climatic Conditions



Source: Servicio Nacional de Meteorología e Hidrología

Table A.1.2-8 Features of Major Producing Areas: Production Aspects - San Isidro Area

1. General

Surface Area:	1,227 ha	Related Institutions in the Area:	CIAT Regional Research Station; ASOFRUT San Isidro
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2. Present Land Use

Primary Crop Production Areas:	irrigated areas	Major Crops in Rainfed Areas:	limited
Estimated Net Irrigated Areas:	1,100 ha	Estimated No. of Beneficiaries:	926
Averaged Irrigated Areas per Beneficiary:	1.5 ha	Primary Irrigation System:	canal system
Major Crops in Irrigated Areas:	potato & vegetable	Secondary Irrigation system:	pumping

3. Estimated Current Annual Cropped Area & Production

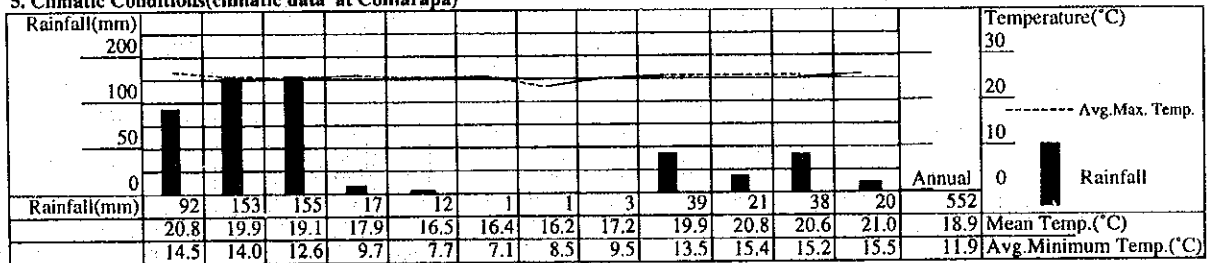
Crops	Cropped Area (ha)	Production (t)	Crops	Cropped Area (ha)	Production (t)	Remarks
1. Cereals & Beans			2. Vegetables			Others(cereals/beans) - groundnut etc.
Maize			Potatoes	500	6,000	
Beans			Tomato	220	3,740	
Wheat			Choclo	220	1,320	Others(vegetables) - carrot, green pepper
Others			Others	490	4,900	
Sub-total	n.a.	n.a.	Sub-total	1,430	15,960	
3. Fruits			4. Others			Others(fruits)
Peach			Tobacco			
Citrus			Others			
Grape			Sub-total	n.a.	n.a.	Others(others)
Others						
Sub-total	0	0	Total	1,430	15,960	

4. Prevailing Cropping Calendar

Planting: ----- Harvesting: -----

Crops	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	Remarks
1. Potatoes			-----	-----			-----	-----					Mar/Apr - Jun/Jul: Wecha variety Jul/Aug - Oct/Nov: Holland variety
2. Tomato	-----							-----	-----				year round cultivation practiced indicating major growing season
3. Choclo							-----	-----					one cropping season
4. Onion				-----	-----								one cropping season
5. Peach													

5. Climatic Conditions (climatic data at Comarapa)



Source: Servicio Nacional de Meteorología e Hidrología

Table A.1.2-9 Features of Major Producing Areas: Production Aspects - Saipina Area

1. General

Surface Area:	359 km ²	Related Institutions in the Area:	ASOFRUT Saipina
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2. Present Land Use

Primary Crop Production Areas:	irrigated areas	Major Crops in Rainfed Areas:	limited
Estimated Net Irrigated Areas:	1,410 ha	Estimated No. of Beneficiaries:	140
Averaged Irrigated Areas per Beneficiary:	1.4 ha	Primary Irrigation System:	canal system
Major Crops in Irrigated Areas:	potato, vegetable & sugarcane		

3. Estimated Current Annual Cropped Area & Production

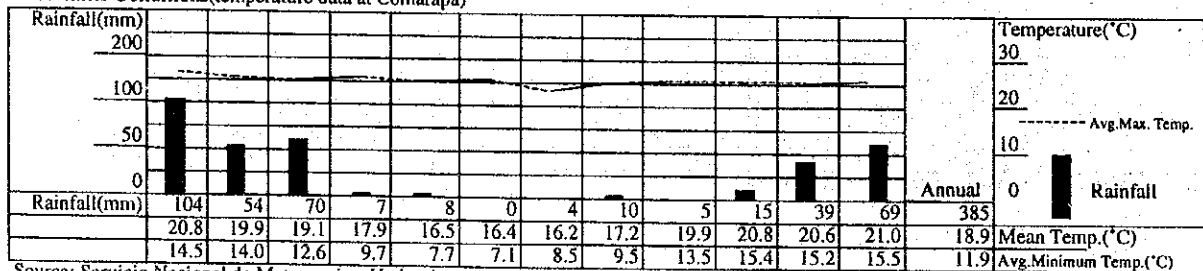
Crops	Cropped Area (ha)	Production (t)	Crops	Cropped Area (ha)	Production (t)	Remarks
1. Cereals & Beans			2. Vegetables			Others(cereals & beans)
Maize			Potatoes	680	7,480	
Beans			Tomato	430	7,310	Others(vegetables) - beans, peas, onion
Wheat			Lettuce			
Others			Others	340	1,700	
Sub-total	n.a.	n.a.	Sub-total	1,450	16,490	
3. Fruits			4. Others			Others(fruits)
Peach			Sugarcane	250	15,000	Others(others)
Citrus			Others			
Grape			Sub-total	250	15,000	
Others						
Sub-total	n.a.	n.a.	Total	1,700	31,400	

4. Prevailing Cropping Calendar

Planting:----- Harvesting:-----

Crops	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	Remarks
1. Potatoes			-----		-----			-----					Mar-Jun planting: Weicha variety
2. Tomato			-----		-----			-----					Aug/Sep planting: Holland variety year round cultivation practiced
3. Onion		-----	-----										major cropping season cultivation in other seasons limited
4. Green Pepper		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	year round cultivation practiced
5. Others													cabbage, carrot, lettuce
6. Water Melon													
7. Mango													
8. Sugarcane													
9. Beans													generally non-irrigated areas
10. Maize													

5. Climatic Conditions (temperature data at Comarapa)



Source: Servicio Nacional de Meteorología e Hidrología

Table A.1.2-10. FEATURES OF MAJOR PRODUCING AREAS: PRODUCTION ASPECTS-VALLEGRANDE AREA

1. General

Surface Area:	2,702 km ²	Related Institutions in the Area:	CIAT Regional Research Station; ASOFRUT Vallegrande
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2. Present Land Use

Primary Crop Production Areas:	rainfed areas	Major Crops in Rainfed Areas:	maize, wheat
Estimated Net Irrigated Areas:	1,000 ha	Estimated No. of Beneficiaries:	830
Averaged Irrigated Areas per Beneficiary:	1.4 ha	Primary Irrigation System:	canal system
Major Crops in Irrigated Areas:	potato, vegetable, fruit & sugarcane		

3. Estimated Current Annual Cropped Area & Production

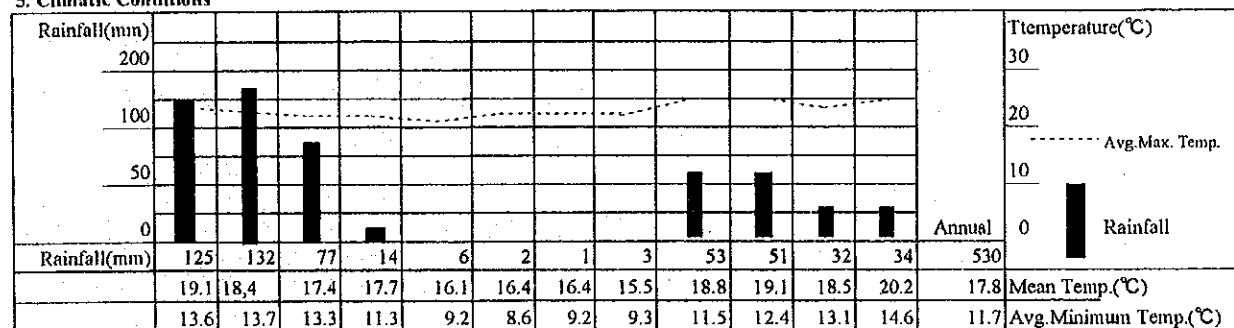
Crops	Cropped Area (ha)	Production (t)	Crops	Cropped Area (ha)	Production (t)	Remarks
1. Cereals & Beans			2. Vegetables			Others(cereals & beans)
Maize	6,200	13,640	Potatoes	900	9,900	- groundnut etc.
Beans			Tomato	100	1,500	
Wheat	900	1,080	Lettuce			Others(vegetables)
Others			Others	50	500	- carrot, green pepper
Sub-total	7,100	14,720	Sub-total	1,050	11,900	
3. Fruits			4. Others			Others(fruits)
Peach	120	1,200	Sugarcane	200	8,000	
Plum	50	500	Others			
Apple	70	700	Sub-total	200	8,000	Others(others)
Others	110	1,100				
Sub-total	350	3,500	Total	8,700	38,120	

4. Prevailing Cropping Calendar

Planting: - - - - - Harvesting: _____

Crops	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	Remarks
1. Potatoes													high land low land subtropical area
2. Tomato (low land)										- - - - -	- - - - -		one cropping season frost restrict cropping season
3. Green Pepper (low land)										- - - - -	- - - - -		one cropping season frost restrict cropping season
4. Green Pepper (low land)													year round cultivation practiced
5. Others													peas, cabbage, carrot, lettuce
6. Peach													low land & high land
7. Plum													
8. Apple													
9. Others													orange, mandarine
10. Maize													generally non-irrigated areas
11. Wheat													

5. Climatic Conditions



Source: Servicio Nacional de Meteorología e Hidrología

File: Tab A.1.2-10

