


JAPAN INTERNATIONAL COOPERATION AGENCY

DEPARTMENT OF SUSTAINABLE DEVELOPMENT
PREFECTURE OF SANTA CRUZ DEPARTMENT
GOVERNMENT OF THE REPUBLIC OF BOLIVIA

FEASIBILITY STUDY
FOR THE IMPROVEMENT OF AGRICULTURAL MARKETING SYSTEM
IN
SANTA CRUZ

ANNEX

JUNE 1999

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IN
SANTA CRUZ**

ANNEXES

JUNE 1999

**SYSTEM SCIENCE CONSULTANTS INC.
NIPPON KOEI CO., LTD.**

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Units of Measurement

Bs	Bolivianos, Bolivian currency
US \$	US dollars, US currency: US\$ 1.00 = Bs. 5.62
mm	millimeter(s)
cm	centimeter(s)
m	meter(s)
km	kilometer(s)
km ²	square kilometer(s)
ha	hectare(s)
m ²	square meter(s)
kg	kilogram(s)
t	ton
arroba(s) / @	1 arroba = 25 lbs. = 11.5 kg
quintal	1 quintal = 100 lbs. = 46.5 kg
arroma	bunch, weight depends on the product
bolsa	sack, weight depends on the product
caja	box, weight depends on the product
canasta	basket, weight depends on the product
racimo	stalk, weight depends on the product
%	percent
°C	degree(s) centigrade
db	decibel(s)

Abbreviations

ACPAMA	Association of Merchants
AIPPA	Integral Association of Small-scale Agricultural and Livestock Producers
AMALA	Abasto Market Lake Alalai Association
ANAPO	National Association of Vegetable Oil Crops
ASOHFRUT	Association of Fruit and Vegetable Producers
ASOPROCE	Association of Cereal Products Suppliers
ASPROA	Association of Small-scale Livestock Producers
IDB	Inter-American Development Bank
C/D	Collection/Distribution
CADEX	House of Exporters of Santa Cruz
CAINCO	House of Industry and Commerce of Santa Cruz
CAISY	Integral Livestock Cooperative of San Juan de Yapacani
CAO	House of Agricultural and Livestock Farmers of the East
CIAT	Center of Tropical Agricultural Investigation
CIPCA	Center of Investigation and Promotion of the Farmer
CLISA	Clean City Corporation
COB	Bolivian Labor Headquarters
CODER	Departmental Council of Irrigation
CORACA	Agrarian Farmers' Corporation
CORDECRUZ	Regional Development Corporation of Santa Cruz
CRAMA	Regional Council of Livestock Supply and Market
DF/R	Draft Final Report
DNMA	National Office of Agriculture and Livestock Marketing
EFA	Railroad Company
EFO	Railroad Company of the East
EIA	Environmental Impact Evaluation
EMCA	Livestock Commercializing Company
EMDELU	Municipal Company of Urban Cleaning
ENAFER	Railroad Company of Peru
ENDE	National Company of Electricity
F/R	Final Report
F/S	Feasibility Study
FAO	United Nations Organization for Agriculture and Nutrition
FDC	Farmer Development Fund
FSE	Social Emergency Fund

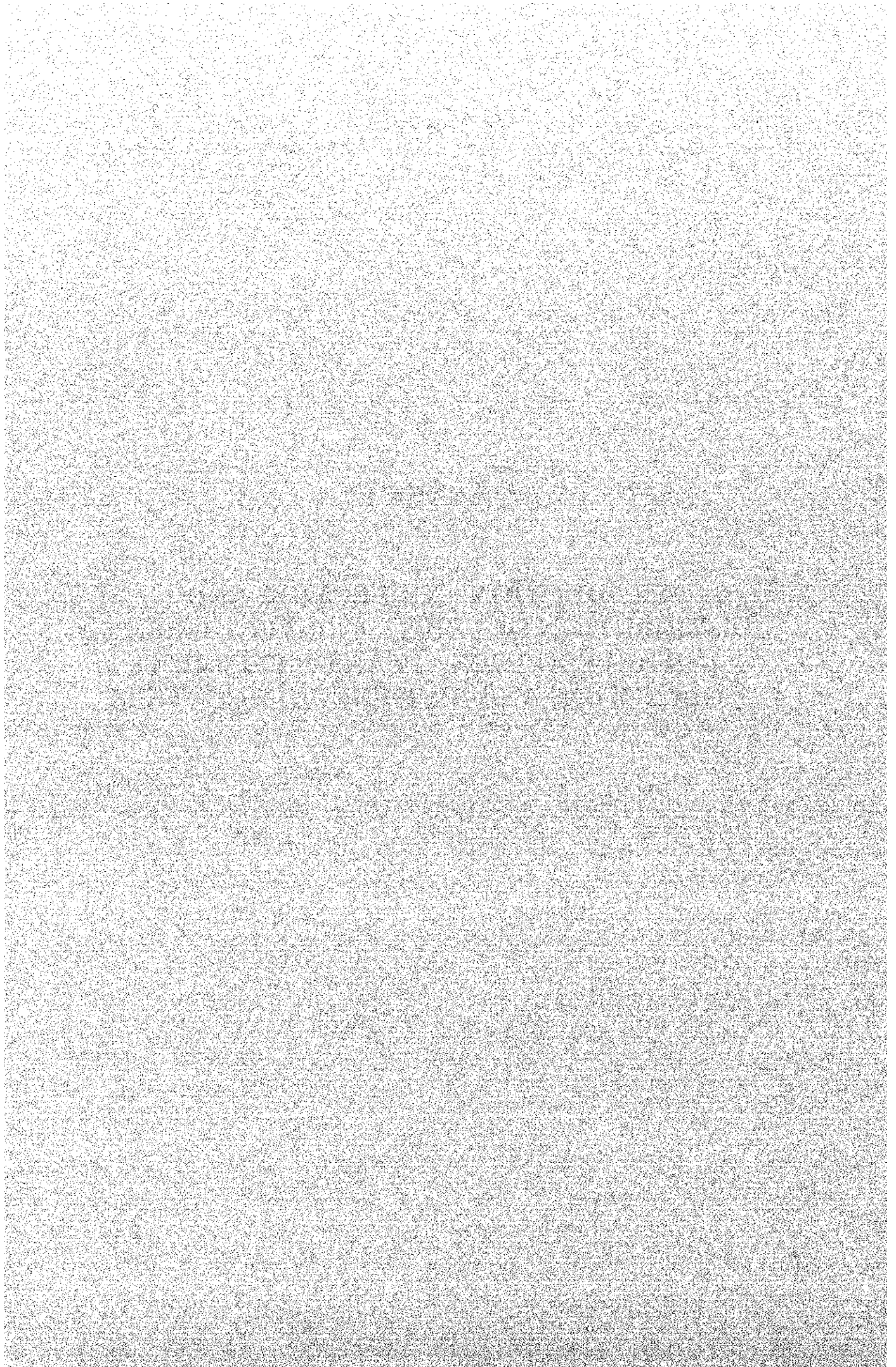
FSUTCSC	Unique Federation of Farm Workers' Syndicate of Santa Cruz
FINDESA	Financial Development of Santa Cruz
GDP	Gross Domestic Product
GTZ	German Technical Cooperation Society
ICI	Institute of Credit Intermediaries
ICO	Eastern Training Institute
IC/R	Inception Report
IEE	Initial Environmental Evaluation
IGM	Military Geographical Institute
INE	National Statistics Institute
IT/R	Interim Report
JICA	Japan International Cooperation Agency
JOCV	Japan Overseas Cooperation Volunteers
KfW	Kreditanstalt für Wiederaufbau
MACA	Ministry of Farmers and Livestock Affairs
MAGDR	Ministry of Agriculture, Cattle and Rural
MERCOSUR	Common Market of the Southern Cone
M/P	Master Plan
NGO	Non-Governmental Organization
NWM	New Wholesale Market
O/D	Origin/Destination
O/M	Operation and Management
OJT	On-the-Job Training
OTB	Territorial Base Organizations
OTPR	Technical Office of Regulating Plan
PAIS	Social Food Support Project
PCELA	Computerized Procedure for Environmental Impact Evaluation
PCM	Project Cycle Management
PDA	Agriculture and Livestock Development Project
PDM	City Development Plan
PDM	Project Design Matrix
PETHOSAM	Vegetable Processing Plant, Co.
PPM	Project Planning Matrix
PRECONAT	Ecology and Nature Program
PRICRUZ	Irrigation Project Comarapa-Saipina-San Rafael, Prefecture of Santa Cruz
PRODECAF	CORDECRUZ Project for Micro-Regional Development in Caballero and Florida
PRODEM	Promotion and Development of Micro Enterprises

PRODEVA	CORDECRUZ Program for Micro-regional Development in Vallegrande
PR/R (1)	Progress Report 1
PR/R (2)	Progress Report 2
RRC	Regional Research Center
S/W	Scope of Work
SAGUAPAC	Sewage and Potable Water Service
SNAG	National Secretariat of Agriculture and Livestock
SNC	National Road Service
STMMC	Manuel Maria Caballero Transporters' Syndicate
UNDP	United Nations Development Program
UPRA	Unit Program for Rural, Agriculture and Livestock
USAID	United States Agency for International Development
UV	Ward Unit
WHO	World Health Organization
WUG	Water Users' Group
ZAPU	Potentially Urbanized Agricultural Zone

*Feasibility Study
for the Improvement of Agricultural
Marketing System
in
Santa Cruz*

ANNEX 1

PRODUCTION, COLLECTION AND DISTRIBUTION OF FRUITS AND VEGETABLES AND DEVELOPMENT PLAN OF PRODUCTS COLLECTION AND DISTRIBUTION CENTERS



ANNEX 1
PRODUCTION, COLLECTION AND DISTRIBUTION OF FRUITS AND
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**ANNEX 1 PRODUCTION, COLLECTION AND DISTRIBUTION OF
FRUITS AND VEGETABLES AND DEVELOPMENT PLAN OF
PRODUCTS COLLECTION AND DISTRIBUTION CENTERS**

**1. CROP PRODUCTION IN SANTA CRUZ DEPARTMENT AND
MAJOR PRODUCING PROVINCES OF FRUITS AND
VEGETABLES**

1.1 Crop Production in Santa Cruz Department

The Santa Cruz Department has been established as the supply base of farm products in Bolivia and majority of food crops have been produced in the department. The shares of cropped areas and crop production of the department to the national figures from 1992/93 to 1996/97 are shown in Table A.1.1-1. As shown in the table, dominant crops produced in the department include maize, rice, wheat, cassava, soybeans, sugarcane, cotton and tomato. Shares of the department in the national production in 1996/97, major producing departments and dominant production systems of major crops are as summarized below.

Shares of Santa Cruz Department in Country's Production (1996/97)

Commodity	Share(%)	Major Producing Department	Dominant Production System
Maize	54	Santa Cruz	large scale/mechanized
Soybeans	98	Santa Cruz	large scale/mechanized
Rice	74	Santa Cruz	large scale/mechanized
Sugarcane	82	Santa Cruz	large scale/mechanized
Potatoes	8	Cochabamba	small scale under rainfed
Cassava	56	Santa Cruz	small scale under rainfed
Tomato	85	Santa Cruz	small scale under irrigation
Other Vegetables	-	Santa Cruz	small scale under irrigation

Remarks: Share(%) - - - Production share of Santa Cruz Department in the country

As shown in the table, production of maize, soybeans, rice and sugarcane are generally carried out in large scale in the low land areas. While, potatoes, vegetables and temperate fruits are mostly produced in small scale in the high land areas, the valley region.

1.2 Major Producing Provinces of Fruits and Vegetables in Santa Cruz

1.2.1 Major Producing Provinces of Fruits and Vegetables

(1) Present Land Use

The present land use by province in Santa Cruz Department is presented in Table A.1.1-2. The objective areas of the present study, the valley region composed of Florida, Caballero and Vallegrande province, occupies only about 10% of the total cultivated land in the department. However, as shown in Table A.1.1-3, the irrigated areas in the region account for some 6,500 ha or 70% of the department total(9,500 ha), which means that substantially intensive irrigated farming is introduced in the region to overcome restricted rainfall distribution. The figures on the existing irrigation projects in the Table indicate that majority of the irrigation projects are small scale and an average irrigated area per

beneficiary is limited at 1.6 ha. The irrigated areas in the valley region are intensively used for cultivation of potatoes and vegetables.

(2) Major Producing Provinces of Fruits and Vegetables

Crop production patterns in Santa Cruz Department are characterized by regions, the low land areas and the high land areas, as discussed in Section 1 and cultivation of maize, soybeans, rice, cassava and sugarcane are extensively practiced in the low land areas and that of vegetables(temperate vegetables) other than tomato, potatoes and fruits other than citrus is rather exclusively done in the highland valley region. The major producing provinces by commodity defined by CAO are presented in the following table.

Major Producing Provinces by Commodity

Commodity	Major Producing Provinces
Maize	Chiquitos, Cordillera, Chavez, Warnes
Soybeans	Obispo Santisteban, Ichilo
Potatoes	Valley region, Cordillera
Tomato	Valley region, Andres Ibanez, Ichilo
Temperate Vegetables	Valley region, Andres Ibanez
Citrus	Andres Ibanez, Warnes, Ichilo, Sara
Other Temperate Fruits	Valley region,

Remarks: Valley region include Florida, Caballero & Vallegrande province

Source: Numeros de Nuestra Tierra, 1997, CAO

1.2.2 Crop Production and Destination Markets of Fruits and Vegetables in Valley Region

(1) Crop Production

In Santa Cruz Department the valley region can be clearly defined as the main supply basis of potatoes, tomato and temperate vegetables and fruits, major target commodities in wholesale marketing of fruit and vegetable products in the department. While, production of citrus is extensively carried out and expanding in the lowland areas of Andres Ibanez, Ichilo and Warnes. Estimated current production volumes of major commodities produced in the three provinces of the valley region and shares occupied by each province are shown in Table A.1.1-4 and summarized below.

Shares of Crop Production by Province in Valley Region

Commodity	Share by Province(%)			3 Provinces Total
	Florida	Caballero	Vallegrande	
Maize	47	6	47	100
Potatoes	28	31	41	100
Tomato	34	51	15	100
Other Vegetables	50	36	14	100
Fruits	51	3	46	100

Remarks 1: Other vegetables include choclo, green pepper, carrot, onion etc.

Remarks 2: Fruits include peach, orange, mandarin, apple, plum etc.

Due to the restriction of rainfall distribution, cultivation of vegetables are almost exclusively practiced under irrigation along rivers in the valley region. Potato cultivation is also almost exclusively carried out in irrigated areas in Florida and Caballero province, while in Vallegrande province the same is also practiced under rainfed conditions, especially in high altitude areas, in addition to irrigated areas. Production of fruits is done both under irrigated and rainfed conditions. In the lowland areas where having favorable rainfall distribution, temperate vegetable cultivation for domestic consumption is practiced usually in winter under rainfed conditions. However, the expansion of tomato and potato growing areas in Ichilo and Andres Ibanez is reported. In those areas, cultivation of such crops is done in cool winter season and major harvesting season is July to September for potatoes and June to November for tomato.

The current annual marketing volumes of potatoes, vegetables and fruits produced in the valley region are estimated on the basis of the results of field surveys and studies on previous reports as shown in Table A.1.1-5. The estimated marketing volumes of the products are 36,200t, 33,900t and 28,900t, respectively for Florida, Caballero and Vallegrande province and 99,000t in the valley region as a whole as follows;

Annual Marketing Volumes of Products in Valley Region(unit ton)

Commodity	Florida Province	Caballero Province	Vallegrande Province	Valley Region
Potatoes	12,800	15,000	17,600	45,400
Vegetables	17,700	18,600	6,200	42,500
Fruits	5,700	300	5,100	11,100
Total	36,200	33,900	28,900	99,000

Remarks: Rounded figures

(2) Destination Markets of Fruits and Vegetables

Destination markets of the products differ among provinces depending partly on distance from possible markets and road conditions to the markets. The products in Florida and Vallegrande province are almost entirely shipped to Santa Cruz(Abasto Market) because it is the nearest wholesale market and due partly to poor road conditions to Cochabamba in case of Vallegrande province. While, the greater parts of products in Caballero province are shipped to Cochabamba. The destination markets of potatoes, vegetables and fruits produced in the valley region estimated based on the results of field surveys are presented in Table A.1.1-5 and summarized below.

Shares(%) by Destination Markets of Products in Valley Region

Destination Markets	Florida Province	Caballero Province	Vallegrande Province
Santa Cruz	91 %	43 %	95 %
Cochabamba	8 %	57 %	0 %
Local Market	2 %	0 %	5 %

Remarks: Products including potatoes, vegetables & fruits

1.2.3 Crop Production in Other Study Areas

Angostura, El Torno Municipality, Andres Ibanez Province

Angostura area is located neighboring to Samaipata municipality and is at the threshold of the lowland areas. Vegetable production, mainly tomato, is carried out in irrigated areas

along the Piray river in limited extent. Irrigation is made by taking water from the river by installing small pumps. The area is located close to Santa Cruz and products are directly shipped to markets in the city. While, in the municipal capital of El Torno, a collection and distribution center with floor spaces of 750m² has been developed by ASOPROA under the financial support of Italian NGO. The operation of the center is scheduled to commence in April 1999. The envisaged marketing functions of the center were not clearly defined by the organization but the same will be to collect products in the lowland areas and valley areas and to distribute to consumers, wholesalers and intermediaries.

Trigal Municipality, Vallegrande Province

Trigal municipality is located to the north of Vallegrande municipality and has irrigated areas of some 300 ha under canal system. However, the limitation of irrigation water resources restricts crop production in the irrigated areas to rainy season. Major crops in the areas are potatoes and tomato. Annual cropped area of vegetables is estimated to be around 150 ha. Because of the limitation in production volume, the municipality has not been selected as the proposed location for a products collection and distribution center.

Chancé, Mineros Municipality, Obispo Santistevan Province

Chancé area is located in the lowland areas and large scale mechanized production of soybeans, rice, maize and sugarcane is carried out in the municipality. The marketing systems of those crops are established having collection centers and processing plants in and around the municipality. Partly mechanized potato cultivation using planter is practiced in rotation with soybeans in the area. Estimated cropped area of potatoes in the municipality is only about 100 ha at present, however, there exists the possibility that the area will become a strong competitor of potato production to the valley region.

San Juan Area (Japanese colony)

The immigration of Japanese people started in 1955 in the colony and the number of migrants was 294 families in total. Presently, the number decreased to 230 families and the total land area of the colony is 27,100 ha. Major crops cultivated in the Area are soybeans, rice, maize and citrus. In addition to the crop sector, egg production is predominant agriculture activity in the Area. Products other than citrus are marketed through the collection and distribution centers or processing facilities of CAISY. In case of citrus, wholesalers or intermediaries come to collect the products.

The agriculture cooperative with 115 members in the Area, CAISY, was initially established as a voluntary organization in 1957 and obtained legal status in 1971. The major economic activities of CAISY include; 1) extraction and marketing of soybean oil, 2) milling and marketing of rice, 3) production of poultry feeds from maize, 4) collection and marketing of eggs, 5) supply of farm inputs and machinery repair services and 6) saving and credit. In addition, they have research division which engage in selection of promising varieties, production of macadamia nut seedling and other experimental activities.

The salient feature on crop sector in the Area is the expansion of citrus production and reportedly cultivated areas of the crop will increase to about 2,000 ha in the near future from the present 1,200 ha. To meet this production trend of citrus and for the promotion of fruit marketing, CAISY have plan; 1) to establish fruit section in CAISY, 2) to establish collection and distribution center in the Area and 3) to open a collection and transportation depot at their own land in Santa Cruz city or in the proposed new wholesale market.

1.2.4 Irrigation Development Plans in Valley Region

The irrigation projects being on-going and under study in Santa Cruz Department have irrigation command areas of 9,000 ha in total as listed in Table A.1.1-6. Among the areas, the command areas of the projects in the valley region account for 71% of the total or some 6,400 ha, consisting of rehabilitation areas of 3,500 ha and expansion area of 2,900 ha. Among the projects listed in the Table, the implementation of the Comarapa-Saipina-San Rafael Irrigation Project is scheduled to commence in January 1999 under the financial support of KFW and can be categorized as an on-going project. Financial sources are being sought for other projects domestically and internationally and the implementation schedules of the projects are not certain yet.

2. PRODUCTION OF FRUITS AND VEGETABLES AND PRODUCTS COLLECTION AND DISTRIBUTION IN MAJOR PRODUCING AREAS

2.1 Demarcation of Major Producing Areas

The areal extents of the three provinces in the valley region are large and the same of Florida province is 4,072 km², Caballero province occupies 3,618 km² and Vallegrande province is the largest having the surface area of 6,305km². In each province, production of potatoes, vegetables and fruits are carried out in concentrated manner in irrigated areas along rivers. For the study of collection and distribution system of such commodities, the major producing areas defined in the master plan study have initially been examined by municipality in principle through the collection of secondary data, field interview and field surveys. From the information obtained in such manners, seven(7) major producing areas of fruits and vegetables(including potatoes) in the three(3) provinces are demarcated by municipality or canton as illustrated in Fig. A.1.2-1 and as follows;

Major Producing Areas of Fruits and Vegetables in Valley Region

Province	Major Producing Areas	Municipality	Major Vegetables & Fruits
Florida	Samaipata Area	Samaipata Municipality	Potatoes, tomato, citrus
	Mairana Area	Mairana Municipality & Neighboring Area in Quirusilas	Potatoes, tomato, lettuce, peach, plum, grape
	Pampa Grande Area	Pampa Grande Municipality	Potatoes, tomato, lettuce, peach
Caballero	Comarapa Area 1/	Comarapa Municipality	Potatoes, tomato, green pepper
	San Isidro Area	Irrigated areas in San Isidro & Pulquina Canton	Potatoes, tomato, choclo, onion
	Saipina Area	Saipina Municipality	Potatoes, tomato, onion
Vallegrande	Vallegrande Area	Vallegrande Municipality	Potatoes, tomato, peach

Remarks: Comarapa Area - - - Municipal area excluding irrigated areas in San Isidro Area

The climatic conditions of the major producing areas are presented in Table A.1.2-1. As shown in the Table, substantial variations in climatic conditions among the areas are recognized. Samaipata and Mairana Area are favored with rainfall distribution in rainy season, while rainfall distribution even in rainy season is limited in other areas.

2.2 Socio-economic Features of Major Producing Areas

The socio-economic features of the major producing areas, which are identified on the basis of the existing statistical information and the results of the Socio-economic Survey carried out by the JICA Study Team, are presented by municipality in Table A.1.2-2.

2.3 Crop Production

In the major producing areas, primary crop production areas are rainfed lands except for San Isidro Area where the whole farm lands are under irrigation and Saipina Area where crop cultivation under rainfed conditions is extremely limited due to restriction of rainfall. However, in all the areas, intensive cultivation of potatoes and vegetables is practiced in

irrigated areas along rivers. The total net irrigated areas in the major producing areas as a whole are estimated at 5,660 ha as shown in Table A.1.2-3. The total number of beneficiaries are estimated at 4,900 and the average irrigated areas (gross) per beneficiary is about 1.4 ha. Water resources for irrigation are almost exclusively rivers and dominant irrigation method is canal system except for Samaipata and Mairana Area where pumping system prevails. Cultivation of potatoes and vegetables is almost exclusively carried out in irrigated areas and cereals and beans are mostly cultivated in rainfed areas. While, in Vallegrande Area potato cultivation is practiced in rainfed areas at high altitude areas in addition to irrigated areas. Fruits cultivation is practiced both in irrigated and rainfed areas, however, cultivation in irrigated areas is dominant in the major producing areas. The land use features in individual major producing areas are presented in Tables A.1.2-4 to 2-10 (Features of Major Producing Areas: Production Aspects) and summarized below.

Land Use Features in Major Producing Areas

Major Producing Areas	Major Crop Production Areas	Net Irrigated Areas (ha)	Irrigated Areas per Beneficiary (ha)
Samaipata	Rainfed areas	340	1.7
Mairana	Rainfed areas	480	2.3
Pampa Grande	Rainfed areas	840	1.3
Comarapa	Rainfed areas	490	1.5
San Isidro	Irrigated areas	1,100	1.3
Saipina	Irrigated areas	1,410	1.3
Vallegrande	Rainfed areas	1,000	1.4

Major crops cultivated in the major producing areas include cereals and beans in rainfed areas and potatoes, vegetables and fruits in irrigated areas, in general. However, fruit cultivation in rainfed areas are also practiced in the areas and potatoes are grown in rainfed areas in Vallegrande Area. Further, in Saipina Area crop production under rainfed conditions is extremely limited as stated earlier. Major rainfed crops are maize and beans in Samaipata, Mairana and Pampa Grande Area. The same in Comarapa are maize and wheat for seed production purpose and major rainfed crops in Vallegrande Area are maize, wheat for seed production purpose and potatoes. Major crops in the irrigated areas include potatoes, tomato and lettuce in Samaipata, Mairana and Pampa Grande. Those in Comarapa, Saipina and Vallegrande Area are potatoes and tomato. In San Isidro Area, choclo is also a main crop next to potatoes and tomato. However, varieties of temperature vegetables such as onion, carrot, cabbage, cauliflower, green pepper, beans, peas and others are grown in the major producing areas and kinds of crops cultivated show annual variation to some extent. Predominate fruits in Samaipata, Mairana and Pampa Grande Area are citrus (orange and mandarin) and peach and those in Vallegrande are peach and plum. Fruit production in other areas is limited.

The current cropped areas and production of major crops in the major producing areas are estimated as shown in Tables A.1.2-4 to 2-10 and Table A.1.2-11 and as summarized in the following table.

Estimated Current Annual Cropped Area and Production of Major Crops

Major Producing Areas	Items	Potatoes	Tomato	Other Vegetables	Fruits
Samaipata	Cropped Area(ha)	470	70	80	190
	Production(t)	5,170	1,050	1,150	1,900
Mairana	Cropped Area(ha)	140	110	210	250
	Production(t)	1,680	1,650	3,200	2,500
Pampa Grande	Cropped Area(ha)	300	240	660	130
	Production(t)	3,600	4,080	6,900	1,300
Comarapa	Cropped Area(ha)	290	100	210	40
	Production(t)	3,190	1,700	1,050	400
San Isidro	Cropped Area(ha)	500	220	710	-
	Production(t)	6,000	3,740	6,220	-
Saipina	Cropped Area(ha)	680	430	340	-
	Production(t)	7,480	7,310	1,700	-
Vallegrande	Cropped Area(ha)	900	100	50	350
	Production(t)	9,000	1,500	500	3,500

Cropping seasons of cereals and beans in rainfed fields are in rainy season, generally from October/November to March/April. While those of potatoes and vegetables are diversified depending on the producing areas and year round production of vegetables is commonly carried out in Mairana, Pampa Grande and Saipina Area. The prevailing cropping calendar in the individual major producing areas is shown in Tables A.1. 2-4 to 2-10. Dominant production periods of crops in the individual major producing areas are summarized as follows;

Dominant Production Periods of Potatoes, Vegetables and Fruits in Major Producing Areas

Major Producing Areas	Potatoes	Tomato	Other Vegetables	Citrus	Peach
Samaipata	Mar. & Aug.	Feb. & Nov.	Nov.	Jun. - Aug.	Nov. - Feb.
Mairana	Oct. - March	year round	year round	Apr. - Jul.	Nov. - Feb.
Pampa Grande	Jun. & Oct.	Nov. - Jan.	year round	May - Jun.	Jan.
Comarapa	Jul. - Aug.	Nov. - Dec.	year round	-	Feb. - Mar.
San Isidro	Mar. - Apr.	Aug. - Oct.	year round	-	-
Saipina	Mar. & May	year round	year round	-	-
Vallegrande	Mar. - Jun./Aug. - Sep.	Feb. - Mar.	depending on crop	-	Nov. - Feb.

From the current production features and dominant production periods discussed earlier, the major producing areas can be categorized by production features into three as follows;

Mairana, Pampa Grande and San Isidro Area

Primary crop is potato and cultivation of vegetables is diversified. Year round cultivation of vegetables is practiced.

Samaipata and Vallegrande Area

Primary crop is potato followed by fruit production. Cropping seasons of potatoes and vegetables are basically fixed. Municipal government has strong

intention to expand fruit production and production increase of the crop is expected.

Comarapa and Saipina Area

Primary crop is potato followed by tomato. Year round cultivation of vegetables is practiced.

2.4 Potential for Expansion of Fruit and Vegetable Production and Irrigation Development Plan

The future development potential of potato and vegetable production in the major producing areas will largely depend on the expansion of irrigated areas as: 1) the crops are grown in irrigated areas except for Vallegrande Area and 2) the rooms for productivity increase is rather limited because the intensive cultivation of the crops is already practiced and 3) the productivity increase through the improvement of farming practices will not be expected much under the present technical guidance system. On the other hand, there exist the development potential of temperate fruits through areal expansion and technology improvement in the areas, especially in Samaipata and Vallegrande Area. However, the potential will be realized for the first time when the improvement of marketing conditions is achieved and the improvement of production technologies is promoted through technical guidance and support.

There exists one irrigation project in the major producing areas which could be categorized as an on-going project, the Comarapa-Saipina-San Rafael Irrigation Project. The project has the rehabilitation component covering the entire irrigation areas of Saipina Area and part of those in Comarapa Area and the component of development of new irrigation areas, expansion area, of 288 ha in Comarapa Area and 302 ha in Saipina Area, 590 ha in total. The project implementation is scheduled to be commenced from January 1999 and completed in 2000 in Comarapa Area and in 2001 in Saipina Area. Accordingly, substantial increase of potato and vegetable production is expected after the completion of the project works in both the Areas. The irrigation development under the project is as follows;

Irrigation Development under Comarapa-Saipina-San Rafael Irrigation Project

Major Producing Area	Irrigation Zone	Rehabilitation Area	Expansion Area	Total
Comarapa Area	Rio Arriba/Comarapa	194		194
	La Pista		288	288
	Subtotal	194	288	482
Saipina Area	Banados	244		244
	Chilon/Saipina	897		897
	San Rafael	420		420
	Expansion Zone		302	302
Subtotal		1,561	302	1,863
Total Project		1,755	590	2,345

Source: Data presented by PRICRUZ

Other irrigation development projects in the major producing areas assessed technically and economically viable based on the feasibility or pre-feasibility studies are as listed in Table A.1.1-6 and summarized in the following table.

Irrigation Development under Study in Major Producing Areas

Major Producing Area	Rehabilitation Area	Expansion Area	Total
Mairana Area(1 project)	317	1,425	1,742
Comarapa Area(1 project)	150	30	180
San Isidro Area(1 project)	1,227	573	1,800
Vallegrande Area(2 projects)	70	279	349
Total	1,764	2,307	4,071

When all the projects come to be implemented, the substantial increase of potato and vegetable production in the newly developed irrigated areas is anticipated in the future. Among the projects, however, the implementation of the project in Mairana Area has not been realized after the completion of feasibility study in 1962 because of the sedimentation problems of the proposed reservoir and the high construction costs of the same. The project in San Isidro Area is still at the stage awaiting for the feasibility study and will take substantial time before the implementation. The implementation of three small scale projects, one in Comarapa Area and two in Vallegrande Area, could be expected within the foreseeable future because of modest requirements of construction costs.

2.5 Crop Production System

The crop production systems prevailing in the major producing areas are classified into 2 types; one is extensive cultivation of cereals and beans in rainfed areas and the other is intensive potato and vegetable production practiced in irrigated areas. The first system is the mainstay as a whole in the areas and the 2nd system is more or less limited to areas along major rivers having access to surface water resources. The production of potatoes and vegetables in the irrigated areas are mostly carried out by small scale farmers with some exceptional cases by medium scale farmers. As indicated in the section 2.3, the average irrigated areas per beneficiary in the major producing areas are in the range of 1.3 to 2.3 ha and the overall average is limited at around 1.4 ha.

In the irrigated areas, land preparation is usually done mechanically, however, draft animal is partly employed for ridging for furrow irrigation. Other farming practices are carried out manually. Farming activities in the areas are usually done by employing farm labor forces from high altitude areas. Main farming activities performed by family labor include nursery preparation, chemical spray and irrigation. Weeding and harvesting is mostly depends on hired labors. Predominant irrigation method is furrow irrigation, while basin irrigation is common in vegetable nursery. The prevailing farming practices for potatoes and major vegetables are presented in Table A.1.2-12.

Cultivation of diversified vegetables is commonly practiced and annual variation in crop selection is also usual in the irrigated areas, therefore, no reliable secondary data and information on the prevailing cropping pattern is available except for Samaipata and Mairana Area. Accordingly, prevailing cropping patterns, cropping intensity and yield

levels in irrigated areas in other major producing areas are assumed for the estimation of cropped area and production on the basis of secondary data on cropped areas and production, results of the socio-economic survey, data and information obtained during field survey and previous studies as follows;

Prevailing Cropping Pattern and Current Yield Levels in Irrigated Areas(Assumed)

Major Producing Areas	Cropping Pattern/ Cropping Intensity	Yield Levels(t/ha)
Samaipata	-	potato: 11, tomato: 15 lettuce: 20, peach & citrus:10
Mairana	-	potato: 12, tomato: 15 lettuce: 20, peach & citrus:10
Pampa Grande	potato: 25%, tomato: 20%, lettuce: 20%, other vegetables: 35%; cropping intensity 150%	potato: 12, tomato: 17 lettuce: 20, peach & citrus:10
Comarapa	potato: 35%, tomato: 15%, other vegetables: 34%, fruits: 6%; cropping intensity 130%	potato: 11, tomato: 17
San Isidro	potato: 35%, tomato: 15%, choclo: 15%, other vegetables: 35%; cropping intensity 130%	potato: 12, tomato: 17 choclo: 6
Saipina	potato: 40%, tomato: 20%, other vegetables: 20%, sugarcane: 15%; cropping intensity: 130%	potato: 11, tomato: 17
Vallegrande	potato: 50%, tomato: 15%, other vegetables: 5%, sugarcane: 15%, fruits: 20%; cropping intensity: 115%	potato: 11, tomato: 15 peach & plum: 10

Remarks: Cropping pattern - - - Shares(%) of each crop to the total cropped area(100%)

2.6 Collection and Distribution of Fruits and Vegetables

The currently prevailing collection and distribution systems of fruits and vegetables in the major producing areas identified through field survey, interview with producers and representatives of producers group, agriculture institutions as CIAT and the findings of the socio-economic survey are presented in Tables A.1.2-13 to 2-19(Features of Major Producing Areas: Marketing Aspects) and summarized in the following sections.

(1) Commercialization of Fruits and Vegetables

Basically all fruits and vegetables(including potatoes) produced in the major producing areas except for limited volume for family consumption, for seed potato requirement and post harvest losses due mainly missing marketing timing are being marketed. On the basis of the findings of the field surveys, the results of previous studies by JICA master plan study, CORDECRUZ(Diagnostico de la Comercializacion Agropecuaria de la Provincia de Vallegrande, 1992) and FAO(Estudio de Comercialization para los Valles, Provincias de Vallegrande, Florida y Caballero, 1988) and the information presented in provincial PDMs, the current commercialization rates of the products are estimated as follows;

Estimated Commercialization Rate(%) of Potatoes, Vegetables & Fruits

Major Producing Areas	Potatoes	Tomato	Other Vegetables	Fruits
Samaipata, Mairana, Comarapa & Vallegrande Area	80 %	85 %	85 %	85 %
Pampa Grande, San Isidro & Saipina Area	90 %	85 %	85 %	85 %

Remarks: Assuming seed potatoes procured for planting in P. Grande, San Isidro & Saipina

(2) Marketing Volumes and Destination Markets

On the basis of the estimated production volumes and the commercialization rates, the current annual marketing volumes of the products in the major producing areas are estimated as shown in Table A.1.2-20. The estimated current marketing volumes of the products are the largest in Saipina Area followed by San Isidro, Pampa Grande and Vallegrande and the smallest in Comarapa Area as follows;

Annual Marketing Volumes of Products in Major Producing Areas(unit ton)

Major Producing Areas	Potatoes	Vegetables	Fruits	Total
Samaipata	4,100	1,900	1,600	7,600
Mairana	1,300	4,100	2,100	7,500
Pampa Grande	3,200	9,300	1,100	13,600
Comarapa	2,600	2,300	300	5,200
San Isidro	5,400	8,500	-	13,900
Saipina	6,700	7,700	-	14,400
Vallegrande	7,900	1,700	3,000	12,600
Total	31,200	35,500	8,100	74,800

Remarks: Rounded figures

The main destination of potatoes, vegetables and fruits produced in Samaipata, Mairana, Pampa Grande and Vallegrande Area is ABASTO market. While, the principal destination market of products in Saipina Area is markets in Cochabamba and products in Comarapa and San Isidro Area are shipped both to Santa Cruz and Cochabamba market. The destination markets of the products by major producing areas identified through the field survey are presented in Table A.1. 2-20 and the main marketing routes to the destination markets are shown in Fig. A.1.2-1. From the Table, the shares of destination markets by major producing areas are generalized in the following table.

Destination Markets of Potatoes, Vegetables and Fruits

Major Producing Areas	Santa Cruz	Cochabamba	Local Market
Samaipata, Mairana & Vallegrande Area	> 90 %	limited	limited
Pampa Grande	80 %	< 20 %	limited
Comarapa & San Isidro	60 %	40 %	0 %
Saipina	20 %	80 %	0 %

(3) Prevailing Collection and Distribution Systems

Collection and distribution(marketing) of potatoes, vegetables and fruits are mostly carried out by individual producers in Samaipata, Mairana, Pampa Grande, Comarapa and San Isidro Area and are usually directly sold to wholesaler(or sometimes to retailer) at destination markets. While in Saipina and Vallegrande Area marketing of such products is mostly carried out by the hands of intermediaries. In any cases, it appears that the collection and distribution systems of the products are fairly well established in the valley region. The currently prevailing systems in the region are as follows;

Selection & Collection

- Harvesting is usually practiced one day prior to shipment. After harvest, products are selected and generally graded into 3 sizes, packed in plastic bags, wooden boxes or bamboo baskets and piled at farm depots or roadside for shipment. In irrigated areas, manual transportation distance from field to roadside is short because of the establishment of access road. However, in case of rainfed areas, long distance transportation up to 1 - 2km, by manual/draft animal is necessary.
- 1 to 2 days before harvesting, producers arrange shipping schedule(commodities, volume and time of collection) with transporter or buyer. Shipment is done from 6 a.m. to 6 p.m., mainly in the afternoon to evening, and products arrive at a market on the same day. Selling/delivery is on next day in general.
- In case when products of individual producers are limited, products of plural producers are collected and shipped to market together.

Distribution

Prevailing marketing channels in Samaipata, Mairana, Pampa Grande, Comarapa and San Isidro Area are as follows;

- Primary Case: Producer hiring truck & direct selling to wholesaler(or retailer) at market
- Secondary Case: Producer with own truck & direct selling to wholesaler(or retailer) at market
- Thirdly Case: Selling or consignment selling to intermediary

Prevailing marketing channels in Saipina and Vallegrande Area are as follows;

- Primary Case: Selling or consignment selling to intermediary(Consignment selling in Saipina & selling to buyer in Vallegrande)
- Secondary Case: Producer hiring truck & direct selling to wholesaler(or retailer) at market
- Thirdly Case: Producer with own truck & direct selling to wholesaler(or retailer) at market

Transshipment

Transshipment by transporter is not common as truck usually come to farm depots in irrigated areas where access roads are mostly constructed. While, transshipment from small scale truck to large one is common in Vallegrande. In addition, in fruit growing areas and in case when volume of products is limited, transshipment by producers are carried out at roadside of marketing routes.

Payment Terms

Payment in cash after several hours of delivery at market in case of direct selling and in case of consignment sale, about a few days after delivery.

2.7 Major Agriculture Facilities

Agriculture facilities related with the present Study in the valley region are shown in Table A.1.2-21. Among the facilities, major facilities include: 1) ASOFRUT collection facility in Samaipata Area, 2) ASOFRUT building for small scale fruit processing in Samaipata Area, 3) PETHOSAM collection facility in San Isidro Area and 4) farmers market in Vallegrande Area.

The ASOFRUT collection facility was constructed by ASOFRUT under the financial support of CORDECRUZ in 1985, however, the facility has seldom utilized for the original purposes. Presently, the facility has been temporary used for storage of food stuff under PAIS program. The building for fruit processing was constructed by CORDECRUZ/ASOFRUT in 1994 and trial processing of fruit jam and marmalade was carried out for about 3 months under the guidance of a JOCV member in 1996. However, the commercial scale processing of fruits was not done because of failure in price competition with import commodities. Presently, the facility is left unused.

The PETHOSAM collection center was constructed by CORDECRUZ in 1983 for tomato keycap production, however, without any operation of tomato processing the use of facility was entrusted to San Isidro sub-municipality in 1993 for the period of 5 years,. The reasons for the failure are not clear, but failure to procurement of processing plant, price competition with import products and political issues could be enumerated.

The farmers market(consumer market) in Vallegrande Area was constructed in 1993 by the assistance of FDC/CORDECRUZ and operation and management of the market is under the jurisdiction of municipal government. The market opens on Saturday and Sunday, where farm products are sold by retailers in the market which are directly delivered by producers. The idea to use the facility for collection of fruits and others as an initial stage of the introduction of improved collection and distribution system was not accepted by the municipal office and other related personnel including representatives of producers because the idea will bring about social conflicts with the current users of the market.

2.8 Agriculture Research and Extension

(1) Agriculture Research

The areas of research and technology transfer for crop, livestock and forestry in Santa Cruz Department are under the responsibility of the Tropical Agricultural Research Center(CIAT) having the head office in Santa Cruz City(Fig. A.1.2-2). With the mandates to develop and validate appropriate technologies and improved practices of agriculture production system and to disseminate appropriate technologies and practices among farmers through organizations involved in agriculture extension and provision of technical assistance in rural areas, CIAT presently has about 100 technical staff, 2 Experimental Stations and 12 Regional Research Centers(RRC, small experimental stations) in the department, among which 4 Centers are established in the valley region; in Samaipata, Mairana, San Isidro and Vallegrande municipality.

To meet the said mandatory tasks, CIAT has three major action areas of research, dissemination and supply of technical and genetic resources. The major research fields of CIAT are applied and adaptive ones and carried out in the Experimental Stations and the Research Centers. In the areas of dissemination to promote farmers adaptation of the technologies generated by research, activities are supposed to be directed to three target groups of institutions working in rural development, extension workers and farmers. The supply of technical and genetic resources includes production of foundation seeds, preparation of certified seeds and publication of technical documents.

The main research activities of RRC on fruit and vegetable production in the valley region are: 1) soil management, 2) integrated pest management and variety selection and adaptability test. Primary target crops include potatoes, tomato, lettuce, green pepper and

cauliflower for vegetable and peach, plum and citrus for fruit. The principal target crops and technical staffing in each Regional Research Centers are as follows;

Principal Target Crops and Technical Staff in Regional Research Centers

Research Center	Principal Target Crop	No. Technical Staff/Researcher(specialty)
Samaipata	fruits(plum, peach, citrus, wheat	1 (fruit)
Mairana	maize	3 (maize, vegetable & fruit)
San Isidro	vegetables & fruits	2 (vegetable & fruit)
Vallegrande	fruits	4 (fruit & vegetable, livestock, fishery & forestry)

Although the technical assistance in rural areas is one of the mandatory tasks of CIAT and the dissemination of improved farming technologies is one of the major action areas, technology transfer of CIAT is limited to extension personnel of non-governmental organization or producers associations and direct involvement of CIAT in extension services in rural areas is not presently realized presently because mainly of limitation in financial resources for the purposes, except for extension activities to fruit and vegetable growers implemented in the valley region in cooperation with ASOFRUT.

(2) **Agriculture Extension**

In the valley region, the agreement between CIAT and ASOFRUT was made and technical staff in the Regional Research Centers are assigned to provide extension services to farmers. However, the provision of such services is presently limited because of financial constraints and limitation of manpower resources. In addition to the extension activities of CIAT/ASOFRUT, such services are provided by extension personnel belonging to producers organization such as ASOFRUT and EMCA in the valley region. Major organizations currently providing extension services in the region are as follows;

Major Organizations Providing Extension Services in Valley Region

Province	Cropped Area(ha)	Major Organizations Providing Extension Services
Florida	3,420	CIAT in cooperation with ASOFRUT(Samaipata & Mairana), ASOFRUT(1), PAIS(3), PRECONAT(2)
Caballero	3,520	CIAT in cooperation with ASOFRUT(San Isidro), ASOFRUT(1), EMCA(1)
Vallegrande	3,200	CIAT in cooperation with ASOFRUT, ICO

Remarks: Cropped Area - - Estimated cropped areas of potatoes, vegetables and fruits(Table A.1.1-4)
PRECONAT: Programa Ecologia y Naturaleza; ICO: Instituto de Capacitacion del Oriente

In addition to the above extension services, some suppliers of farm inputs give technical guidance for the usage of chemicals, selection of varieties and etc. However, the coverage of extension services in the valley region is limited and the strengthening of technical guidance or extension activities, especially on fruit production and chemical use, will be essential for the enhancement of vegetable and fruit production and the introduction of production planning in the valley region.

3 CONSTRAINTS IN PRODUCTION AND MARKETING OF FRUITS AND VEGETABLE AND DEVELOPMENT NEEDS IN MAJOR PRODUCING AREAS

3.1 Major Constraints for Agriculture Development

In the major production areas, the production and marketing system of potatoes, fruits and vegetables have been developed fairly well by farmers own effort in spite of little government contribution and without cooperative marketing system. However, there still exist rooms for the improvement of production system, especially of fruits, and there exist problems and weakness in current marketing systems and needs for the introduction of effective production planning for the enhancement of agriculture development. Major constraints in production and marketing of vegetables and fruits in the areas are categorized into: 1) production technology and production planning issues, 2) marketing issues and 3) institutional aspects. Most of the major constraints identified are common in the major producing areas while some area specific issues are also identified as enumerated hereunder.

(1) Constraints Common in Major Producing Areas

As stated earlier, major constraints for production and marketing of fruits and vegetables in the areas are categorized into production issues, marketing issues and institutional and organizational issues as follows,

Production Issues

- Limitation in sources of technical guidance, stagnation of yield levels of crops, delay in adaptation of proper crop rotation system and poor fruit production technology,
- Outbreaks of pest and diseases and increased application of agro-chemicals without adequate technical guidance, and
- Lack of crop production planning as a whole in the areas, which often results in over production of certain crops.

Marketing Issues

- Prevailing of individual marketing system and poor experiences and capability of farmers in cooperative marketing for their group to introduce cooperative marketing system,
- Lack of marketing facilities(collection and storage facilities), which sometimes results in time loss, missing of marketing timing, degradation of products quality and economic loss,
- Market price fluctuation and poor price bargaining capacity of individuals,
- Limited information on market conditions and prices,
- Prohibition of producers' direct selling to retailers/consumers at Abasto Market, which was dominant at M/P stage, by the new municipal ordinance and resultant dependence on intermediaries in marketing of their products at the market, and

- Prohibition of daytime traffic of trucks with loading capacity over 6 tones within the third ring of Santa Cruz city.

Institutional and Organizational Issues

- Limited sources of institutional guidance which results in organizational weakness and lack of leading manpower resources for cooperative activities,
- Lack of experiences in cooperative marketing of fruits and vegetables, and
- Lack of coordination among producers, organization like ASOFRUT, transporters and municipal governments.

(2) Area Specific Constraints

Area specific constraints identified for production and marketing of fruits and vegetables are as follows;

- Restricted cropping season due to frost (tomato, green pepper etc.; Vallegrande),
- Cooperative use of existing facilities for products collection and distribution not being realized in spite of movement toward the purpose(Samaipata & San Isidro),
- Poor access to trunk road: long distance transportation by manual/animal from farm land to loading site (Samaipata & Vallegrande),
- Lack of all-weather road : shipping restricted due to poor road conditions in rainy season (Saipina and Comarapa), and
- Transshipment of commodity due to poor road conditions(Samaipata, Saipina & Vallegrande).

However, the most serious problems in the major producing areas which are not clearly recognized by farmers in the areas will be the facts that the large production potential of potatoes, some vegetables(especially tomato) and citrus exists in the low land areas and the unpredictable influences of the slated participation of Bolivia in MERCOSUR on the future crop production. They have to face to the competition with larger scale producers in the low land areas and in other countries in the future if they fail to improve crop productivity, to introduce crop production planning reflecting market demand for individual commodities and to adapt adequate marketing systems and strategies to meet demand of market for commodities, timing of shipment, volume and quality of commodities and forms of packing.

3.2 Needs for Establishment of Products Collection and Distribution Centers

Fortunately, the areas are under temperate to subtropical climatic conditions which are availing production of variety of temperate fruits and the areas have irrigation systems which are availing the cultivation of temperate vegetables throughout a year. Accordingly, it is assessed that the areas have potential to be developed as the supply basis of temperate vegetables(including potatoes) and fruits to expanding Santa Cruz metropolitan markets and other markets when the promotion of crop production toward the establishment of

such supply basis in the valley region is achieved through: 1) the improvement of production system and technology, 2) the introduction of crop production planning in all the major producing areas for adjusting to seasonal market demand and production trends of other competitive producing areas, especially in the low land areas and 3) the improvement of the present marketing system and the introduction of adequate cooperative marketing system by establishing products collection and distribution centers. However, the attainment of such goal will become possible for the first time when the strong technical and institutional guidance on such issues is provided to all the related sectors successfully and the said improvement and introduction take root firmly in the areas. Accordingly, stage-wise development approaches should better be taken for the attainment of the goal.

The results of farmer interview survey in the major producing areas indicate that: 1) about 70 % of sample farmers(70 samples) are not satisfied with the present marketing system of fruits and vegetables and 2) over 90 % of them have intention to use products collection and distribution centers for marketing of their products. Further, all the municipal governments in major producing areas have expressed their support for the establishment of the collection and distribution centers for improvement of present marketing system of fruits and vegetables.

By assessing the said constraints for production and marketing of fruits and vegetables, the potential for development as the supply basis of the crops and the intentions of farmers and municipal governments, the needs for the improvement of production and marketing system and the establishment of products collection and distribution centers in the major producing areas are identified as follows;

- Development of collection and distribution centers in all the major producing areas and introduction of cooperative marketing system for establishment of improved marketing system and promotion of crop sector development,
- Establishment of the center from the initial stage as a central place for providing technical and institutional guidance to farmers and establishment of the center as a nuclear for promotion of crop sector development in the areas, and
- To envisage the introduction of integrated production planning and marketing system in the whole valley region so as to establish the region as the supply base of temperate vegetables and fruits to Santa Cruz and even in the country.

4 DEVELOPMENT PLAN FOR PRODUCTS COLLECTION AND DISTRIBUTION CENTERS

4.1 Basic Approaches for Development

The basic approaches for the development of products collection and distribution centers(C/D center) aiming at the introduction of cooperative marketing system of fruits and vegetables and the development of the major producing areas in the valley region as the supply basis of fruits and vegetables(including potatoes) to Santa Cruz and other markets are set stage-wisely as follows;

Short Term Approaches

- Trial operation and management of cooperative marketing by making use of the existing products collection facility(PETHOSAM) in San Isidro by farmers groups in cooperation with transporters,
- Institutional and technical guidance on cooperative marketing system, organizational aspects, operation and management system of the new wholesale market and other markets and production technologies to fruit and vegetable producers and all related personnel and organizations in San Isidro Area, and
- Implementation of Pilot Project: Development of pilot C/D center and introduction of cooperative collection and distribution system by renovating the existing collection facilities in San Isidro and establishment of the centers as central places for providing institutional and technical guidance to fruit and vegetable producers in other major producing areas and to recruit management staff for the areas.

Medium Term Approaches

- Institutional and technical guidance on cooperative marketing system, organizational aspects, operation and management system of the new wholesale market and other markets and production technologies to fruit and vegetable producers and all related personnel and organizations in the areas,
- Considering the availability of manpower resources having management skills and time required for recruiting management personnel and the availability of financial resources, Phase-wise development of C/D centers in other major producing areas is planned: 1) by assessing the readiness of individual major producing areas for introduction of cooperative marketing system fruits and vegetables and 2) based on the evaluation of the operation of the Pilot Project for the possibility of the introduction of cooperative marketing system, and
- Institutional and technical guidance on cooperative marketing system, organizational aspects, operation and management system of the new wholesale market and other markets and production technologies to producers and all related personnel and organizations in the areas, and
- Introduction and establishment of cooperative collection and distribution system in all the major producing areas.

Long Term Approaches

- Introduction and establishment of cooperative collection and distribution system at C/D centers operated and managed by farmers group in all the major producing areas and introduction of crop production planning in order to meet market demand for timing of shipment, volume of commodities and quality of commodities.
- Introduction of the integrated production planning and marketing system in the whole valley region so as to establish the region as the supply base of temperate fruits and vegetables to Santa Cruz and even in the country.

4.2 Proposed Locations, Site Selection and Target Areas for Products Collection

4.2.1 Proposed Locations for Products Collection and Distribution Centers

The proposed locations of C/D centers are determined taking into consideration of that proposed locations are: 1) to be on the present major marketing routes of fruits and vegetables, 2) to be at around the center of major producing areas and 3) to be in the municipal or sub-municipal administrative centers; as shown below.

Samaipata Area	In and around Municipal capital Samaipata
Mairana Area	In and around Municipal capital Mairana
Pampa Grande Area	In and around Los Negros
Comarapa Area	In and around Municipal capital Comarapa
San Isidro Area	In and around San Isidro
Saipina Area	In and around Municipal capital Saipina
Vallegrande Area	In and around Municipal capital Vallegrande

4.2.2 Site Selection for Products Collection and Distribution Center

The methodology (criteria ranking methods) which identifies the character of each project site by the several criteria is adopted here, but the purpose to utilize this method is deferent between the consumption area and the production area. In the consumption area, it is main purpose to select only one site for the New Wholesale Market. On the other hand, character identification and suitable plan-making for each target area is the purpose of this study.

- (1) Conditions of site and their infrastructure in each target area

Sites locations is shown from Fig. A.1.4-1 to Fig. A.1.4-7. City infrastructure condition of each target area are shown in Table. A.1.4-1.

- (2) Feeder roads condition from farms in each target area

The condition of feeder roads in each target area are shown in Fig. A.1.4-1 to Fig. A.1.4-7 jointly with the sites location map.

(3) Existing facilities for agri-products by CORDECRUZ/ ASOHRUT

Samaipata has a agri-product facility built by ASOHRUT, and San Isidro has also a similar facility built by CORDECRUZ and ASOHRUT. It is supposedly possible to utilize for the Product Collection / Distribution Center. The conditions of these 2 facilities are summarized in Table A.1.4-2.

(4) Proposed project sites by Municipal Government

All of the City Mayor proposed the project site for the Products Collection/Distribution Center. Each proposal has the characteristics shown as follows.

- Land owners : Mairana, Pampa Grande and Saipina do not have a public land suitable for the Center, therefore City Mayor proposed a private lot that they can supposedly expropriate from private sector. The other mayors proposed public lands for the project sites.

- Alternatives in a City : City Mayor of Samaipata and Vallegrande proposed a few public lands, i.e. Samaipata - 3 sites, Vallegrande - 2 sites.

General characteristics of these sites are shown in Table A.1.4.-2.

(5) Criteria for characteristic evaluation

The concept of products collection and distribution system by 2 types of facilities (Main Center and Sub Center) was shown in M/P 1994. According to the result of research in Valley Areas in 1998, the trunk roads conditions from each target area to consumption area are not a critical constrain towards the transport system. Therefore Study Team determined not to adopt the Main and Sub Center system but to make adequate C/D Center plans for all of the target areas considering the characteristic of each target area. For the characteristic evaluation of the proposed sites in each target area, 8 evaluation criteria items (including several sub-criteria items) shown as follows were selected.

1) Production and supply potential :

"Production / target collection volume", "presence of its positioning as a target area for agriculture development", and "potential for production expansion (scale of existing irrigation development plan)" are evaluated in sub-criterias.

2) Possibility for organizing farmers :

"Presence of current farmers cooperative activities", and "presence of current water management association" (for irrigation project) are evaluated in sub-criterias to estimate the possibility for organizing farmers.

3) Possibility for adaptation of proposed shipping method (transshipment at C/D Center) :

It is necessary to estimate the possibility whether the trans-shipment method is adaptable for each target area or not. For this purpose, "presence of trans-shipment in current shipment", "employment of local transporters in current shipment", "presence of current transporters cooperatives" are selected for the sub-criterias.

4) Beneficiaries :

The actual dominant user of C/D Center will supposedly be the owner farmers and/or the farmer transporters. On the other hand, from the viewpoint of contribution to the weak, it is necessary to check whether C/D Center locates in the area where the small/weak farmers are dominant or not. Therefore "owner farmers ratio", "number of beneficiaries", "illiteracy ratio" and "presence of farmers intention to participate in cooperative collection and distribution", are selected for the sub-criteria.

5) Site condition :

"Accessibility to the project site from feeder road in farms", "possibility of actual practical use of existing facilities after rehabilitation", "reliability of land acquisition", "necessity of large scale land preparation work", and "infrastructure's conditions" of the project site in each target area are evaluated in sub-criterias.

6) Environmental impact Assessment :

a) Social Impact

"Social impacts to the related persons" have to be evaluated in sub-criterias. Main related persons are anticipated as follows.

- Small scale farmers, women engaged in small scale transportation, large scale farmers, local transporters, local intermediates, dealers of consumption area, neighboring inhabitants

b) Environmental impact

"Impacts of noise pollution", "air pollution", "water pollution", "soil pollution" and "garbage/dust problems" of each target area are evaluated in sub-criterias.

7) Project Evaluation :

As mentioned in the Consumption area, it is necessary to carry out the rough study of economic/financial reliabilities and income re-distribution among beneficiaries who belong to management organization and users here also.

8) Effective technology transfer :

It is necessary to evaluate whether the technology transfer to the related persons shown in criteria-6 (without neighboring inhabitants) will be done effectively or not. If some difficulties are found out for technology transfer, it is necessary to prepare the adequate treatment. To take care of the influence of illiteracy ratio is necessary for the effective technology transfer.

(6) Evaluation of proposed project sites

The result of characteristic evaluation of the target areas is shown from Table A.1.4-3 to Table A.1.4-4.

1) General characteristics

The result of "Production / Supply Potential" shows that only Saipina got the highest score, and it reflects the fact that only this city has both large scale production and irrigation plan on going in addition to the position of target area. Totally, the scores of each target area vary from high to low.

In the result of "Possibility for Organizing Farmers", only Vallegrande shows the highest score and the others show consistently medium scores, because both "presence of current farmers cooperative activities" and "presence of current irrigation cooperatives" are jointly observed only in Vallegrande.

The result of "Possibility for Adaptation of Proposed Shipping Method" shows that only Comarapa got extremely high score, and 3 target areas (i.e. Mairana, Pampa Grande, San Isidro) show consistently low scores, because "Trans-shipping Method" and "Transporter cooperatives" are confirmed jointly only in Comarapa, but these 2 items are not found in these 3 areas. Totally, the scores of each target area vary from high to low.

The result of "Beneficiaries" shows that the scores of Samaipata, Mairana, Pampa Grande and Comarapa are comparatively small than the others, because they reflect mainly the factor of "number of beneficiaries" and "Illiteracy ratio", i.e. the total beneficiaries' numbers of these 4 target areas are especially smaller than the others, and the illiteracy ration is very low only in Mairana. But totally, the scores of each target area do not vary so much.

The scores of "Site Condition" vary from high to low. Mairana, Pampa Grande and Saipina show consistently low scores, because these 3 sites proposed by the Municipal Government are private land and their infrastructure conditions are comparatively no good.

The score of "Environmental Impact Assessment" shows that there is no deference between each target area.

The result of "Project Evaluation" reflects the following facts.

- Pampa Grande, Saipina and Vallegrande show consistently high score in the economic/financial reliabilities because of their extreme high production/target collection volume, and high (comparative high) number. of beneficiaries.

The result of "Site Condition" shows consistent low score of Mairana, Pampa Grande and Saipina because of their low reliability of land acquisition, and non developed infrastructures.

The result of "Effective Technology Transfer" reflects the illiteracy ratio's condition in Valley Area. Only Mairana has comparatively low illiteracy ratio, therefore it shows the highest score, and the others show consistently almost medium scores. This type of bud influence from high illiteracy ratio can be reduced easily by means of introducing "on job training" or other practical training.

2) Classification of the target sites

From production volume, investment cost and technology transfer's view points, target areas can be classified as follows at present time.

- a) Area that has large potential of production/supply and high possibility for adaptation of trans-shipment method , and requires medium investment cost dependent on existing site conditions (Comarapa, Vallegrande)
- b) Area that has large potential of production/supply and high possibility for adaptation of trans-shipment method , but requires comparatively large investment cost dependent on existing site condition (Saipina*)
- c) Area that has large potential of production/supply and low possibility for adaptation of trans-shipment method, and requires small investment cost dependent on existing site condition (San Isidro)
- d) Area that has large potential of production/supply and low possibility for adaptation of trans-shipment method, and requires large investment cost dependent on existing site condition (Pampa Grande*)
- e) Area that has low potential of production/supply and high possibility for adaptation of trans-shipment method, and requires small investment cost dependent on existing site condition (Samaipata)
- f) Area that has low potential of production/supply and low possibility for adaptation of trans-shipment method, and requires large investment cost dependent on existing site condition (Mairana*)

Remark : * means that the site is private land. Special care has to be taken to these site, i.e. reconfirmation for the possibility of land acquisition, permission for the boring test/land survey from land owners, etc.

4.2.3 Target Areas for Products Collection

Zoning of target areas for products collection of each center has been made in the following manners.

- Irrigated areas are demarcated as the principal target areas for collection in all the producing area since production of potatoes, vegetables and fruits are dominantly carried out in irrigated areas,
- Rainfed potatoes growing areas at high altitude areas in Vallegrande Area and rainfed fruit growing areas in all the major producing areas are demarcated to be the target areas for collection, and
- Consideration of present marketing routes and transportation strategy in the demarcation; growing areas of potatoes, vegetables and fruits which presently have marketing routes of the products passing through or close to the location of C/D center in another municipality are demarcated as the target areas for collection of the center.

The demarcated target areas for products collection(target collection areas) of individual centers are Samaipata Collection Area, Mairana Collection Area, Pampa Grande Collection Area, Comarapa Collection Area, San Isidro Collection Area , Saipina Collection Area, Vallegrande Collection Area as illustrated in Figure A.1.4.-8 and as shown in Table A.1.4.-5.