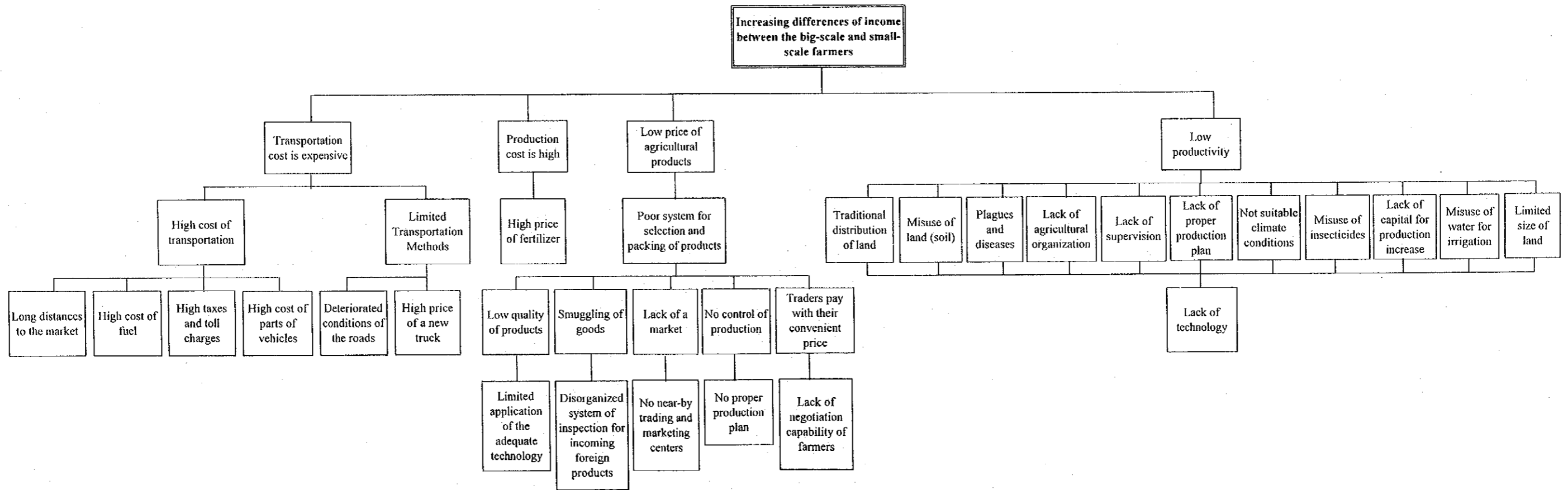
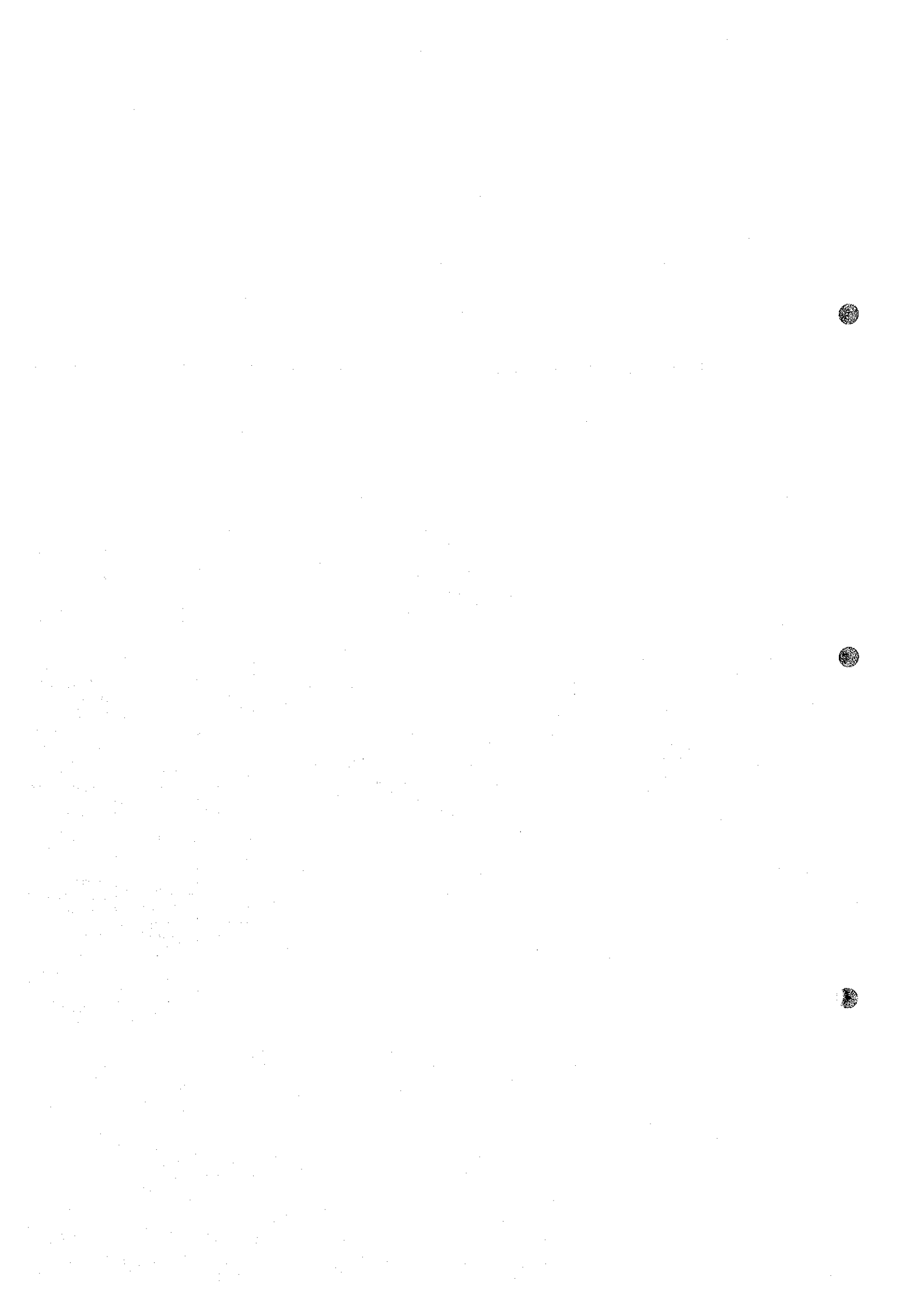


I-4 "Problem Tree on the Agriculture Sector in Comarapa" Formulated in the Comarapa Workshop









## I-5 PDM "Project for Establishment of Collection and Distribution Center"

PROJECT SUMMARY			INPUTS
<b>SUPER GOAL</b> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 45%;">Recognized as Fruit and Vegetable Supply Center in the prefecture and then in the country</div> <div style="border: 1px solid black; padding: 5px; width: 45%;">Regarded as Extension Center of Agricultural Technology and Institutional Strengthening</div> </div>			<div style="border: 1px solid black; padding: 5px; text-align: center;">Land</div>
<b>OVERALL GOAL</b> <div style="border: 1px solid black; padding: 5px; text-align: center; width: 30%; margin: 0 auto;">Increase of Agricultural Income</div>			<div style="border: 1px solid black; padding: 5px; text-align: center;">Equipment and Materials for Facility Construction</div>
<b>PROJECT PURPOSE</b> <div style="border: 1px solid black; padding: 5px; text-align: center; width: 30%; margin: 0 auto;">Improvement of Collection and Distribution System</div>			<div style="border: 1px solid black; padding: 5px;">                     Initial Investment for Facility Construction                       Operation Cost of the Center                 </div>
<b>OUTPUTS</b> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 30%;">Facilities of Collection and Distribution Center</div> <div style="border: 1px solid black; padding: 5px; width: 30%;">Established Cooperative Collection and Distribution System</div> <div style="border: 1px solid black; padding: 5px; width: 30%;">Improved Quality of Agricultural Products</div> </div>			<div style="border: 1px solid black; padding: 5px;">                     Experts of                      - Institution                      - Production Technology                      - Marketing                      - Post-harvesting                 </div>
<b>ACTIVITIES</b> <div style="display: flex; flex-wrap: wrap; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 30%;">Construction of Facilities</div> <div style="border: 1px solid black; padding: 5px; width: 30%;">Collaboration with a newly establish wholesale market in Santa Cruz</div> <div style="border: 1px solid black; padding: 5px; width: 30%;">Extension of Production Technology</div> <div style="border: 1px solid black; padding: 5px; width: 30%;">Establishment of Farmers' Association</div> <div style="border: 1px solid black; padding: 5px; width: 30%;">Extension of Harvesting, Post-Harvesting, and Packing Technology</div> <div style="border: 1px solid black; padding: 5px; width: 30%;">Technology Transfer in Cooperative Collection and Distribution</div> <div style="border: 1px solid black; padding: 5px; width: 30%;">Pilot Project with Existing Collection and Distribution Center</div> </div>			<div style="border: 1px solid black; padding: 5px; text-align: center;">Acceptance of Farmers</div>
			<b>PRECONDITIONS</b>

## I-6 Comments on the Proposed Operation System

### (1) Constraints which are expected to be solved by the Proposed Project

Most of their products have been sold in Cochabamba. However, the market in Cochabamba is getting smaller, because farmers in Cochabamba and La Paz have promoted growing fruit and vegetables.

Farmers including women, who used to sell their products in the Abasto Market, seldom go to the Abasto Market, because there are no space available for them.

There are no information system available to know how much their products are to be sold by intermediaries in the Abasto Market.

Their competitiveness in the Abasto Market is not strong, because the volume they can supply to the Market is very limited.

### (2) Important Issues which need to be Considered in the Proposed Project

Credibility and transparency on the pricing system in the new wholesale market should be improved and secured.

To foster a reliable relationship between the project and the farmers is most important to make the project acceptable by the production site.

### (3) Possible Constraints for the Proposed Project

They rely on EMCA rather than ASOFRUT. They regard ASOFRUT as the organization having less relationship with the producers.

Existing strong financial relationship between the intermediaries as financiers and the farmers might be difficult to be neglected.

Two types of land ownership (owned/rent) might be one of the conflicts for the farmers to start to join the project.

Farmers' fear and suspicion about working in a group have been formed based on their previous bad experience in various projects. No equal distribution of benefits.

Farmers are not familiar with the activities in a group traditionally. They prefer to work individually due to its cultural background. Some experience for getting credit.

Poverty and high illiteracy rate of women in the mountain areas, especially in the small-scale farmers' families, is one of the biggest constraints in improvement of their market competitiveness.

## II-1 Agenda

### AGENDA OF PCM WORKSHOP IN SANTA CRUZ

With Wholesalers  
in Hotel Asturias  
November 30, 1998

---

8:30 – 10:00	Registration
<i>- Opening -</i>	
10:00 – 10:10	Opening Speech by the Representative from the Prefecture of the Department of Santa Cruz
10:10 – 10:20	Brief Explanation by the Team Leader of the Study Team
<i>- Workshop -</i>	
10:20 – 10:30	Outline of the Workshop by the Moderator
10:30 – 10:45	Introduction of the Participants
10:45 – 11:00	Outline of the PCM by the Moderator
11:00 – 11:15	Coffee Break
11:15 – 11:45	Explanation about the Proposed Project
11:45 – 12:30	Questions and Answers
12:30 – 14:00	Lunch
14:00 – 14:45	Participation Analysis
14:45 – 15:45	Problem Analysis and Discussions about the Operation System of the Proposed Project
<i>- Closing -</i>	
15:45 – 16:00	Closing Address by the Prefecture of Department and Presentation of Certification

**II-2 LIST OF PARTICIPANTS IN THE SANTA CRUZ 1 WORKSHOP (November 30)**

	NAME	INSTITUTION	POSITION
1	Jose Arimoza	ACPAMA	President
2	Mario Grass	Cooperativa 2 de Junio	Administrator
3	Guido Valdivia	Cooperativa 19 de Marzo	Representative
4	Gerardo Ricaldez	Cooperativa 19 de Marzo	Representative
5	Edgar Montano	Cooperativa 2 de Junio	President
6	Armando Rivera	ASPROA	President
7	Fermin Tito	FSUTCSC	Representative
8	Placido Baron	AIPPA	President
9	Ernesto Romero	AIPPA	Vicepresident

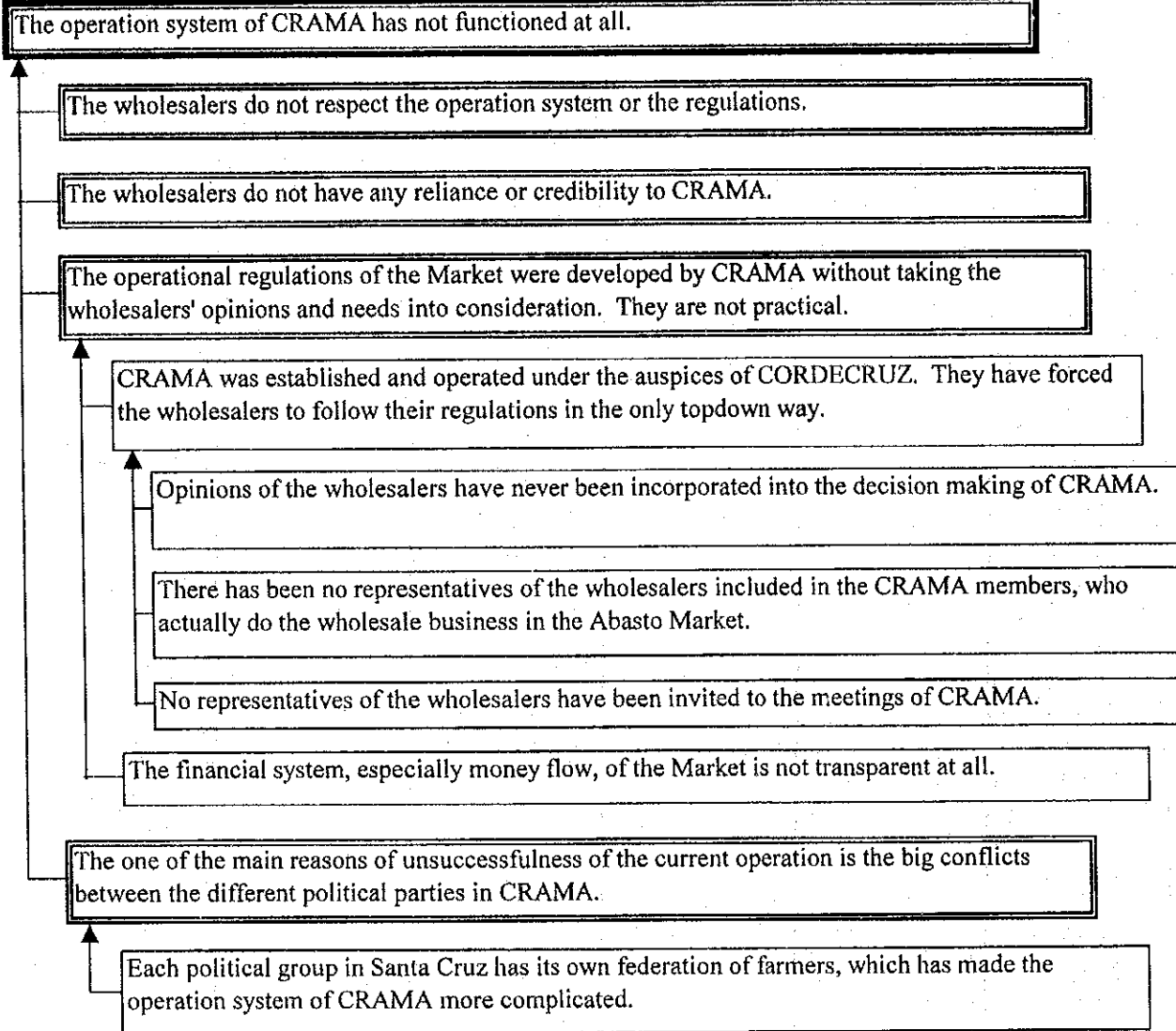


## II-3 Participation Analysis Formulated in the Santa Cruz 1 Workshop

### "Project for Improvement of the Wholesale Market in Santa Cruz"

Direct Beneficiaries	Possible Opponent	Implementation Agency	Decision Makers	Funding Agency	Supporting Agency
Wholesalers' Association	Intermediaries	Municipal Government	Municipal Government	NGO	NGO
Wholesalers' Cooperatives		Institute of Investigation		JICA	Donors
Indirect Beneficiaries					Transporters
Small-scale Farmers					Government of Bolivia
Retailers					Prefecture Government
Consumers					CAO
ASOFRUT					EMCA
Farmers					Provincial Technical Committee
FSUTCSC					CIAT
					ASOFRUT

## II-4 Problems in the Current Operation System of the Abasto Market



## II-5 PDM "Project for Improvement of the Wholesale Market in Santa Cruz"

PROJECT SUMMARY			INPUTS
<b>OVERALL GOAL</b> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 30%;">Improvement of the Marketing System of Vegetables and Fruits</div> <div style="border: 1px solid black; padding: 5px; width: 30%;">Establishment of fair and proper pricing system</div> </div>			<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Land</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Equipment and Materials for Market Construction</div>
<b>PROJECT PURPOSE</b> <div style="border: 1px solid black; padding: 5px; margin-top: 10px; width: 40%; margin-left: auto; margin-right: auto;">Development of effective wholesale market system</div>			<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Initial Investment for Market Construction</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Operation Cost of the Market</div>
<b>OUTPUTS</b>			<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Experts of - Laws &amp; Institutions - Market Operation - Marketing</div>
New Wholesale Market	Separation of Wholesale Market and Retail Market	Institutional Strengthening for Wholesale Market Operation	
<b>ACTIVITIES</b>			<b>PRECONDITIONS</b>
Construction of Facilities	Clarification of the Roles of each Market	Establishment of Operational Organization	Acceptance of Market Users
	Development of the Regulations	Development of Operational Rules and Regulations	Acceptance of Inhabitants
		Technology Transfer for Market Operation	Cooperation between the prefecture and the municipal governments

## II-6 Comments on the Proposed Operation System

The participants understood the entire scope of the project for improvement of agricultural marketing system.

The participants agreed that the project would be operated under the management committee under the municipal government in the beginning basically.

The participants understood the importance of improvement of production, harvesting, post-harvesting, collection, and distribution systems in the 7 production centers.

The participants understood the importance of including the farmers in the valley area in the beneficiaries of the project

The participants agreed that both of the representatives from the wholesalers and from the producers would be involved in the administration system of the new market.

It is not appropriate to include ASOFRUT in the administration system of the new market, they do not know anything about marketing and they do not reflect the actual needs of farmers.

Good coordination between the prefecture and the municipal governments is the most important issue for the successfulness of the project.

They are really interested in the institutional strengthening of the operation system. They never want to repeat the same failure like CRAMA.

CAO is not the appropriate agency included in the administration system, because they have never been involved in the activities of marketing fruit and vegetables.

The project needs to be designed with considering not only large-scale farmers but also small-scale farmers.

Municipal government can be a supervision agency. However, prefecture government does not have authorities to administrate the wholesale market. They can be a supporting agency.

### III-1 Agenda

**AGENDA  
OF  
PCM WORKSHOP IN SANTA CRUZ**

**With Female Retailers/Wholesalers  
in Hotel Asturias  
December 3, 1998**

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7:30 – 8:30	Registration
<i>- Opening -</i>	
8:30 – 8:45	Opening Speech by Representative from Prefecture of Department
8:45 – 9:00	Brief Explanation by Representative from the Study Team
<i>- Workshop -</i>	
9:00 – 9:15	Outline of the Workshop by the Moderator
9:15 – 9:30	Introduction of the Participants
9:30 – 9:45	Outline of the PCM by the Moderator
10:00 – 10:30	Explanation about the Proposed Project by the Moderator
10:30 – 10:45	Coffee Break
10:45 – 11:15	Questions and Answers about the Proposed Project
11:15 – 12:00	Participation Analysis and Discussions
12:00 – 13:30	Lunch
13:30 – 15:00	Discussions on Current Problems in the Abasto Market
15:00 – 15:15	Coffee Break
<i>- Closing -</i>	
15:15 – 15:30	Closing Address by the Prefecture of Department and and Presentation of Certification

**III-2 LIST OF PARTICIPANTS IN THE SANTA CRUZ 2 WORKSHOP (December 3)**

	NAME	INSTITUTION	POSITION
1	Rita Arandia	ASPROA	Public Relations (Retailer)
2	Raymunda Arevalo	ASPROA	Member (Retailer)
3	Zenovia Quena	ASPROA	Member (Retailer)
4	Lilian Romero Tedia	2 de Junio	Member (Retailer)
5	Trifonia Balderrama	ASOPROCA	President (Wholesaler/Retailer)
6	Norma Cañari	ASOPROCA	Secretary of Coordination (Wholesaler)
7	Matilde Muñoz	Libre	Member (Wholesaler)
8	Marcelina Parra	ASOPROCA	Member (Wholesaler)
9	Servanda Barcios	19 de Marzo	Secretary General (Wholesaler)
10	Ilda Zeballos	19 de Marzo	Member (Wholesaler)
11	Kasiana Chumaser	Federacion Unica	Member (Retailer)
12	Justina Guzman	ASOPROCA	Member (Retailer)
13	Elsa Sonco Peñoloza	AIPPA	Member (Retailer)
14	Marlene Alvarado	AIPPA	Member (Retailer)
15	Luisa Soliz	AIPPA	Member (Wholesaler)
16	Deisy Morales	19 de Marzo	Representative of Potato Sector (Wholesaler)
17	Celia Vasquez	19 de Marzo	Member of Potato Sector (Wholesaler)

### III-3 Participation Analysis Formulated in the Santa Cruz 2 Workshop

#### "Project for Improvement of the Wholesale Market in Santa Cruz"

Beneficiaries	Possible Opponent	Implementation Agency	Decision Makers	Funding Agency	Supporting Agency
Wholesalers	Supermarkets	JICA	Prefecture Government	Cooperatives	Municipal Government
Producers	Associations			Banks	JICA
Retailers	Street Venders			Cooperatives of Credits	ASOFRUT
Large-scale Wholesalers					
Small-scale Producers					
Transporters					
Large-scale Producers					
Associations					
Intermediaries					
Consumers					

### III-4 Problems in the Abasto Market

#### (1) Infrastructure

There are no roofs over the retail markets.

Selling space is very limited. Congestion in the market.

Parking space is limited.

Truck entrance is too small for smooth flow of traffic and products.

Hall-ways are too narrow for smooth traffic of trucks and pedestrians.

#### (2) Facilities and Equipment

Small trucks are not available for re-distribution of the vegetables.

Weighing equipment for trucks and for products is not enough.

No storage available to keep the products fresh.

#### (3) Sanitation and Working Environment

No nurseries available. They take care of their children under the tables in the market.

Garbage collection system is not well functioning. Garbage containers are not enough.

There is only one water pipeline. Absolutely inconvenient for washing products.

Limited number of bathrooms. Sanitary conditions are not good. Shower room is needed.

Cleaning system of the market has not been well functioning.

Restaurants or canteens should be improved.

Ventilation system of the market is terrible.

No green area or playground in the market.

#### (4) Operations

Security system of the market has not been functioning.

Supervision on the market activities (ex. weighing of products) are not well conducted.

Cost for electricity is very expensive.

Disorganized spacing in the market.



### III-5 PDM "Project for Improvement of the Wholesale Market in Santa Cruz"

PROJECT SUMMARY			INPUTS
<b>OVERALL GOAL</b> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 45%;">Improvement of the Marketing System of Vegetables and Fruits</div> <div style="border: 1px solid black; padding: 5px; width: 45%;">Establishment of fair and proper pricing system</div> </div>			<div style="border: 1px solid black; padding: 5px; width: 100%;">Land</div>
<b>PROJECT PURPOSE</b> <div style="border: 1px solid black; padding: 5px; width: 100%; text-align: center;">Development of effective wholesale market system</div>			<div style="border: 1px solid black; padding: 5px; width: 100%;">Equipment and Materials for Market Construction</div> <div style="border: 1px solid black; padding: 5px; width: 100%;">Initial Investment for Market Construction</div> <div style="border: 1px solid black; padding: 5px; width: 100%;">Operation Cost of the Market</div>
<b>OUTPUTS</b> <div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 25%;">New Wholesale Market</div> <div style="border: 1px solid black; padding: 5px; width: 25%;">Separation of Wholesale Market and Retail Market</div> <div style="border: 1px solid black; padding: 5px; width: 25%;">Institutional Strengthening for Wholesale Market Operation</div> </div> <div style="border: 1px solid black; padding: 5px; width: 25%; margin-top: 5px;">Renovated Abasto Market</div>			<div style="border: 1px solid black; padding: 5px; width: 100%;">Experts of - Laws &amp; Institutions - Market Operation - Marketing</div>
<b>ACTIVITIES</b> <div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 25%;">Construction of Facilities</div> <div style="border: 1px solid black; padding: 5px; width: 25%;">Clarification of the Roles of each Market</div> <div style="border: 1px solid black; padding: 5px; width: 25%;">Establishment of Operational Organization</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="border: 1px solid black; padding: 5px; width: 25%;">Renovation of Abasto Market</div> <div style="border: 1px solid black; padding: 5px; width: 25%;">Development of the Regulations</div> <div style="border: 1px solid black; padding: 5px; width: 25%;">Development of Operational Rules and Regulations</div> </div> <div style="border: 1px solid black; padding: 5px; width: 25%; margin-top: 5px; text-align: center;">Technology Transfer for Market Operation</div>			<b>PRECONDITIONS</b> <div style="border: 1px solid black; padding: 5px; width: 100%;">Acceptance of Market Users</div> <div style="border: 1px solid black; padding: 5px; width: 100%;">Acceptance of Inhabitants</div> <div style="border: 1px solid black; padding: 5px; width: 100%;">Cooperation between the prefecture and the municipal governments</div>

### III-6 Comments on the Proposed Operation System

Reorganization and rehabilitation of the Abasto Market is highly required.

There are no reliance on the municipal government due to their bad experience in the past. The municipal government should not join the administration committee. They should supervise the project only.

Money and tax collection system and financial system of the market handled by the municipal government should become open to the public and need to be reorganized.

There have been many conflicts about the selling space etc. among the many associations. The existing associations need to be unified. One association of wholesalers and one association of retailers are the most desirable number for effective operation of the market.

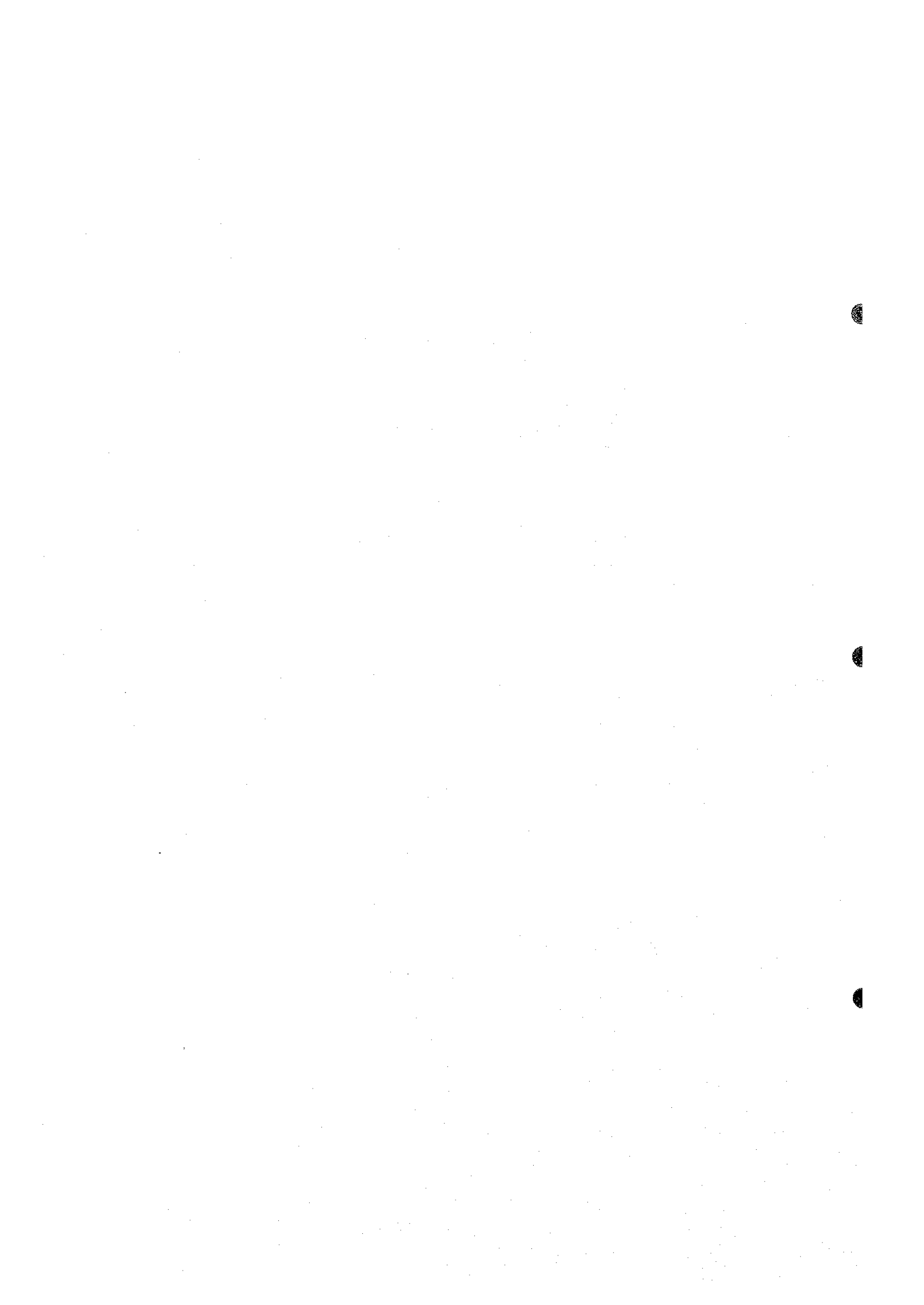
Nursery is very much required for the safeties of their children and for their efficient activities.

The current operation system has been terrible. Technical support by JICA is very much required.

ASOFRUT can not be an administrative body. They can be a supporting body.

**ATTACHMENT 3**

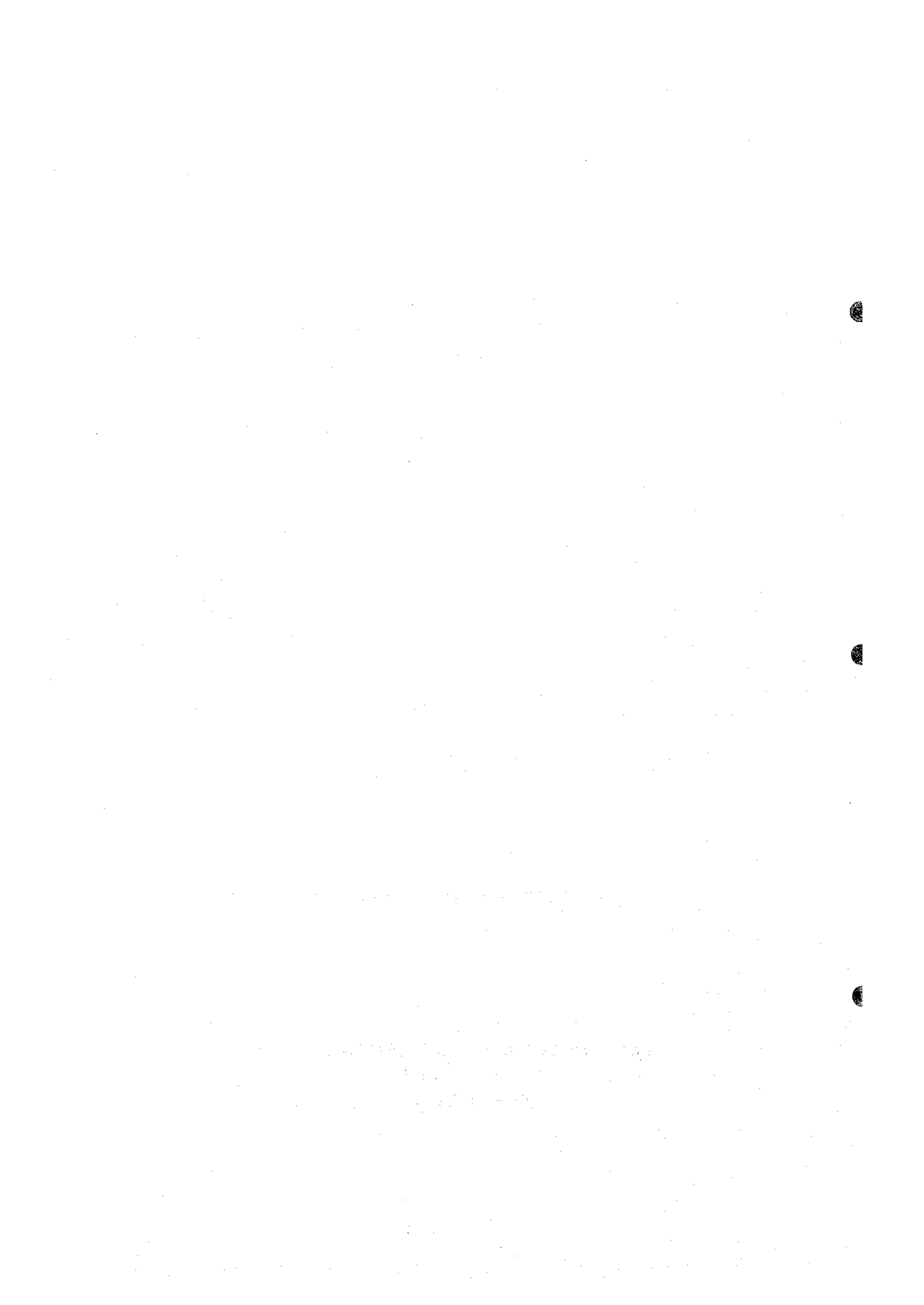
**MATERIAL FOR DEMONSTRATION**



**DEMONSTRATION OF  
COOPERATIVE COLLECTION AND DISTRIBUTION  
IN SAN ISIDRO**

**NOVEMBER 30 – DECEMBER 1, 1998**

**PRODUCERS/ TRANSPORTERS OF SAN ISIDRO  
ASOFRUT  
JICA STUDY TEAM**



## **1 Introduction**

The demonstration of cooperative collection and shipment of vegetables was carried out at San Isidro Collection Area by utilizing the existing PETHOSAM collection facility from November 30 to December 1, 1998. The objectives, collection and shipment system, trials implemented and results of the demonstration are as follows;

## **2 Objectives and Collection and Shipment System for Demonstration**

The objectives of the demonstration (trial collection and shipment) are:

- To initiate trial cooperative collection and shipment participated by producers in cooperation with wholesalers at Abasto Market and other buyers ,
- To demonstrate cooperative collection and shipment by producers,
- To examine possibility for introduction of cooperative collection and shipment, and
- To collect data on market preference for quality and grading.

The cooperative collection and shipment system employed in the demonstration is illustrated in Fig. -1.

## **3 Location and Schedule**

Location: PETHOSAM collection facility, San Isidro  
Schedule: November 29 to December 1, 1998  
November 29 : Preparation  
November 30 : Cooperative collection & shipment  
December 1 : Selling & evaluation

## **4 Basic Procedures for Trial Collection and Shipment**

The basic procedures taken for the implementation of demonstration are as shown in Fig. -2.

## **5 Trial Components**

The trial components implemented during the demonstration include trials on 1) re-selection & grading, 2) packing methods and 3) destination market (supermarkets, Hipermaxi and Hamacas).

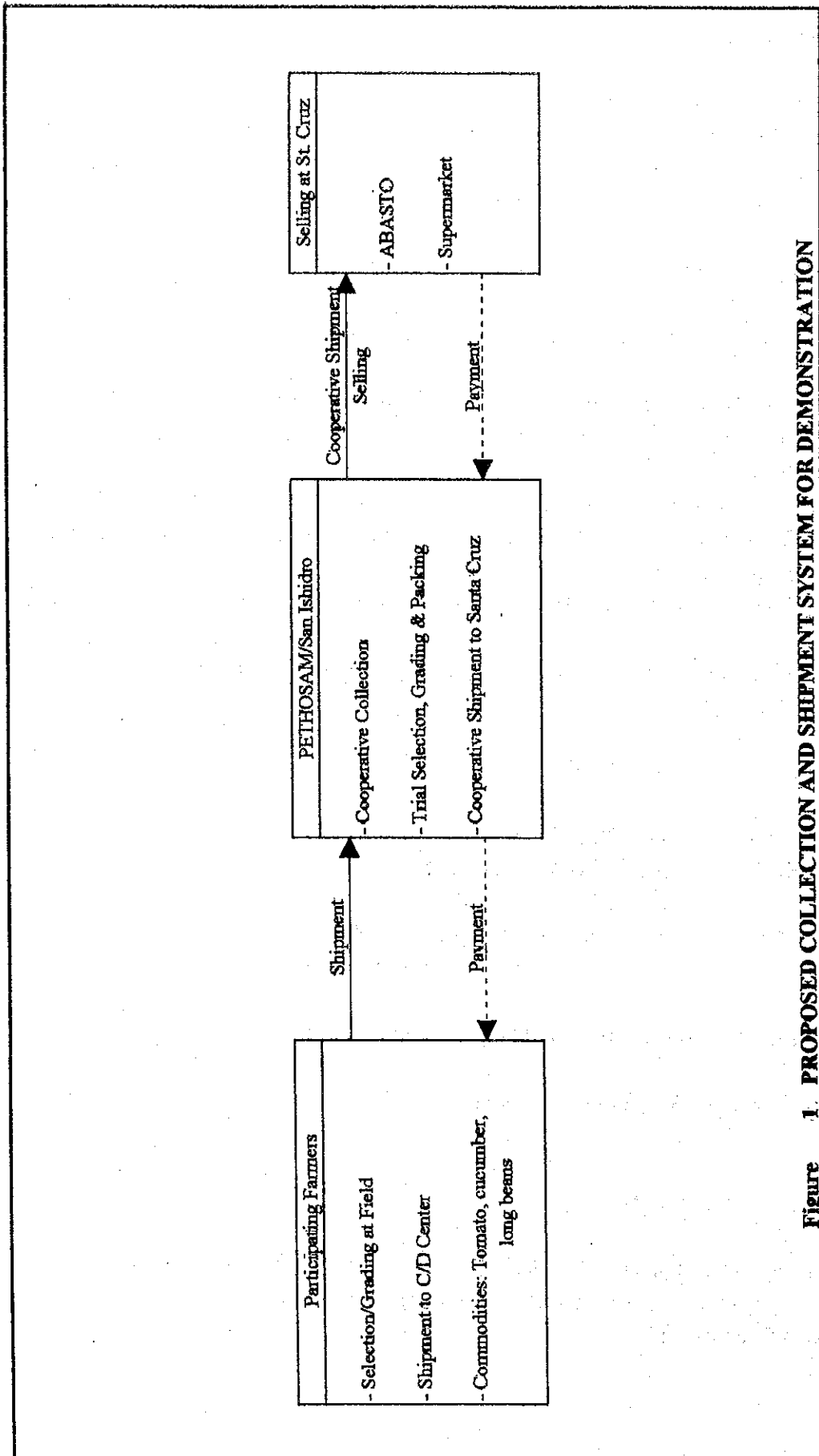
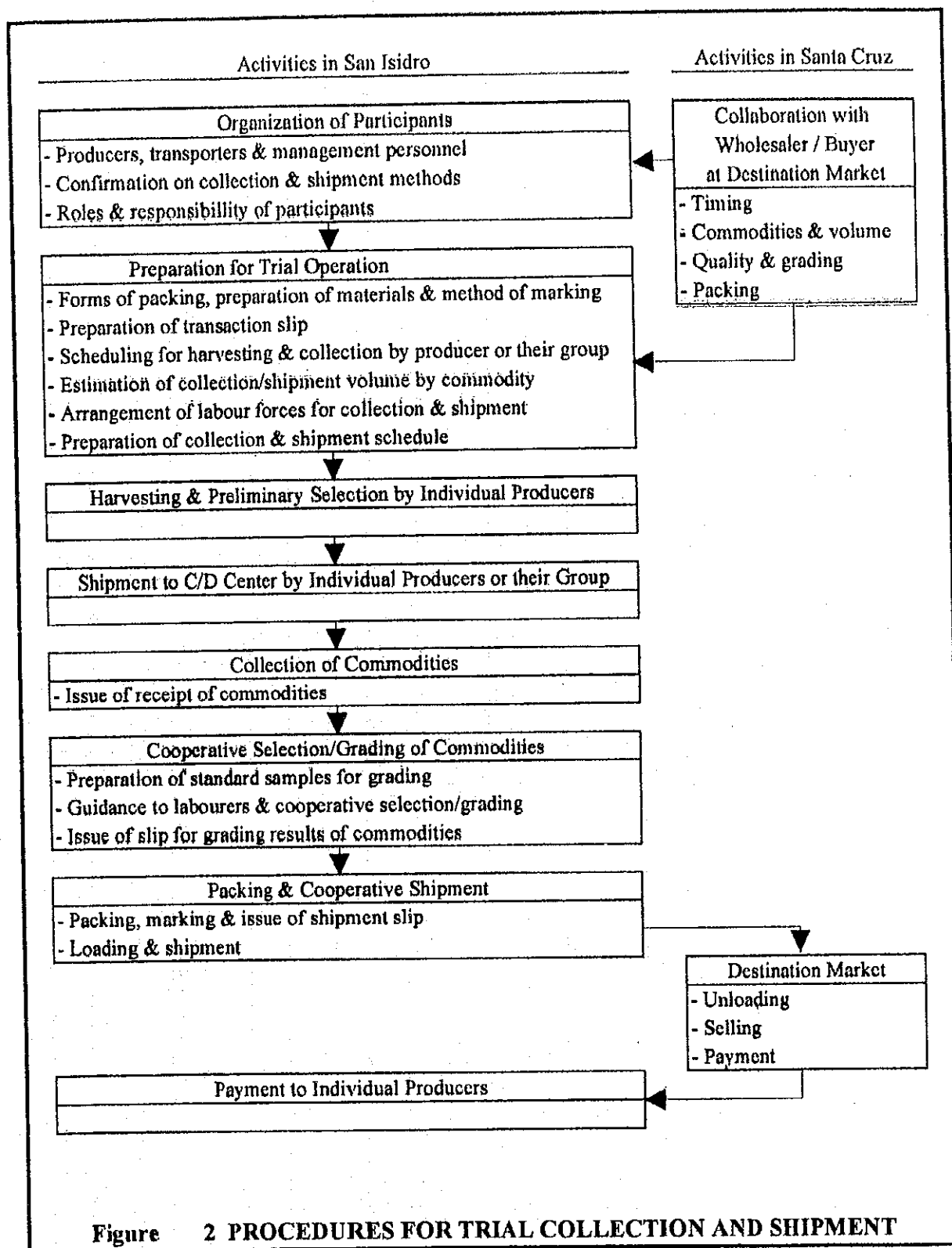


Figure 1 PROPOSED COLLECTION AND SHIPMENT SYSTEM FOR DEMONSTRATION





**Figure 2 PROCEDURES FOR TRIAL COLLECTION AND SHIPMENT**

**Table 1 RESULTS OF DEMONSTRATION - 1/4**

1. Producer: Fisher Mariaca		Products: Tomatoes		Collection			
Grade	Quantity(box) & Volume(kg)	Collection Time	Harvesting Date	Transportation to PETHOSAM	Remarks		
PE ( excellent	12 boxes; 276kg	18:45	Nov. 30	Collected at fields due to delay in	Graded into 2 classes at fields		
P(1st class)	38 boxes; 874kg	18:45	Nov. 30	harvesting, selection & packing	Variety: Santa Clara(pera)		
Total	50 boxes; 1,150kg	-	-	-	-		

Selection and Shipment			
Grade	Quantity(box)	Selection/Grading Methods	Quality of Products
PE ( excellent	12 boxes; 276kg	No re-selection made due to delay in	Less matured products
P(1st class)	38 boxes; 874kg	harvesting, selection & packing	
Total	50 boxes; 1,150kg	-	-

Selling						
Grade	Destination Market	Arrival at ABASO	Time of Delivery	Quantity(box)	Unit Price (Bs./box)	Producer Price (Bs./box)
PE ( excellent	ABASTO(1 wholesaler)	04:15	06:25	12	8.00	96.00
P(1st class)		04:15	06:25	38	8.00	304.00
Total	-	50	0.53	50	-	400.00

Remark 1: Producer price(Bs./box) = unit price - transportation cost(Bs. 3/box)

**Table 1 RESULTS OF DEMONSTRATION - 2/4**

2. Producer: Willy Guzman		Products: Tomatoes			
		Collection			
Grade	Quantity(box) & Volume(kg)	Collection Time	Harvesting Date	Transportation to PETHOSAM	Remarks
P(1st class)	45 boxes; 1,035kg	11:05	Nov. 29 & 30	By a truck employed for shipment	Graded into 2 classes at fields
S(2nd class)	5 boxes; 115kg	11:05	Nov. 29 & 30	to ABASTO	Variety: Santa Clara(pera)
Total	50 boxes; 1,150kg	-	-	-	-

Selection and Shipment			
Grade	Quantity(box)	Selection/Grading Methods	Remarks
E(excellent class)	6	1st class products re-graded into E & P	E class products cleaned by cloth & packed in order by using paper cushion for trial purpose
P(1st class)	40	class by size and maturity	Variety: Santa Clara(pera)
S(2nd class)	5	No re-selection made	
Total	51	-	-

Selling						
Grade	Destination Market	Arrival at ABASO	Time of Delivery	Quantity(box)	Unit Price (Bs./box)	Producer Price (Bs./box)
E(excellent class)	Hipermaxi	03:15	07:00	2	20.20	40.40
E(excellent class)	Hamacas	03:15	07:30	2	15.00	30.00
E(excellent class)	Consumer	03:15	06:45	2	15.00	30.00
P(1st class)	ABASTO(3 wholesalers)	03:15	06:45	40	6.00	240.00
S(2nd class)		03:15	06:45	5	5.00	25.00
Total	-	-	-	51	-	265.00

Remark 1: Producer price(Bs./box) = unit price - transportation cost(Bs. 3/box)

**Table 1 RESULTS OF DEMONSTRATION - 3/4**

3. Producer: Ernesto Olivera		Products: Cucumber		Collection		
Grade	Quantity (bag) & Volume (kg)	Collection Time	Harvesting Date	Transportation to PEHOSAM	Remarks	
No selection	94 bags; 3,290kg	15:25	Nov. 30	By tractor	No selection made	
Total	94 bags; 3,290kg	-	-	-	-	

Selection and Shipment				
Grade	Quantity (bag)	Selection/Grading Methods	Quality of Products	Remarks
Selected	3	Selected based on quality standard	Fairly good	Contaminated with soils because of rain before harvest
Selected	1 carton box; 10kg	demanded by Hipermaxi & washed		
No selection	91			
Total	94			

Selling						
Grade	Destination Market	Arrival at ABASO	Time of Delivery	Quantity (bag)	Unit Price (Bs./box)	Producer Price (Bs./bag)
Selected	Hipermaxi	03:15	07:00	3	32.87	98.60
Selected	Hamacas	03:15	07:30	1 carton box(10kg)	10.00	-
No selection	ABASTO(5 intermediaries)	03:15	03:45	91	8.00	728.00
Total	-	-	-	51	-	836.60

Remark 1: Producer price(Bs./bag) = unit price - transportation cost(Bs. 4/bag)

**Table 1 RESULTS OF DEMONSTRATION - 4/4**

**4. Producer: Jose Gal**      **Products: Long Beans**

Collection					
Grade	Quantity(bag) & Volume(kg)	Collection Time	Harvesting Date	Transportation to PETHOSAM	Remarks
No selection	60 bags; 1,380kg	16:25	Nov. 30	By tractor	No selection made
Total	60 bags; 1,380kg	-	-	-	-

Selection and Shipment				
Grade	Quantity(bag)	Selection/Grading Methods	Quality of Products	Remarks
Selected	3	Selected based on quality standard demanded by Hipermaxi	Inclusion of black spotted pods & over matured pods	Substantial time required for selection Selection at harvesting preferable
No selection	56.5	-	-	-
Total	59.5	-	-	-

Selling							
Grade	Destination Market	Arrival at ABASO	Time of Delivery	Quantity(bag)	Unit Price (Bs./box)	Amount(Bs.)	Producer Price (Bs./bag)
Selected	Hipermaxi	03:15	03:45	3	24.33	72.10	20.33
No selection	ABASTO(1 intermediary)	03:15	03:45	20	15.00	300.00	11.00
No selection	ABASTO(4 intermediaries)	03:15	03:45	36.5	13.00	474.50	9.00
Total	-	-	-	59.5	-	846.60	-

Remark 1: Producer price(Bs./bag) = unit price - transportation cost(Bs. 4/bag)

**Table 2 ITINERARY FOR STUDY TOUR**

Date	Time	Programs	Presenter	Moderator	Place
1st Day December 9	13:00 - 13:50	Reporting at Prefecture Office			
	14:30	Departure to CAISY, Colonia San Juan de Yapacani			
	17:00	Arriving at CAISY			
2nd Day December 10	17:30 - 17:45	Opening of Study Tour	Study Team	Prefecture	Japan & Bolivia Cultural Center
	17:50 - 19:50	Lecture 1. Background & history of CAISY	CAISY		Japan & Bolivia Cultural Center
	08:00 - 10:00	Lecture 2. Collection and marketing system in CAISY	CAISY		Japan & Bolivia Cultural Center
	10:00 - 10:05	Break			
	10:05 - 12:15	Visit to marketing & processing facilities, farm lands & farmers	CAISY		Colonia de San Juan
	12:00 - 14:00	Lunch			Restaurant in Colonia de San Juan
	14:00 - 15:30	Explanation of appraisal sheet & free discussion		Prefecture/Study Team	
3rd Day December 11	16:30 - 18:30	Exchange of opinion with representatives of CAISY members & CAISY staff(6 representatives)	CAISY		Colonia de San Juan
	18:30 - 20:30	Friendly party by the courtesy of CAISY			Japan & Bolivia Cultural Center
	07:30 - 08:00	Preparation for Evaluation by Participants		Prefecture	Hotel Meeting Hall
	08:00 - 09:30	Evaluation & Closing of Study Tour		Prefecture/Study Team	Hotel Meeting Hall
	10:00	Departure to Santa Cruz			
	12:00	Arriving in Santa Cruz & breaking up at Prefecture Office			

**Table 3 LIST OF PARTICIPANTS FOR STUDY TOUR**

<b>Representatives of Sub-Prefecture Office, Municipal Government &amp; NGO</b>	
Representative of Sub-Prefecture Office, Caballero Province	Walter Terccros
Representative of Municipal Government, Samaipata Municipality	Alfredo Vargas
Representative of Municipal Government, Saipina Municipality	Victoriano Barron
Representative of Municipal Government, Vallegrande Municipality	Pedro Vargas Mojica
Representative of Instituto de Capacitacion del Oriente(ICO), Vallegrande	Vargas Alcidas
Representative of Instituto de Capacitacion del Oriente(ICO)	Ruede Robert

<b>Representatives of Farmers</b>		
Target Areas for		
Municipality	Products Collection	Participants
Mairana	Mairana Area, President ASOFRUT	Noe Moron
	Mairana Area, Representative of ASOFRUT	Abberto Alba
Comarapa	San Isidro Area, participant of demonstration	Ernesto Olivera
	San Isidro Area, participant of demonstration	Fisher Mariaca
	Comarapa/San Isidro Area, EMCA	Israel Arana
Saipina	Saipina Area, Water Users Association, Saipina	Carlos Aguirre
	Saipina Area, President of ASOFRUT	Justo Serrano
Vallegrande	Vallegrande Area, Member CAPA	Eduardo Mendoza
Santa Cruz	Representative of ASOFRUT	Esther Luisa Rojas

<b>JICA Study Team &amp; Counterpart of Prefecture</b>	
JICA Study Team	T. Yamazaki (Rural Society/Organization)
	T. Shiraki (Production Site Collection/Distribution)
	Technical Assistant
Prefecture	Ing. Cuillermo Serrate Cespedes
	Ing. Jose Luis Carreno

Table 4 RESULTS OF EVALUATION ON THE STUDY TOUR

Participants	Answer to Q-1		Answer to Q-2				Answer to Q-3				Answer to Q-4			Q-5			
	Very useful	Useful	Not so much	a)	b)	c)	d)	a)	b)	c)	d)	Good	Too much	Too short	a)	b)	c)
Officer of Local Government																	
No.1	1				1			3	1	4	2				1		
No.2	1				1			1	4	3	2				1		1
No.3	1				1			2	1	3	4			1	1		
No.4		1			1			2	1	3	4				1		1
Sub total	3	1	0	0	4	0	0	8	7	13	12			3	1	1	0
Representative of Farmers																	
No.1	1				1			2	1	3	4				1		1
No.2	1				1			1	2	4	3				1		1
No.3		1			1			4	3	2	1				1		
No.4		1			1			4	2	1	3				1		1
No.5		1			1			4	3	2	1				1		1
No.6		1			1			1	2	3	4				1		1
No.7		1			1			1	2	3	4				1		1
No.8		1			1			2	1	3	4				1		1
No.9		1			1			2	1	3	4				1		1
No.10		1			1			4	2	3	1			1	1		
No.11		1			1			3	2	1	4				1		1
Sub total	10	1	0	0	9	0	0	28	21	28	33			9	1	1	8
Grand Total	13	2	0	0	13	0	0	36	28	41	45			12	2	1	10

Note:

Q-1; Was the Study Tour useful for to promote a C/D center and a farmers' organization in your Municipal?

Q-2; When your answer "Useful", which is the most useful among the following matters?

a) Visit to modern facilities. b) Experience of establishing CAISY. c) Operation of CAISY. d) Other

Q-3; Which subject are more interest for you through the Study tour? (Put order in blankets)

a) Background and history of CAISY. b) Collection & marketing system of CAISY. c) Visit to the facilities of CAISY. d) Exchange of opinion with CAISY's members.

Q-4; Was the period of study enough or not?

Q-5; When you promote the establishment of the C/D center and farmers' organization, do you think that farmers' study tours to advanced areas should implement at any cost in order to understand the significance of the C/D center and farmers' organization?

a) Yes, but the cost should be burden by the Government. b) Yes, but the cost should be burden by farmers themselves. c) No



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

## **ANNEX 4**

### **FACILITIES DESIGN FOR PRODUCTS COLLECTION AND DISTRIBUTION CENTER AND NEW WHOLESALE MARKET**

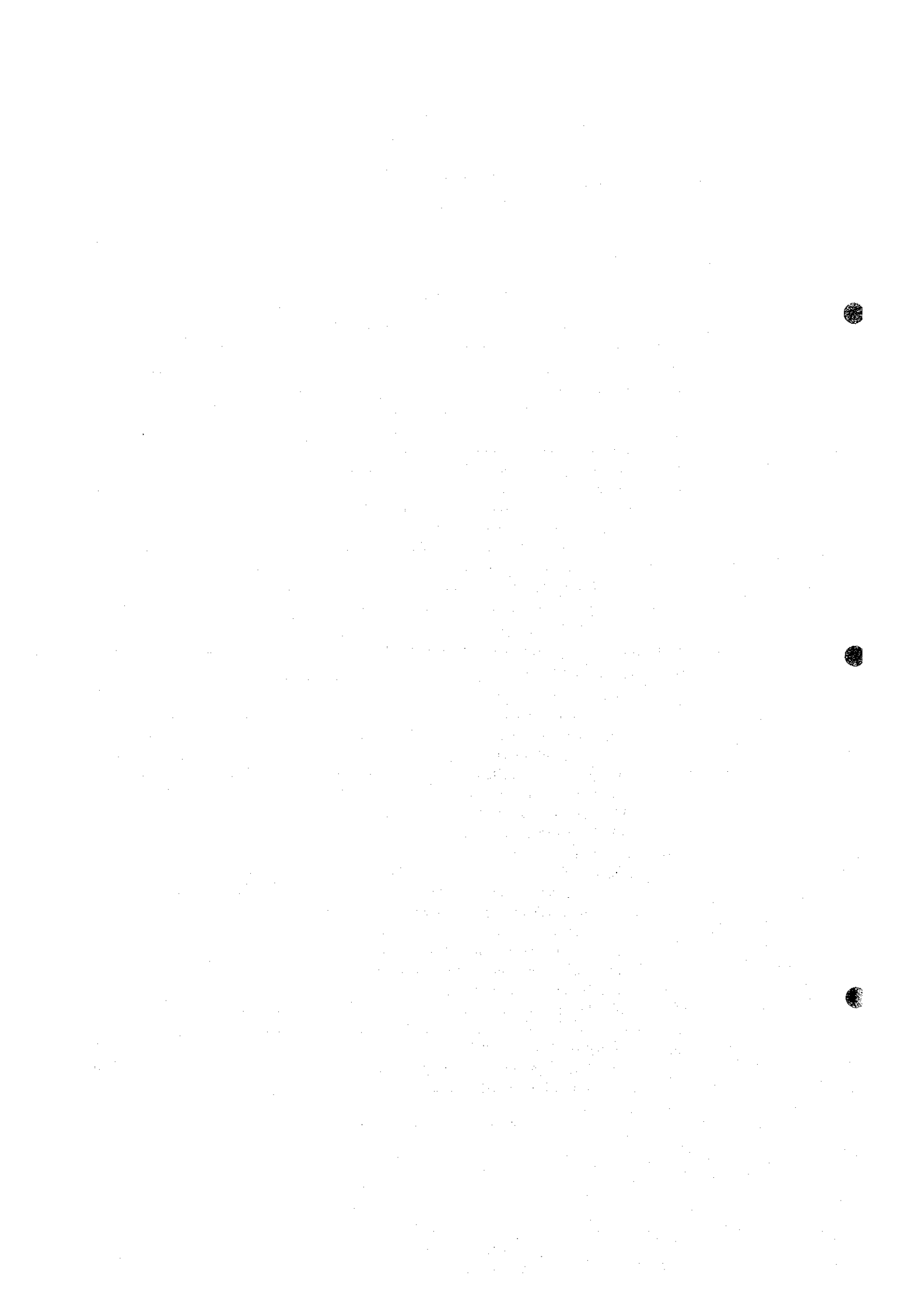


## ANNEX 4

# FACILITIES DESIGN FOR PRODUCTS COLLECTION/DISTRIBUTION CENTER AND NEW WHOLESALE MARKET

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**FACILITIES DESIGN FOR PRODUCTS COLLECTION/DISTRIBUTION CENTER**  
**AND NEW WHOLESALE MARKET**

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**ANNEX 4 FACILITIES DESIGN FOR PRODUCTS  
COLLECTION/DISTRIBUTION CENTER AND NEW  
WHOLESALE MARKET**

**1 PRODUCTS COLLECTION/DISTRIBUTION CENTER IN  
PRODUCTION AREA**

**1.1 Project Sites**

7 proposed sites in Samaipata, Mairana, Pampa Grande, San Isidro, Comarapa, Saipina, and Vallegrande shown in ANNEX 2 - 4.2.1.

**1.2 Natural Condition**

**1.2.1 Climatic Condition**

In Samaipata, Mairana and Pampa Grande, mean and minimum air temperature are 21.6°C and 15.2°C respectively, and annual rainfalls are from 588 mm to 850 mm. In Comarapa, San Isidro and Saipina, mean and minimum air temperature is 18.9°C and 11.9°C respectively, and annual rainfalls are from 385 mm to 552 mm. In Vallegrande, mean and minimum air temperature are 17.8°C and 11.7°C respectively, and annual rainfall of 530 mm is recorded (refer to "Climatic Condition" of "Features of Major Production Areas").

Regarding mean wind velocity and humidity, 3.7 m/s (NE) and 71 % are recorded in Vallegrande.

**1.2.2 Earthquake**

In 1998 large scale earthquake occurred in Aiquile in Cochabamba Prefecture. According to the local geotechnic surveyers, Saipina and Vallegrande are located in seismic zone, but there is no earthquake record in 7 target areas in Valley Areas.

**1.2.3 Geotechnic Condition**

Facilities of the Products Collection and Distribution Center in Valley Areas is comparatively light-weighted. Therefore it's supposedly possible to adopt the spread type foundation for almost all of C/D Center considering the neighboring existing buildings' foundations. But there are not outstanding buildings/residences around the proposed site in Pampa Grande and Saipina. Therefore boring tests are carried out in these 2 sites. General characteristics of geotechnic condition of these 2 sites are shown below (refer to Fig. A.4.1-1 and A.4.1-2, and Table A.4.1-1 and A.4.1-2).

(1) Pampa Grande

In the project site of Pampa Grande sandy material (up to 5.5 m) and clayey sand/muddy clay (from 5.6 to 10.0 m) were found out. N value of standard penetration test were more than 25 (from 2.5 m to 6.5m) and 50 (from 7.5 m to 10 m). Bearing capacity of 11 ton/m<sup>2</sup> was confirmed at -1.0 m level. Spread type foundation is recommended for C/D Center in this site.

(2) Saipina

In the project site of Saipina, sandy slime (up to 1.7 m) and big stone layers ( from 1.7 m to 10.0 m) were found out. From 1.7 m level N value of standard penetration test was more than 65. Bearing capacity of 11 ton/ m<sup>2</sup> was confirmed at -1.0 m level. Spread type foundation is recommended for the products collection/distribution center facilities in these sites.

### 1.3 Building Regulation, Design Standard

Refer to 2.3 (City Planning, Building Regulation, Design Standard for New Wholesale Market).

### 1.4 Infrastructure Condition

Refer to ANNEX 2 - 4.2.1 (Proposed Locations for Products Collection and Distribution Centers).

### 1.5 Equipment, Construction Material/Machinery Procurement Condition

Refer to 2.5 (Equipment, Construction Material/Machinery Procurement Condition for New Wholesale Market).

### 1.6 Facilities and Equipment Design

#### 1.6.1 Facilities and equipment elements

Taking the target sites characteristics into consideration, it is necessary to prepare the following facilities and equipment elements for the Products Collection / Distribution Center.

(1) Mairana, Pampa Grande, Comarapa, Saipina and Vallegrande

It is necessary to prepare new facilities and equipment shown as follows for these target areas.

1) Facilities :

- Platform for products unloading, sorting, stocking, loading and box/basket stocking



- Covering shell for platform
- Administration office
- Small meeting room
- Equipment / tools storage
- Public W.C.
- Garbage collection yard
- Fence, Gate
- Electricity, potable water, drainage line, pit latrine and wasted water tank

2) Equipment :

- Pick-up type truck and motorcycle
- Computer, telephone/fax

(2) Samaipata and San Isidro

In Samaipata and San Isidro it is possible to re-use the existing facilities (storage) for the Products Collection and Distribution Center. But the existing storage building in Samaipata does not have a function of large scale unloading and loading, therefore it is necessary to prepare new platform / entrances of products and to adjust the floor level between this platform and existing storage. On the other hand, existing storage building in San Isidro had been designed to have a function of products unloading / loading, but it is not sufficient. Therefore it is also necessary to new platform / entrance of products for the existing storage building in San Isidro.

Required reform works for facilities and required equipment are shown as follows.

1) Reform works for Facilities :

- Rehabilitation for the wall of existing storage building to prepare new entrances for products transportation works
- New platform for products unloading/loading
- Level adjusting works between existing storage floor and new platform mentioned above (only for Samaipata)
- New canopy for the platform
- Miscellaneous repair work for other existing facilities to utilize them as a administration office and/or storage.
- Land cut works for the truck berth (only for San Isidro)
- New garbage collection yard
- Gate

2) Equipment :

- Pick-up type truck and motorcycle

- Computer, telephone/fax

### 1.6.2 Required facilities scale

Facilities scales of the Products Collection and Distribution Center in each target area were calculated considering the following items. (Refer to Table A.4.1-3)

- (1) Total floor area of platform for products unloading, sorting, stocking, loading and box/basket stocking

Total floor area of platform is calculated by summing up following items.

- 1) Required floor area for products stocking calculated by “Peak handling volume per day of fruits and vegetables in 2005 (150% of planned average handling volume per day in a peak season in 5th year of operation)” and “Products stockable volume in one square meter (t/m<sup>2</sup>) for each item of packed products”
- 2) Stocking area for box and basket that is required for peak handling volume per day mentioned above (tomato-box, lettuce/pimento- basket, citrus/other fruits-box).
- 3) Required floor area for products sorting works calculated by “Peak handling volume per day in 2005” mentioned above and “Working capacity per man per day”
- 4) Products unloading/loading area that is balanced with “Required floor area for products stocking”

- (2) Required floor area for platform

Required floor areas for platform in each target area are shown as follows. It is supposedly suitable for this facilities planning to use a module of 7.5 m width / 15 m length (herein after “platform unit” : Refer to 1.6.4), therefore required numbers of platform units are also shown below.

REQUIRED FLOOR AREA FOR PRODUCTS COLLECTION AND DISTRIBUTION CENTER (SUMMARIZED TABLE)

Production Area	Planned handling volume			Sorting	Stocking	Loading	Box/Basket	Total platform area		
	Peak season collection volume (ton/month) A	Planned average handling volume (ton/day) C=A/B	Peak handling volume (ton/day) D=C*1.5	Required sorting area (m <sup>2</sup> )	Required stocking area (m <sup>2</sup> )	Required unloading / loading area (m <sup>2</sup> )	Box/basket stocing area (m <sup>2</sup> )	Total floor area of platform	Required no. of platform unit R=Q/112.5m <sup>2</sup>	
Samaipata	Feb.	910	30.33	45.50	72.80	127.00	34.29	21.27	255.36	-
Mairana	Nov.	840	28.00	42.00	57.60	193.25	52.18	49.66	352.69	3.14
P. Grande	Oct.	1,440	48.00	72.00	95.20	378.33	102.15	52.86	628.54	5.59
Comarapa	Nov.	880	29.33	44.00	66.40	171.82	46.39	21.05	305.66	2.72
San Isidro	Nov.	1,540	51.33	77.00	123.20	219.75	59.33	10.63	412.92	-
Saipina	Sept	1,480	49.33	74.00	118.40	207.25	55.96	26.31	407.91	3.63
Vallegrande	Mar.	1,280	42.67	64.00	76.00	172.50	46.58	39.18	334.25	2.97

(3) Other facilities elements

It is necessary to install minimum scale of administration office (accommodation capacity: supervisor 2 persons), meeting room (accommodation capacity : 18 persons), storage (accommodation capacity : s motorcycles and other equipments).

**1.6.3 Layout plan of the facilities**

Following items were considered to make the layout plan of Products Collection and Distribution Center.

(1) Smooth circulation of vehicles from/to neighboring local trunk road

Wide approach road from local trunk road to the site and wide gate were prepared for smooth circulation.

(2) Smooth circulation of vehicles and pedestrians within the site

In case of newly constructed C/D Center, C/D Center building with incidental facilities is located in the center of the site, and internal road (vehicle road) is prepared around the building. Anti-clockwise vehicle circulation was planed in this internal road. Basically, all of the small trucks for unloading works parks at the “truck berth for unloading” allocated at the backyard of C/D Center building. All of the high-tonnage trucks parks at the “truck berth for loading” allocated in front of the building.

**1.6.4 Building structure**

In Valley Areas, “steel bar lattice framed roof with concrete post” is dominantly used for the large scale facilities such as gymnasium building of schools. To prepare a large space, this structure is light-waited as well as low cost. This structure can be adopted for newly constructed Products Collection and Distribution Center. In actual facilities planning shown later, a module of 7.5 m width / 15 m length (herein after “platform

unit") was used for facilities planning considering a width of 2 high tonnage trucks and a span length that can be constructed by "steel bar lattice framed roof" without difficulty. Reinforced concrete structure can be also adopted for the incidental facilities (administration office, meeting room and storage) and platform.

Regarding the design loads, wind velocity of 30 m/s is used for the calculation of wind load. On the other hand, earthquake load is not taken in account considering the existing buildings condition.

### **1.6.5 Facilities plan**

Facilities scale (number of stories, total floor area), type of foundation, type of structure, and special equipment are shown in Table A.4.1-4. Layout plans of Products Collection and Distribution Center in each target area are shown in Fig. A.4.1-3 to A.4.1-7 and Fig. A.4.1-10 to A.4.1-13. Typical plan, elevation and section of newly constructed C/D Center are shown in Fig. A.4.1-8 and A.4.1-9.

## 2 NEW WHOLESALE MARKET IN CONSUMPTION AREA

### 2.1 Project Sites

Project site for the New Wholesale market is located at aprox. 8 km south-west from Santa Cruz City Center and approx. 1.4 km south-east of Route 4 and approx. 500 m south-west of Ring Road 8th (ZAPU District-10, next to UV189). Private road is used to approach from Route 4 to the site, and it is facing a projected road from Route 4. Incidentally, Santa Cruz City is now engaged in the improvement work of Route 4, and they started this works partially from the beginning of this year (1998). This improvement work includes i) total 6 vehicle lanes, ii) bicycle lane, iii) pedestrian way, iv) safety zone in center line, v) rain drainage along both road sides, vi) road lighting, and vii) interchanges. Regarding the existing condition of Route 4, it has asphalt concrete pavement, but only 2 vehicle lanes. Ring Road 8th is not paved yet.

Total land area of the site is approx. 10.7 ha. Almost all land surface is covered by grass. This site is used for farm land partially, and small brick maker's facilities also exists in the site.

The site can be divided into 2 areas (lower part and hither part) considering its land surface level. Approx. 69 % of the site in the north-eastern part has almost flat land surface with small undulation, but there is a height part (approx. 13 % of the site) with level difference of 5.5 m in the south-western end of the site. Approx. 18 % of the site is slope surface. Along the north-western boundary there is land level difference of approx.1.5 m (refer to Fig. A.4.2-2).

### 2.2 Natural Condition

#### 2.2.1 Climatic Condition

Mean air temperature varies from 20°C (winter) to 27°C (summer). Annual rainfall of 1,160 mm is recorded (dry season : April - September, rainy season : October - March). Mean annual humidity is from 60 % to 70 %. Wind direction is constantly NW, and mean wind velocity is 6.0 m/s.

#### 2.2.2 Earthquake

Earthquakes were recorded in Lapaz, Sucre and Cochabamba in mountainous district, but there is no earthquake record in and around Santa Cruz City.

#### 2.2.3 Geotechnic Condition

We have already shown in 2.1 that the site can be divided into 2 areas (lower part and hither part) considering its land surface level. Geotechnical characteristics is different

between lower part and higher part in the site, but totally, both parts have relatively normal bearing capacity.

In the lower part, there is clay layer of 1.3 - 1.7 m thickness near the ground surface, but almost all layers below this clay layer (-2m to -10m) were sand layers. N value of the standard penetration test were 5 -10 in the clay layer, and 20 -30 in the sand layers. Bearing capacities of 6.0 ton/ m<sup>2</sup> to 12.0 ton/ m<sup>2</sup> are confirmed at -1.0m level.

In the higher part of the site, oozy sand or clayey layers are found from 0 m to approx. 5.5 m, and N value of the standard penetration test were lower than 10 from 0 m to 8.5 m. Bearing capacities of 5.0 ton/ m<sup>2</sup> to 12.0 ton/ m<sup>2</sup> are confirmed at -1.0m level. (refer to Fig. A.4.2-3 to A.4.2-7)

Basically there's no problem for building construction in this project site. However, it is necessary to carry out approx. 2 meters height of filling-up works to prevent a large amount of rain water inflow because the ground level of the lower part is the lowest in and around the project site.

## **2.3 City Planning, Building Regulation, Design Standard**

### **2.3.1 City Planning and others**

#### **(1) General Policies**

Considering the urban expansion due to the continuous population growth mainly along Route 9 North and Route 4 West/East, Santa Cruz City prepared following general policies in its Integral Urban Development Plan in 1993.

- Correction of the dispersed growth and low density
- Definition of the urban structure within the municipal jurisdiction
- Incorporation of urbanized area and consolidation of settlement
- Activation of development in city center
- Activation of district consolidation in the city for the future metropolitan growth

Santa Cruz City has been carrying out following actual plan for the policies mentioned above.

- To supply and consolidate facilities
- To increase large public spaces
- To adjust urban regulation to socio-economic conditions and infrastructure
- To give first priority to implementation of principal road

Santa Cruz City is now preparing its new City Development Plan, and has a schedule to complete it in 1999.

## (2) City Planning Zones

Santa Cruz City is divided mainly into 5 types of city planning zones ;

- Z1 : Historic Center (central area of urban zone where historic and traditional buildings are located)
- Z2 : Central of Compound Use (city block in the perimeter between Z1 and 1st Ring)
- Z3 : Intermediate (area between 1st and 2nd Ring)
- Z4 : External (area between 2nd Ring and the Municipal urban boundary)
- Z5 : Industrial Park (north east of Santa Cruz City)

UV189 and ZAPU belong to Z4.

## (3) General characteristics and expansion tendencies of Santa Cruz City (Refer to Fig. A.4.2-1)

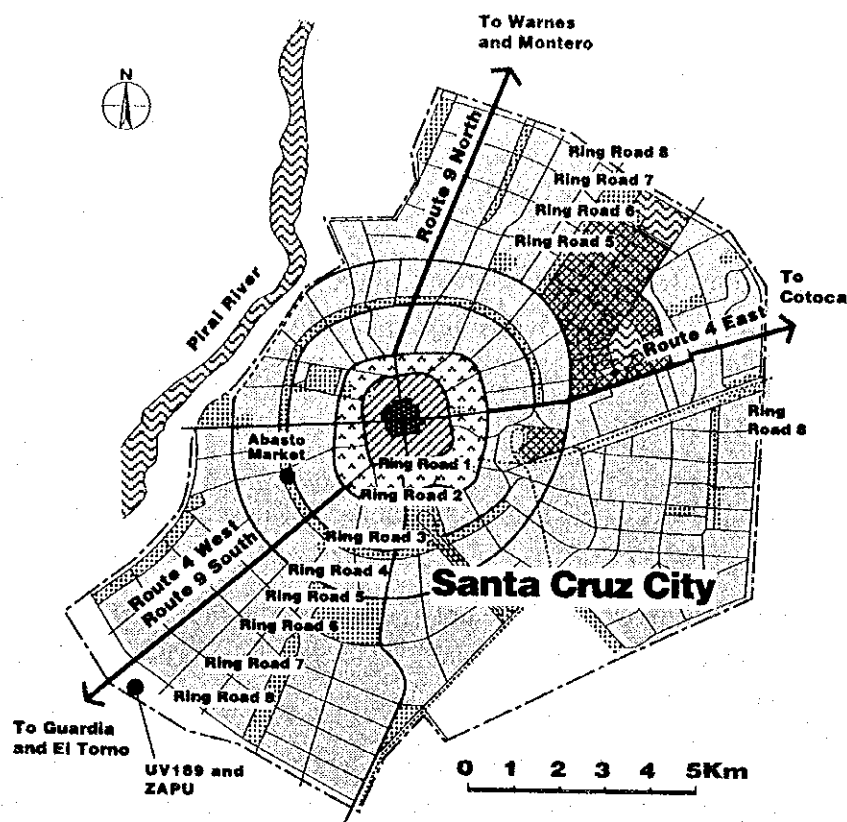
The area within 2<sup>nd</sup> Ring is utilized mainly as a high commercial zone. In addition, the area between Inner 3<sup>rd</sup> Ring and Outer 3<sup>rd</sup> Ring is also designated to be a high commercial zone.

Along Route 9 (Santa Cruz – Warnes) the tendency is related to the growth of residential and commercial areas. The area along Route 9 between Ring 3<sup>rd</sup> and Ring 8<sup>th</sup> is utilized as a high grade residential area.

Along Route No. 4 east (Santa Cruz – Cotoca) the expansion of residential areas is presently observed. Through Route No. 4 east agri-products like soybean, corn, beans, cotton and sunflower are transported to Santa Cruz from the Triangle Zone defined by Pailon, Los Troncos and Quimome. Soybean is transported to Brazil mostly by rail road system. Therefore many agro business company locate along this Route.

The land area along Route 9 East outside 8<sup>th</sup> Ring has the potential to become an industrial area for agri-products, since it has good accessibility for Soybean and beans products coming in from San Jose and Pailon area.

There is a general tendency of expansion along Route No. 4 west (Santa Cruz – La Guardia) that involves country houses (quintas). Between 1960 – 1970's, the land along Route No. 4 west (Santa Cruz – La Guardia) was used mainly for chicken farms. Today the people in this business have moved away towards the area beyond the town of Warnes and this land is utilized for the headquarters of big companies and so on. But some chicken farms still exist here. In fact, the towns of La Guardia and El Torno began as supply stops for truck drivers and other vehicles going from Santa Cruz towards Cochabamba and vice versa.



**Outline of Santa Cruz City**

(4) Road network and railroad network condition in and around Santa Cruz City  
(Refer to Fig. A.4.2-8)

1) Existing road network condition

There are difficulties for high tonnage transportation from Warnes to La Guardia (and vice versa) through Santa Cruz 3<sup>rd</sup> Ring except the night time (20:00-06:00) because of the traffic regulation. After completion of construction work of 4<sup>th</sup> Ring near River Pirai in this year, there will be no difficulties for high tonnage transportation in the day time because 4<sup>th</sup> Ring has no traffic regulation to prohibit the high-tonnage transportation.

Regarding the transportation from Cotoca to La Guardia (and vice versa) through Santa Cruz City Ring, it is difficult to take clock wise direction because 3<sup>rd</sup> Ring is interrupted by the military airport (Trompillo airport), and the access to 4<sup>th</sup> Ring and 5<sup>th</sup> Ring is long although these 2 road are paved and available for heavy traffic.

2) Road network development plan

Regarding Route 4 East, Bolivian Central Government is proceeding development plan, i.e. (i) Road development plan for the section between



Pailon and San Jose de Chiquitos, (ii) Road development plan for the section between San Jose de Chiquitos and Puerto Suarez. The former's feasibility study was already completed, and it has been scheduled to start the construction work in 1999, and complete it by 2002. The latter's feasibility study will supposedly be finished within 1998, and they will carry out its construction works during 2000 and 2004.

Far from Santa Cruz to north east, for the section between San Rafael and San Matias (final destination: Brazilia), Central Government has also road development plan They had finished its feasibility study, but its construction schedule is not clarified yet.

Regarding Route 9 South, Central Government has road improvement plan for the section between Abapó and Camiri. Almost all of Route 9 south are paved except in this section, therefore they have already finished its feasibility study, and they have construction schedule to start it in 1999 and complete it by 2002. Regarding the Paraguay route from Boyuibe to Fortin Villazón (Paraguay), they are proceeding its feasibility study with Paraguay government jointly within 1998, and they hope to complete its construction work by 2002.

3) Rail road network toward other region

There is no possibility for the Santa Cruz Rail Road Station to be used as a base for cargo transportation to Brazil, since it was designed only as a passenger station (present and future). In case of soybean transportation from the above mentioned triangle zone to Brazil, the following 4 different stations are used mainly :

- a) Pailon Station
- b) Tres Cruces Station
- c) Pozo de Tigre Station
- d) San Jose Station

(5) Public traffic (bus network) system in and around Santa Cruz City

Bus network system is extremely developed in and around Santa Cruz City.

Regarding the bus line between Santa Cruz City and La Guardia City, there are 12 bus lines, and the operation condition (bus no. for one line / operation hours / actual bus operation) is same as below.

[ The outline of bus system of Santa Cruz City ]

- Total bus line : 81 lines
- Total no. of bus : approx. 3,200 buses
- Capacity of bus : 25 - 30 person/bus
- Buses allocated to one line : 30 - 70 buses

- Operation hours : 07:50 - 23:00
- Actual bus operation : approx. 14 hours/day  
: 6 round operation/bus/day  
: approx. 2 hours/round operation
- Charge : 1.2 Bs (within Santa Cruz City)  
: 2.5 Bs (to La Guardia City)
- Average daily user : approx. 1,300,000 person/day

### 2.3.2 Building Regulation

For building design, "Codigo de Urbanismo y Obras" (Code of City Planning and its works: compiled by Architect Association of Bolivia) is used dominantly in the urban/non-urban area in Santa Cruz Prefecture. It does not include the building structural standards and building equipment standards, and it mainly mentions about the zone definitions and building/city-infrastructure regulations only from the city planning viewpoint. But it includes many technical recommendations for typical buildings and rooms (e.g. ventilation/lighting, locations of emergency stairs, basic fire-fighting disposition, exit ways, etc.), therefore facilities design mentioned later was planned in accordance with this Code.

### 2.3.3 Design Standard

As above, design standard for building material, structure and equipment does not exist in Bolivia. Regarding the structural standard, US standard (ACI) and German standard (DIN) are utilized. On the other hand, electric equipment standard of US (NEC, AWG) and Brazil (ABNT) are dominantly used in Bolivia. Facilities design mentioned later was planned in accordance with US standard.

## 2.4 Infrastructure Condition

Project site has not public road from Route 4 and Ring Road 8th, but it has only private road to approach from Route 4, and is not equipped with electric/telephone and potable water main line. And also, this district is outside the sewage service area.

### (1) Access road

Project site has not public road from Route 4 and Ring Road 8th, but it has only private road to approach from Route 4.

It's necessary to construct the access roads from Route 4 or Ring Road 8th. Especially, construction of the access road from Ring Road 8th to the project site is urgent matter for the construction work of new wholesale market and initial stage of market operation. The reason of above mentioned thing is that access from the project site to Ring Road 8th is only about 500m and it is comparatively easy to construct as a part of urban development work by the City Government.

(2) Electric/telephone main line

Project site is not equipped with electric/telephone main line, but electric main line of CRE (24.9 KV) and telephone main line of COTAS are located along Ring Road 8th. Therefore it has no problem to get electricity of 380 V (3 phase) and 220 V (single phase) and telephone line by setting the extension line from main line along Ring Road 8th (approx. 500 m). It's expected that required electricity will be approx. 400 KVA, and more than 25 telephone lines will be required.

(3) Potable water main line

COSPAIL, potable water cooperative that covers this area, had already installed the potable water main line at 60 m out of the north-western boundary of the project site. It is possible to take potable water from this main line by extension work. Required potable water will be approx. 140 m<sup>3</sup>/day.

(4) Wasted water treatment and its discharging system :

Sewage service is limited within the Ring Road 2nd in Santa Cruz City, therefor the district to where the project site belongs is not equipped with sewage line. Therefore it is necessary to prepare a discharging system of treated water, e.g. installation of a new sewage pipe-line from the project site to Pirai River (approx. 5 km distance) or a large scale seepage area in the project site, as well as wasted water treatment system that handles approx. 140 m<sup>3</sup>/day of wasted water. Any way, new sewage pipe-line is strongly required as a discharging system.

(5) Garbage collection service

Private micro-enterprise of garbage collection service is now carrying out the collection works every day near the project site, and an agreement that the project site will be included in the coverage area of this micro-enterprise had been already established between this micro-enterprise and Santa Cruz City.

(6) New public bus route

Route 4 is one of the main route of public bus service in Santa Cruz City, and there are a few branch routes on Ring Road 8th. Therefore it's necessary to prepare a new public bus route for market users from Route 4 via Ring Road 8th. It is necessary to prepare the bus lane in the project site to locate the bus stop at the nearest point of the marketing hall considering users' convenience.

## 2.5 Equipment, Construction Material/Machinery Procurement Condition

### 2.5.1 Equipment procurement condition

Handling tools, telephone/fax and computer are procured in Bolivia easily. Track-scale, refrigerator machine, high pressure water cleaner, and inspection apparatus are imported from foreign countries.

Equipment Items	Origin
Truck-scale	Brazil, Argentine and Chile
High pressure water cleaner	Brazil, Argentine and Chile
Inspection apparatus	Germany
Refrigerator machine	Brazil, Argentine, Chile, Japan, and U.S.A

Regarding the refrigerator, machinery itself are imported from Brazil, Argentine, Chile, Japan, and U.S.A, but it's possible to purchase the chamber material in Santa Cruz.

### 2.5.2 Construction material procurement condition

Current condition of construction material procurement is summarized below. Recent price escalation of building materials is estimated general average 5% in 2 - 3 years (all construction materials are sold in US\$). Price of gravel/sand shows rising-up tendency due to the fuel price escalation. Steel and cement show price down tendency, and import materials are considered stable.

#### (1) Fundamental construction materials

Material Items	Procured from/in
cement	Bolivia
gravel/sand	Bolivia
ready mixed concrete	Bolivia
steel bar / steel frames	Brazil, Argentine, and Chile
aluminum products (aluminum sash-windows / roof material)	Brazil, Argentine, and Chile

Regarding the quarry of gravel/sand, there are several quarry between Santa Cruz City and La Guardia City and Yapacani.

#### (2) Metal materials

Material Items	Procured from/in
hardware for doors/windows	Bolivia
plumbing products	Bolivia
steel roof material (incl. 3D-truss)	Bolivia

#### (3) Wooden material

Domestic wooden materials are utilized for doors/windows/furnitures.

(4) Building equipments

Material Items	Procured from/in
air conditioning	Bolivia
central control type air conditioning	Brazil, Argentine, and Chile
generator	Bolivia
electricity panel	Bolivia

(5) Plumbing material

Material Items	Procured from/in
steel/PVC pipes	Bolivia

(6) Concrete piles

All of the concrete piles are produced by the concrete products companies after customers' offers.

**2.5.3 Construction equipment procurement condition**

Concrete mixer trucks and large type crane (movable) are dominantly used in Santa Cruz, but there are some difficulties for the procurement of pile driving machine because construction works with piling are not so many in this city.

**2.6 Facilities and Equipment Design**

**2.6.1 Facilities and equipment elements**

Facilities and equipment elements of the New Wholesale Market are shown as follows.

Table Facilities and Equipment Element for New Wholesale Market

Item	Function					Remarks
	A	B	C	D	E	
<b>Facilities</b>						
Marketing hall	○					equipped with products handling tool, balance and high pressure water cleaner
Administration office						
Management committee office		○			○	equipped with telephone/fax and computer
Associates office		○				equipped with telephone/fax and computer
Canteen				○		
Shops				○		
Elevated water tank			○			
Electric power station			○			equipped with underground reservoir tank
Public W.C.				○		receiving pannel, transformer and distribution pannel
Guard box			○			
Wasted water treatment plant / seepage pit			○			
Truck berth / Taxi parking	○					
Garbage collection yard			○			
Seepage pits/area for treated water			○			incl. treated water supply pipe line
Street lights			○			
Fence and Gate			○			
<b>Equipment</b>						
Products handling tool	○					
Communication equipment - telephone/fax		○				
Management tools - computer, etc.		○				
Measurement tools						
Truck scale		○				
Balance		○				
Apparatus for quality control		○				
High pressure water cleaner		○				

Remarks : Alphabet of A to E in this Table mean following functions.  
 A = Distribution, B = Supporting, C = Utility, D = Service, E = Education

## 2.6.2 Required floor area for main facilities

### (1) Marketing Hall

Marketing hall has to accept 2 different types of products. One is large amount of fruits and vegetables that is already reserved by the specific wholesalers, and the other is relatively small amount of fruits and vegetables that is not reserved but procured by many wholesalers. In New Wholesale Market, total handling volumes of former and latter are estimated to be 62 % and 38 %.

In the Abasto Market, high tonnage trucks stay in the market for long hours, and the area around the trucks is used as a selling space. This condition makes the facilities utility efficiency lower. In case of comprehensive wholesale market in San Paulo, accessibilities to each facilities are secured for trucks of producers and buyers, therefore there is no problem like as Abasto Market. In case of Nakaorosi system in Japan, large amount of products is transported speedy to retailers.

Taking these typical examples in Brazil and Japan into consideration and pay attention to the construction cost saving, 2 types of marketing hall were prepared to accept 2 different types of products mentioned above.

Marketing hall - 1 : Marketing hall that is equipped with wholesalers sections. All of the associates possess their own sections in this marketing hall, and all of the products reserved by specific wholesalers is delivered directly to their wholesalers sections. Therefore trucks

for unloading and loading have access directly to the wholesalers sections.

Marketing hall - 2: Marketing hall that accepts the non reserved products. All of the non-reserved products is gathered here temporally, and wholesalers purchase necessary amount of products after the direct negotiation with producers.

Calculation method for the required scale of marketing hall is shown as follows (Refer to Table A.4.2-1).

1) Items considered for facilities scale determination

Facilities scale of marketing hall - 1 is determined considering the following items.

a) Peak handling volume per day of fruits and vegetables (potato, onion, banana, citrus and tomato) in 2005 (150% of average handling volume per day)

b) Tonnage stockable in one square meter for each item of packed fruits and vegetables (ton/m<sup>2</sup>)

c) Required floor area for products stocking

Required floor area for products stocking is calculated by considering the above mentioned condition ( a and b ).

d) Required floor area for tomato/citrus box stocking

It is necessary to prepare box stocking space needed for average handling volume per day of tomato and citrus. 50 % of required floor area needed for average handling volume of tomato and citrus is prepared for this box stocking space.

e) Required number of wholesalers section

Required number of "wholesalers section" mentioned in 2)-a) b) is calculated taking above mentioned "Required floor area for products stocking", "Required floor area for tomato/citrus box stocking" and "floor area available for products stocking in one wholesalers section" mentioned 2)-b) into account.

f) Future expansion area is calculated dependent upon the peak handling volume per day in 2010.

Facilities scale of marketing hall - 2 is determined considering the following items.

- g) Handling volume in marketing hall - 2 is estimated to be 38% of total handling volume per year of New Wholesale Market. Its details are 22 x 10<sup>3</sup>t/year of potato, 34 x 10<sup>3</sup>t/year of tomato, 21 x 10<sup>3</sup>t/year of other vegetables (onion), 15 x 10<sup>3</sup>t/year of fruits (citrus) in 2005. Banana is not included here.
- h) Peak handling volume per day of fruits and vegetables mentioned in g in 2005 (150% of average handling volume per day)
- i) Products stocking volume in unit floor area (ton/m<sup>2</sup>) for each item of packed fruits and vegetables.
- j) Required floor area for products stocking
- Required floor area for products stocking is calculated by considering the above mentioned condition ( h and i ).
- k) Required total floor area for marketing hall - 2
- Required total floor area is determined considering the required floor area for products stocking (mentioned in j), passage space within the grouped product (approx. 33 % of j) and central passage.
- l) Future expansion area is not considered because handling volume of “non reserved products” is estimated to be reduced in 2010.
- 2) Wholesalers section
- a) Dimension of wholesaler’s section was determined to be 3m<sup>width</sup> × 5m<sup>length</sup> (15 m<sup>2</sup>) per one section considering the smallness of existing wholesalers section (3m<sup>width</sup> x 4m<sup>length</sup>) in Abasto Market and the average purchasing volume in one time (approx.5 ton per one time) of minimum scale wholesaler who can get the wholesalers section in the New Wholesale Market. Partition of each section is designed to be movable, therefore, wholesalers who need several sections can use the sections without inner partitions.
- b) Floor area available for products stocking is estimated to be 75% of the floor area of wholesalers section, i.e. 11.25 m<sup>2</sup> per one wholesalers section.
- 3) Required number of wholesalers section in marketing hall - 1
- a) Required number of wholesalers section in marketing hall - 1 was estimated to be 188 sections in 2005 and 224 sections in 2010 (Refer to Table A.4.2-1).



b) Layout of sections

Taking the facilities layout into consideration, marketing hall - 1 was divided into 4 units. Therefore one units of marketing hall - 1 was designed to have 56 wholesalers section (224 section ÷ 4 =56 section). Actually 3 units (168 wholesalers sections) and one irregular small unit (20 wholesalers sections) of marketing hall - 1 were prepared, and future extension space for 36 sections was also prepared.

REQUIRED FLOOR AREA FOR MARKETING HALL - 1

Target year	Planned handling volume in New Wholesale Market (ton/year)	Handling Volume				Products stocking area		Units
		Products items and their planned handling volume in New Wholesale Market		Planned average handling volume (ton/day) : A	peak handling volume (ton/day) : B = A x 150%	tonnage stockable in 1 m <sup>2</sup> (ton/m <sup>2</sup> ) : C	required stocking area (m <sup>2</sup> ) : J=B/C	required no. of wholesalers section K=J/11.25 m <sup>2</sup>
		Item	volume (ton/year)					
2005	239,000	Potato / Onion	116,000	317.81	476.71	0.5	953.42	187.54
		Banana	29,000	79.45	119.18	0.4	297.95	
		Fruits (Citrus)	38,000	104.11	156.16	0.6	260.27	
		-(Fruits box)	-	-	-	-	86.76	
		Tomato	56,000	153.42	230.14	0.6	383.56	
		-(Tomato box)	-	-	-	-	127.85	
		Total	239,000	654.79	982.19	-	2,109.82	
2010	284,000	Potato / Onion	136,000	372.60	558.90	0.5	1,117.81	223.05
		Banana	35,000	95.89	143.84	0.4	359.59	
		Fruits (Citrus)	48,000	131.51	197.26	0.6	328.77	
		-(Fruits box)	-	-	-	-	109.59	
		Tomato	65,000	178.08	267.12	0.6	445.21	
		-(Tomato box)	-	-	-	-	148.40	
		Total	284,000	-	1,167.12	-	2,509.36	

Remark :  
 1. Wholesalers unit 3 m x 5 m (floor area : 15m<sup>2</sup>). 75% of floor area (11.25 m<sup>2</sup>) is available for products stocking.  
 2. 1 cluster of wholesalers unit: 56 units  
 2005 : 56 units/cluster x 3 cluster + 20 units = 188 units  
 2010 : 56 units/cluster x 4 cluster = 224 units

4) Required total floor area for marketing hall - 2

- a) Required floor area for products stocking : 689.05 m<sup>2</sup>
- b) Passage space within the grouped product : 227.39 m<sup>2</sup>
- c) Dimension of facilities

Taking above mentioned floor areas (a and b), central passage of 5 meters width into consideration, approx. 15m width x 90m length of space is necessary for the marketing hall - 2.

REQUIRED FLOOR AREA FOR MARKETING HALL - 2

Target year	Handling Volume				Products stocking area		
	Planned handling volume in Marketing Hall - 2 (ton/year)	Products items and their planned handling volume in Marketing Hall - 2		Planned average handling volume (ton/day) : A	peak handling volume (ton/day) : B = A x 150%	tonnage stockable in 1 m2 (ton/m2) : C	required stocking area (m2) : J=B/C
		Item	volume (ton/year)				
2005	92,000	Potato / Onion	43,000	117.81	176.71	0.5	353.42
		Banana	0	0.00	0.00	0.4	0.00
		Fruits (Citrus)	15,000	41.10	61.64	0.6	102.74
		Tomato	34,000	93.15	139.73	0.6	232.88
		Total	92,000	252.05	378.08		689.04

(2) Administration office

Management body office and users' association office are located in this administration office building.

1) Management body office

Management body office has 2 divisions and several sections shown as follows.

Information section, Monitoring section and Finance/Account section have most important function as a "Terminal of Information". Price/volume information are opened to the public by Information section after data collection of truck number, price/volume in wholesalers section and marketing hall - 2.

Information about rental fee, registration charge, parking charge and etc. are collected by Finance/Account section, and these data are submitted to the Management Committee.

a) Planned personnel

Manager 1 person  
Secretary 1 person

[ Administration division ]

Division chief 1 person  
Security control section 6 persons  
Finance / Account section 2 persons  
Personnel / Registration section 2 persons  
Maintenance section 1 persons  
Sub-total 12 persons

[ Marketing division ]

Division chief 1 person  
Information section 3 persons  
Monitering section 1 persons

Sub-total 5 persons

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Total 19 persons

b) Main rooms needed for the office

Manager room, office room with storage and locker room, convention hall, laboratory, first Aid room and W.C.

2) Users' Association office

a) Members in the association office

Representatives of approx. 8 associations will use this association office. Therefore large office room is used by approx. 8 persons divided by low partition etc.

b) Main rooms needed for the office

Office room with storage and locker room and W.C.

(3) Elevated water tank

Approx. 140 tons/day of city water is estimated to be used in the New Wholesale Market. Therefore elevated water tank that has capacity of one day's consumption is prepared with underground reservoir tank.

REQUIRED POTABLE WATER VOLUME IN NEW WHOLESALE MARKET

1. Unloading truck drivers and assistants :	250.00 persons/day	Temporary occupants
2. Loading taxi driver	150.00 persons/day	Temporary occupants
3. Market users (retailers)	3,000.00 persons/day	Temporary occupants
Total number of temporary occupants :	3,400.00 persons/day	
Required potable water volume for temporary occupants :	17.00 ton/day	
4. Wholesalers / Workers in NWM / Administration		
(1) Total number of wholesalers incl. assistants :	300.00 persons/day	Permanent occupants
(2) Workers :	500.00 persons/day	Permanent occupants
(3) Administration office	24.00 persons/day	Permanent occupants
5. Canteen / Shops	34.00 persons/day	Permanent occupants
6. Guradsman / Watchman	24.00 persons/day	Permanent occupants
Total number of permanent occupants	882.00 persons/day	
Required potable water volume for permanent occupants :	97.02 ton/day	
7. Required potable water volume for floor washing :		
Assumption : market hall floor washing of 1 time per week (6,700 m <sup>2</sup> x 0.02 ton/m <sup>2</sup> / 7)	20.00 ton/day	
8 Total Required Potable Water Volume	134.02 ton/day	

(4) Electric power station

Electric power station is equipped with following equipment.

1) Transformer

primary : 24.9 KV

secondary : 380 V

220 V  
capacity : 400 KVA 3-phase  
380 V 50 KVA 3-phase  
220 V 350 KVA 3-phase

- 2) Receiving panel to the above mentioned transformer
- 3) Distribution panel (approx. 15 terminal)

Therefore electric power station is equipped with power station room that accommodates above mentioned equipment as well as telephone exchange room, control room and generator room (generator itself is included in future plan).

(5) Wasted water treatment plant and seepage area

Compact type plant that has treating capacity of approx. 140 ton/day with primary sedimentation tank, aeration tank, secondary sedimentation tank, and chlorinating tank is adopted for the wasted water treatment.

Regarding the discharging system of treated water from treatment plant, installation of new sewage pipe-line from the project site to Pirai River (approx. 5 km north of the project site) is the best. However, the sewage pipe-line will have to be equipped with pump stations at several points in this case. Furthermore, it is necessary to prepare a large scale sewage development plan considering that this sewage pipe-line will be used also by neighboring districts because its total pipe-line length is so long (approx. 5 km). Therefore it will supposedly take long time to make its preparation and coordination. Taking above mentioned condition into consideration, seepage system dominantly used in Santa Cruz City was adopted here, and this system have to be changed to the sewage pipe-line in the near future. Approx. 1.4 ha of seepage area for treated water was planed within the project site. According to the result of boring test, the land of project site is estimated to have enough water permeability if the clay layer near the land surface (approx. 1.5m thickness) will be cut-off because almost all layers under this clay layer are sand layers. But it is necessary to confirm actual water permeability by permeability test in the detailed study before implementation works.

(6) Truck berth and taxi berth

Truck berths are prepared in front of each wholesalers sections (marketing hall - 1) and both side of the marketing hall - 2. Trucks for unloading and taxies for loading will park at this truck berths in the designated time respectively. Additional taxi parkings are prepared near the administration office. Planned units number of truck berth and taxi parking are shown as follows.

- Truck berth in front of the marketing hall - 1: total 132 units
- Truck berth at the marketing hall - 2: total 40 units

- Additional taxi parking total 77 units

(7) Open space for farmers market

Open space that is used only for the farmers market is not constructed in the project site. Following instructions will be given to the producers who intend to sell their products directly to retailers and general consumers.

- 1) To use private farmers markets
- 2) To use Abasto Market
- 3) To use future extension space in the project site of New Wholesale Market
- 4) To use some part of New Wholesale Market within the designated time.

### 2.6.3 Facilities layout plan

(1) Land use of the project site

It was already explained that the project site is divided into 2 part (higher part with slope and lower flat part) in 2.1. It is necessary to prepare large scale flat land for the marketing halls and truck berths, therefore lower of the project site was determined to be utilized for all of the facilities. Higher part of the site can be used for the future extension space (Refer to Fig. A.4.2-9).

(2) Access road from projected city roads to the site

Project site is facing directly to the project city road from Route 4 (herein after Projected City Road A) at the western end of itself, and another projected city road from Ring Road 8<sup>th</sup> (herein after Projected City Road B) exits at approx. 160 m north-west of the north-western boundary. Considering the vehicle circulation especially from Ring Road 8<sup>th</sup>, it is supposedly necessary to prepare access roads both from Projected City Road A and B to the project site. Therefore access road from Projected City Road A was planed along the north-western boundary within the site, and this access road was bent approx. 90 degrees and extended to Projected City Road B (Refer to Fig. A.4.2-9).

(3) Zoning

Location of all of the facilities in the project site was determined considering the following zoning (Refer to Fig. A.4.2-9).

- 1) Zone-1: Zone for almost all of the facilities that have the function of supporting, utility, service and education. Area along the access road within the project site was allocated for this Zone.

- 2) Zone-2: Zone for the facilities that have the function of distribution (marketing hall, truck berth and taxi parking). Almost all of lower part of the central area of the project site was allocated for this Zone. Planned pavement surface level of Zone-1 and Zone-2 is 0.5 m higher than the access road within the project site.
- 3) Zone-3: Zone for the seepage/drying pond for treated water. Area surrounding Zone-1 and Zone-2 is allocated for this Zone. Planned land surface level of this Zone is original level and approx. 1.5 m lower than the access road within the project site.

(4) Circulation (Refer to Fig. A.4.2-10)

- 1) Circulation on the projected city road and access road in the project site.

Projected city road from Ring Road 8<sup>th</sup> and approx. 100 m of Projected city road from Route 4 connected with the project site will be supposedly constructed at first. These projected city roads and access road in and out of the project site compose one kind of "rotary", and smooth vehicle circulation is secured by this rotary.

- 2) Circulation of auto-bus

Bus lane and bus berth is secured between access road and Zone-1. Users who use public bus access to marketing halls from bus-stop here through slope way.

- 3) Circulation of trucks and taxies for unloading/loading

Internal road is planed around Zone-2 (outer internal road), and between each marketing halls (inner internal roads). All of the trucks and taxies for unloading/loading can enter the outer internal road at the western end gate, and get out from the eastern end gate. All of the vehicles have to take anti-clockwise direction in the outer internal road. In the inner internal roads, all of the vehicles have to take north-western direction (one way). In the outer internal road between Zone-1 and Zone-2, 2 way traffic is permitted.

All of the trucks and taxies can access directly to specific sections and withdraw from these sections speedy.

(5) Facilities layout plan

Taking the above mentioned concept of land uses, access road, zoning and circulation into consideration, actual layout plan was made for the new wholesale market facilities. Layout plan is shown in Fig. A.4.2-11. Main line of electricity, potable water and wasted water drainage are also shown in Fig. A.4.2-12 to A.4.2-13.

#### **2.6.4 Building structure**

In Santa Cruz City, large scale roof framed by steel space truss structure (3D truss structure is used for large buildings such as private super-market (e.g. Hyper Maxi), public retail market (Barrio Lindo market: now under construction), and railroad station (new station). On the other hand, reinforced concrete (herein after RC) structure with hollowed brick walls is used dominantly for small or medium scale buildings.

Above mentioned 3D truss structure can be adopted for the marketing - 1 and 2. RC structure with hollowed brick wall can be also adopted for small/medium scale buildings such as administration office, canteen/shops, electric power station and etc.

Regarding the building foundations, shallow spread type foundation was adopted for light weighted small scale facilities (canteen, shops, electric power station, public W.C. and etc.). There are 2 alternatives for the foundation of large scale facilities (marketing hall, administration office, elevated water tank). One is deep spread type foundation of 4 meters depth (up to sand layer), and the other is friction type pile of 8 meters length. Friction type pile was adopted here considering its comparative economical cost.

Regarding the design loads, wind velocity of 30 m/s is used for the calculation of wind load. On the other hand, earthquake load is not taken in account considering the existing buildings condition.

#### **2.6.5 Facilities plan**

Facilities scale (number of stories, total floor area), type of foundation and type of structure of all the facilities are shown in Table A.4.2-2. Plans and elevations of main facilities are shown in Fig. A.4.2-14 to A.4.2-19.

### **2.7 Construction Works Schedule**

#### **2.7.1 Preparation work and phasing**

There is rainy season from November to March, but it is possible to carry out construction works through out the year considering its moderate climate in Santa Cruz.

Before actual construction works, it is necessary to carry out the preparation work shown as follows.

- Construction of access roads (projected city roads and access road in the project site: include. rain drainage ditch)
- trees and bush cutting in the project site
- Land cut-off work in the project site (clay layer in the water seepage pond)
- Sand filling / compaction and leveling work in the project site
- Extension work of electricity, telephone and potable water main line

Construction work schedule of new wholesale market facilities are divided into 2 phases. In the phase-1 stage, minimum facilities needed to market operation (almost all facilities except some of marketing hall - 1, some of equipment, and whole of marketing hall - 2) will be constructed. In the phase-2 stage, construction works of the rest of the facilities will be carried out.

Construction Schedule for New Wholesale Market

Project Items	Preparation Stage	Construction Stage	
		Phase-1	Phase-2
1 Land Acquisition	○		
2 Land Preparation (Tree Cutting / Land Cut-off / Soil Filling)	○		
3 Infrastructure Extension outside the Site			
(1) Electric Main Line	○		
(2) Telephone Main Line	○		
(3) Potable Water Main Line	○		
(4) Access roads (projected city road)	○		
(5) Access road to Site	○		
(6) Rain drainage ditch	○		
4 Building Construction			
(1) Building Works			
F-1 Marketing Hall			
Marketing Hall - 1		○	○
Marketing Hall - 2			○
F-2 Administration Office		○	
F-3 Canteen		○	
F-4 Shops		○	
F-5 Electric Power Station		○	
F-6 City Water Reservoir / Elevated Water Tank		○	
F-7 Public W.C.		○	
F-8 Wasted Water Treatment / Seepage Pit		○	○
F-9 Garbage Collection Yard		○	○
F-10 Guard Box		○	
(2) External Works		○	○
(3) Main Line of Infrastructure in the Site		○	○
(4) Equipment Supply		○	○

Remarks : Sewage line with pump-stations from project site to Pirai River is not included in this table.

### 2.7.2 Work schedule

It is estimated that total 30 months is necessary for whole of the construction works of the marketing facilities including the preparation works. Construction work schedule is shown in Table A.4.2-3 and Fig. A.4.2-20.