

No. 104

THE REPUBLIC OF INDONESIA  
NATIONAL DEVELOPMENT  
PLANNING BOARD  
(BAPPENAS)

JAPAN INTERNATIONAL  
COOPERATION AGENCY  
(JICA)

THE STUDY  
ON  
THE THIRD UMBRELLA COOPERATION  
FOR  
INTEGRATED AGRICULTURAL AND RURAL DEVELOPMENT  
IN  
THE REPUBLIC OF INDONESIA

FINAL REPORT

SUPPORTING REPORT

AUGUST 1996

JICA LIBRARY



J 1131794 (8)

PACIFIC CONSULTANTS INTERNATIONAL  
OVERSEAS MERCHANDISE INSPECTION CO., LTD.

AFA

JR

96-27







**THE REPUBLIC OF INDONESIA  
NATIONAL DEVELOPMENT  
PLANNING BOARD  
(BAPPENAS)**

**JAPAN INTERNATIONAL  
COOPERATION AGENCY  
(JICA)**

**THE STUDY  
ON  
THE THIRD UMBRELLA COOPERATION  
FOR  
INTEGRATED AGRICULTURAL AND RURAL DEVELOPMENT  
IN  
THE REPUBLIC OF INDONESIA**

**FINAL REPORT**

**SUPPORTING REPORT**

**AUGUST 1996**

**PACIFIC CONSULTANTS INTERNATIONAL  
OVERSEAS MERCHANDISE INSPECTION CO., LTD.**



1131794 (8)

**THE STUDY  
ON  
THE THIRD UMBRELLA COOPERATION  
FOR  
INTEGRATED AGRICULTURAL AND RURAL DEVELOPMENT  
IN  
THE REPUBLIC OF INDONESIA**

**FINAL REPORT**

**Supporting Report**

**Table of Contents**

APPENDIX A:	Results of Field Survey of South Sulawesi
APPENDIX B:	Results of Field Survey of West Java
APPENDIX C:	Results of Field Survey of West Nusa Tenggara
APPENDIX D:	Results of Field Survey of South Kalimantan
APPENDIX E:	Farm Household and Farmers' Intention Survey
APPENDIX F:	Livestock
APPENDIX G:	Horticulture
APPENDIX H:	Postharvest and Marketing
APPENDIX I:	Extension
APPENDIX J:	Environment
APPENDIX K:	Synergistic Effect and Prioritization
APPENDIX L:	Monitoring and Evaluation
APPENDIX M:	List of Candidate Projects for Third Umbrella





**APPENDIX A:**  
**RESULTS OF FIELD SURVEY OF SOUTH SULAWESI**



**THE STUDY  
ON  
THE THIRD UMBRELLA COOPERATION  
FOR  
INTEGRATED AGRICULTURAL AND RURAL DEVELOPMENT  
IN  
THE REPUBLIC OF INDONESIA**

**DRAFT FINAL REPORT**

**APPENDIX A : RESULTS OF FIELD SURVEY OF SOUTH SULAWESI**

**Table of Contents**

	Page
<b>A.1 GENERAL .....</b>	<b>A - 1</b>
A.1.1 The South Sulawesi Province.....	A - 1
A.1.2 The Agro-ecosystem of Irrigated Area.....	A - 2
<b>A.2 AGRICULTURE.....</b>	<b>A - 4</b>
A.2.1 Provincial Agricultural Development Policy.....	A - 4
A.2.2 Agricultural Production .....	A - 5
A.2.3 Livestock .....	A - 6
A.2.4 Farming Practice.....	A - 6
A.2.5 Agriculture Supporting Services .....	A - 8
<b>A.3 WATER RESOURCES AND IRRIGATION.....</b>	<b>A - 10</b>
A.3.1 Present Condition of Irrigation Systems .....	A - 10
A.3.2 Water Management and Operation and Maintenance.....	A - 12
<b>A.4 PROPOSED BASIC DEVELOPMENT CONCEPTS .....</b>	<b>A - 15</b>
A.4.1 Development Needs and Constraints.....	A - 15
A.4.2 Proposed Basic Development Concepts .....	A - 18
A.4.3 Required Actions for the Development .....	A - 19

### List of Tables

	Page
Table A.1.1 Population in South Sulawesi Province .....	A - 22
Table A.1.2 Average Monthly Rainfall in South Sulawesi Province .....	A - 23
Table A.1.3 80% Dependable River Basin Water Depth .....	A - 23
Table A.1.4 Gross Regional Domestic Product at Current Market Price .....	A - 24
Table A.2.1 Harvested Area, Production and Yield of Food Crops in BOSWA SIPILU .....	A - 25
Table A.2.2 Harvested Area, Production and Yield of Food Crops in BOSWA SIPILU .....	A - 25
Table A.2.3 Harvested Area, Production and Yield of Food Crops in the Model Area .....	A - 25
Table A.2.4 Comparison of Gross Income of Palawija and Rice .....	A - 25
Table A.2.5 Area of Irrigated and Non-Irrigated Paddy Field .....	A - 26
Table A.2.6 Yearly variation of Paddy Harvested Area and Paddy Yield .....	A - 26
Table A.2.7 Rice Loading and Unloading at Ports in Indonesia .....	A - 27
Table A.2.8 Preliminary Assessment of Rice Supply and Demand Balance ..	A - 27
Table A.2.9 Number of Livestock in South Sulawesi Province, Main Rice Producing Districts and Model Area(1993) .....	A - 28
Table A.2.10 Rice Production Cost .....	A - 28
Table A.2.11 Agricultural Machinery in the Province .....	A - 29
Table A.3.1 Comparison of Farm Households in Sidrap District .....	A - 30
Table A.3.2 Food Crop Cultivation in Sidrap District .....	A - 30
Table A.3.3 Rice Cultivation Households in Sidrap District .....	A - 30
Table A.3.4 Agriculture Daily Employment in Sidrap District .....	A - 30

### List of Figures

	Page
Fig. A.1.1. Distribution of Irrigated Paddy/Palawija Cultivation Area in South Sulawesi Province .....	A - 31
Fig. A.2.1. Cropping Area and Calendar in South Sulawesi Province .....	A - 32
Fig. A.2.2. Recommended Crops/Livestock/Fishery of Each District in South Sulawesi Province .....	A - 33

## **Appendix A: RESULT OF FIELD SURVEY OF SOUTH SULAWESI PROVINCE**

### **A.1 GENERAL**

#### **A.1.1 The South Sulawesi Province**

##### **(1) General Condition**

The South Sulawesi Province lies in the central part of the Republic of Indonesia latitude between 0° - 8' and 0° - 12' south and longitude between 116° - 36' and 122° - 36' east. From the north the Province is surrounded by Central Sulawesi Province, Southeast Sulawesi Province, Bone Bay, the Flores Sea and the Strait of Makassar in clockwise direction. The Provincial capital, Ujung Pandang is the gateway to Eastern Indonesia not only by its geographical location but also by political and economical meanings. It covers an area of 62,482 km<sup>2</sup> in the southwestern part of the Sulawesi Island with 21 districts (kabupaten) 2 municipalities (kotanmadya) and 185 sub-districts (kecamatan). Total population of the Province is about 7.2 million and population density is 116 persons/km<sup>2</sup>, 75 % of people lives in rural area in 1993 (Table A.1.1).

##### **(2) Natural Conditions**

The South Sulawesi Province possesses a fertile lowland rice bowl under the most densely populated region of Indonesia outside of Java and Bali, as well as towering mountains, an arid southern zone, and unusually long coastline dotted with fishery villages.

As shown in Table A.1.2, annual rainfall distribution varies from more than 3,000 mm in the northern mountain area to almost 1,000 mm in the south-eastern area of the province, and their rainfall patterns also differ. The dry season of the Province is between June to October in general, but rainy season in northeastern coastal area is from April to May.

The agriculture sector occupies an important role in the Provincial population and economy as 60% of population above the age of 10 years is involved in agriculture (Table A.1.1) and 38.5% of gross regional domestic product in 1994 (Table A.1.4) is generated from agriculture.

From the days of Dutch occupation, many irrigation systems were installed in the

Province especially in the central part of the Province. With the fertile soil conditions, it is main rice production area in the eastern Indonesia with an annual paddy production at about 3.5 million ton in 1994. They are supplied to eastern Indonesia provinces including the Sulawesi Island.

In 1987, the Provincial Government issued the recommendation of major crops in each district. The area for paddy/palawija, major commodity of Indonesia, is selected based on the existing irrigation and high water resources potentials in the central part of the Province and they are named BOSOWA SIPILU (district of Bone, Soppeng, Wajo, Sidrap, Pinrang and Luwu) by their name of districts. The irrigated paddy field area in 1995 is as follows:

Area	Irrigated (ha)	Not-irrigated (ha)	Total (ha)	Irrigation Ratio
BOSOWA SIPILU	162,999	17,563	180,562	90.3 %
Other area	137,761	18,397	156,158	88.3 %
Provincial	300,720	35,957	336,677	89.3 %

Source : Data Informasi, Dinas P.U. Pengairan Sulsel, April 1995

### **A.1.2 Agro-ecosystem of Irrigated Area**

#### **(1) Definition of Irrigated Area in the Study**

The irrigated area, as one of four agro-ecosystems, in the Study could be understood as one of the agricultural patterns of Indonesia which is cultivated crops, mainly paddy, irrigated lowland. By wider meaning, it is also possible to include the potential irrigable areas. In the Study main stresses is put on the existing irrigation area.

#### **(2) Objectives of the Development in the Irrigated Area**

The objectives of the development in the irrigated area in the Study are described in the Record of Discussion (R/D) of the Umbrella Program signed between the governments of Indonesia and Japan in October 1995 and they are as follows:

- To improve the productivity of paddy fields, in accordance with increase in rice demand, through such projects as 1) improvement of infrastructure for agricultural production including irrigation and drainage facilities and water management, 2) promotion of farmers' cooperative activities and 3) promotion of utilization of agricultural machinery, and

- To promote the diversification in agricultural crops through such projects as improvement of technology and dissemination.

### (3) The Model Area of the Study as an Irrigated Area

The South Sulawesi Province is selected as a model province for the irrigated area of agro-ecosystem in the Umbrella Program by R/D in October 1995. As shown in Fig. A.1.1, the main irrigated paddy/palawija production area in the Province is plotted in the central area of the Province and Ujung Pandang area where the wide alluvial plain is extended. Through the discussion with the provincial government and Secretariat of Umbrella Program on October 13, 1995, the districts selected were Luwu, Pinrang, Bone and Sidrap in the BOSOWA SIPILU. The meeting proposed at not only the paddy/palawija production but also the livestock, especially local chicken needs to be supported such as corn milling and mixer facilities, and fishery development in Pinrang, Maros and Wajo districts. (refer "Report of Explanation Team", Secretariat of Umbrella Cooperation) Following the Provincial meetings with consideration of some specific conditions such as middle/developed area, human resources, on November 6, 1995, the Technical Group of the Program concluded that the model districts of the agro-ecosystem of irrigated area are to be Pinrang and Luwu districts. (refer "Report of Technical Group", Secretariat of Umbrella Cooperation)

Through the discussions between the Study Team and Provincial government, the Study Area of the in the Province was decided as Pinrang, Sidrap and Luwu districts, in consideration of coverage area of Sadang Irrigation system and transmigration project areas. They are summarized as follows;

Proposed Study Area	Irrigation Conditions	Main Objectives
Sidrap District	Sadang Irrigation Project Area	<ul style="list-style-type: none"> <li>- improvement of agriculture and rural infrastructure</li> <li>- maximization of water resources</li> </ul>
Pinrang District	Sadang Irrigation Project Area in western part and eastern part is covered by the area of the Tempe Lake catchment	<ul style="list-style-type: none"> <li>- by introduction of proper water management</li> <li>- promotion and supports for mechanized farming</li> </ul>
Luwu Districts	Irrigation projects for trans-migration since Dutch era up to date.	<ul style="list-style-type: none"> <li>- activate the farmers' cooperatives</li> <li>- study for the diversification in agricultural crops</li> </ul>

## **A.2 AGRICULTURE**

### **A.2.1 Provincial Agricultural Development Policy**

#### **(1) Natural Conditions for Agricultural Production**

South Sulawesi Province is the major agriculture production province for all crops, outside of Java provinces. The rainfall pattern differs in east and west coasts of the Province, and it makes the paddy harvesting through the year as shown in Fig. A.2.1, which make it possible to supply rice through the year. Also, the annual rainfall varies from 1,000 mm to more than 3,000 mm, making it possible to cultivate almost all type of crops in Indonesia.

#### **(2) Provincial Agricultural Policy**

In 1987, the Provincial Government issued the major cropping area of agricultural crops based on the natural and socio-economic conditions as shown in Table A.1.1.

In the Sixth Five-Year Plan, it is planned to increase agricultural productivity and efficiency and diversify export-oriented agricultural products, particularly plantation crops, livestock and fisheries in the Province. Programs are forecasted on highly potential areas such as Bone, Soppeng, Wajo, Sidrap, Pinrang and Luwu (so called BOSOWA SIPILU), Tana Toraja, Pare Pare, Ujung Pandang and Mamuju. Among the proposed activities are:

- a. expanded and intensified planting of rice, corn, cassava, soybean, mangbean, peanut and sweet potato;
- b. development of horticultural crops such as oranges, mangoes, passion fruits, pineapples and bananas;
- c. increased harvests of tenggiri, flying fish, pompanoes, lobster kerapu, squids and shrimp;
- d. development of nurseries for, among other, shrimp, trout carp, sea cucumber and seaweed;
- e. development of livestock, such as cattle, buffaloes, broiler, traditional chicken species and ducks;
- f. development of plantation crops such as coconut, cacao, arabica coffee and cashew nuts;
- g. development of processing industries for fruits, fish and meat;
- h. stepped-up agriculture extension programs on how to acquire and utilize farm



technologies.

### A.2.2 Agricultural Production

#### (1) Agricultural Production in the Province

The harvested area, production and yield of main crops, in the principal rice producing districts of the Province, and in the model area are shown in Table A.2.1, A.2.2, and A.2.3.

The palawija mainly cultivated in the model area consists of maize, peanuts, mung beans, soybeans, cassavas and sweet potatoes. However, the planted area of palawija crop is remarkably smaller than the area under rice cultivation, which is more than 90% of the total harvested area of the model area. Rice cultivation is more profitable than palawija cultivation (see Table A.2.4). As a consequence farmers choose to cultivate rice. However, farmers are enforced to cultivate palawija in some paddy fields in drought year. Therefore, it is better to increase the productivity of rice than other crops for the improvement of farmers' income.

#### (2) Rice Production and Exportation

Rice is the maier resources, soil fertility, and human resources, is the most important forn staple food in Indonesia. The Province, because of rich natural resources in wat rice production outside Java. Its rainfall pattern makes the paddy harvesting through out the year as shown below, which make it possible for constant supply and distribution of rice through the year.

Harvesting Period	January - April	May - August	September December	Total
South Sulawesi Total (ton)	1,007,353	1,604,573	823,071	3,434,997
Annual Distribution	29%	47%	24%	100%
Indonesia Total (ton)	24,257,823	14,316,423	8,067,278	46,641,524
Annual Distribution	52%	31%	17%	100%
Weight of South Sulawesi Province	4%	11%	10%	7%

Source : Agricultural Survey : Production of Paddy in Indonesia 1994, PBS

Table A.2.5 shows the area of irrigated and non-irrigated paddy fields. The areas for rice cultivation may either have stable or unstable production depending on the availability of water resources and the improvement level of irrigation facilities. An area is considered to be stable when there is no or slight variation in its annual production, while it is deemed unstable when its annual production significantly

varies. For example, with a steady annual production of 6.6 - 7.0 ton/ha in both rainy and dry seasons, the paddy fields in Sidrap District are considered to be stable. On the other hand, because the yield of the paddy fields in Pinrang District significantly fluctuates between 4.6 and 6.2 ton/ha (Table A.2.6) as an influence of the precipitation and rainfall distribution in the area, they are considered unstable. In this district, low annual precipitation is observed, which results in decrease of harvest area and yield, increase in the ratio of irrigated area used in proportion to the rainfed paddy area, remarkable decrease in the harvested area of non-irrigated fields, and inhibition of rice growth in irrigated fields.

As shown in Table A.2.7, the rice surplus provinces in eastern Indonesia are NTB and South Sulawesi Provinces only (average between 1989 and 1990). About 350,000 ton of rice or 30% of inter-provincial shipment amount were flew out to East Kalimantan, Maluku, Central and East Sulawesi provinces every year. Also supply and demand balance of rice in the Province shows about 643,000 ton surplus in 1990 (Table A.2.8).

### A.2.3 Livestock

The main livestock in the South Sulawesi Province - BOSUWA SIPILU, the main rice producing districts area, and in the model area is shown in Table A.2.9. There are no fields planted with forage crops in the irrigated area. However, the potential for livestock development has been observed to be high in the sloping area adjacent to the irrigated area and in Bone District, where irrigated paddy fields, farmlands and grasslands co-exist. The fact that Bone District significantly heads other districts in the Province in the number of feeding cattle suggests its high potential for cattle development.

### A.2.4 Farming Practice

#### (1) Cropping Pattern

The typical cropping pattern in the paddy field is as shown below:

District	Cropping season	Crop	Cropping pattern		Growing period(days)
			Planting	Harvesting	
Sidrap	Rainy	Rice	Apr. - Jun. ....	Sept. - Oct.	110~120
	Dry		Nov. - Dec. ....	Mar. - Apr.	110~120
Pinrang	Rainy	Rice	Dec. - Jan. ....	Apr. - May	115~125
	Dry		July - Aug. ....	Oct. - Dec.	120~125

Triple cropping (paddy->paddy->palawija) is rarely carried out due to shortage in the labor required for this intensive farming practice.

## (2) Fertilizer

According to the 1994 statistics on the production cost of crops, the amount of fertilizer used for rice cultivation is as shown below:

District	Urea (kg/ha)	TSP (kg/ha)	Other Chemical Fertilizers (kg/ha)	Yield (kg/ha)
Sidrap	185	80	9	4,335
Pinrang	104	18	1	4,552
Province mean	184	66	20	4,744

However, the farm survey of the Study in the districts of Sidrap and Pinrang, higher values: 150 - 200 kg/ha of urea, 50 - 100 kg/ha of ammonium sulfate, 100 kg/ha of triple superphosphate, and 50 - 100 kg/ha of potassium chloride.

## (3) Labor Inputs

The rice production cost in the districts of Sidrap and Pinrang, based on the Agricultural Census of 1994, is shown in Table A.2.10. The ratio of labor cost to the total rice production cost is high at 50%, including 10% for transplanting and 39% for harvesting. There is a growing shortage in agricultural workers, especially for transplanting and harvesting. To some extent, this labor shortage condition is offset by the influx of workers from other districts.

Land preparation, which entails plowing, puddling and leveling, is generally carried out with a hand tractor. Land preparation requires about 20 hours; 8 to 10 hours for plowing, 5 to 6 hours for puddling, and 5 to 6 hours for leveling. Some farmers have their own hand tractors, hence they conduct the works themselves. Others entrust the work on a contractual basis. The contract price for land preparation is Rp. 90,000 to 100,000/ha.

Transplanting and harvesting are also carried out on a contractual basis. The contract price for transplanting is about Rp.100,000/ha. Transplanting per hectare is completed in a day and requires 10 to 15 workers. If direct seeding is carried out the working time and the contract price amount to less than half that of transplanting. The contract price for harvesting is one seventh (1/7) of the products; 80% of the fee is distributed among the workers, while the remaining 20% is the contractor's share.

Harvesting entails cutting with a sickle, threshing in the field with a power thresher, bagging of unhusked rice and their transport from the field to major roads. A contractor usually owns a power thresher and employs about 30 to 50 workers.

(4) Seeds

There are rice seed farms in the area owned by the local government, and these farms supply high quality seeds to the farmers. However, the supplied quantity is too small. The amount of rice seeds required for transplanting cultivation is 30 kg/ha, and the farmers of Sidrap District and Pinrang District are provided with 90% and more than 60% of the required amount respectively, using the seeds they themselves have raised. Because the rice seeds raised by the farmers are of poor quality, the quality of rice produced in these districts is also poor.

(5) Agricultural Machinery

In 1980's, the Government promoted the tractor tillage in this Area. As shown in Table A.2.11, the Area has about 1,100 units of tractors, mostly two wheel hand tractors, in each district. These total units of tractor are the largest in the Province, and their coverage of paddy cultivated area are less than 100 ha/unit. Some farmers in the Area have their own tractor for the land preparation, enterprises in the Area also have large number of hand tractors, such as P.T. Pertani in Sidenreng they poses more than 100 units of tractors and they rent tractor by contract basis. Most of hand tractors are Japanese make. But there are some Indonesian make tractors also. Attachments are prepared or modified by local black smiths to make them suitable for local conditions. According to the District agricultural service office, about 2 times of existing tractors are required for the smooth implementation of rice cultivation.

### A.2.5 Agriculture Supporting Services

(1) Extension Services

The number of extension offices (BPP), extension workers (PPL) and experts (PPS) in the South Sulawesi Province and the model area are shown below:

District	No. of BPP	No. of PPL	No. of PPS
Sidrap	5 (4)	87 (60)	2
Pinrang	5 (5)	113 (55)	4
S. S. Province	100	1,100	60

Note: ( ): Number of BPP and/or PPL specializing in food crops

The PPL extension activities are carried out through the training and visit system, in which an extension worker takes care of 32 farmers' groups. The extension activities are not satisfactorily carried out, because of a scant supply of required equipment and materials, especially motorcycles. In addition, the extension officers are not adequately trained on new techniques, e.g., new cultivation techniques which involves the use of machinery, and value-adding techniques for agricultural products.

**(2) KUD Activities**

The rural cooperative (KUD) should play an important role as the supplier of input materials and distributor of agricultural products. There are 23 KUD's in charge with the purchase of food crops in Sidrap District and 14 in Pinrang District. There are also 11 KUD's in the district of Pinrang, supplying fertilizer. However, because these KUD groups do not carry out their duties efficiently, shortage in rice seeds of high quality, unstable supply of fertilizer, purchasing of paddy at an inappropriate price, and the deterioration of the quality of rice produced take place: factors that obstruct the realization of increased agricultural production and farmers income.

### A.3 WATER RESOURCES AND IRRIGATION

#### A.3.1 Present Condition of Irrigation Systems

##### (1) Water Resources Development Policies of the Province

In the Sixth Five-Year Development Plan, the Province stresses the improvement of irrigation facilities and increased exploration of water sources. They call for

- a. preparation of master plan for basins along the Jeneberang, Walanae-Cenrane and Sadang rivers;
- b. construction of Bili Bili and Kalola reservoirs;
- c. installation of 30 km pipelines from Bili Bili to Ujung Pandang;
- d. rehabilitation and management of approximately 135 km<sup>2</sup> basins along Sadang, Mampili, Bila, Cerane, Jeneberang, Pampang, Maros and Alu rivers;
- e. maintenance of irrigation canals covering approximately 264, 000 ha of paddy fields;
- f. construction of irrigation canals to serve 40,000 ha in Tana Toraja, Pangkep, Ponre Ponre, Bajo, Balombong and Awo; and
- g. development of fish ponds in 12,000 ha area.

##### (2) Irrigation Development in the Province

According to the Water Resources Development Office of the Province, the following large scale irrigation projects are implemented or to be expected to implemented under the foreign financial assistance during the Sixth and Seventh Five-Year Development Plan (1994/95 - 1998/99 and 1999/2000 - 2003/2004):

Name of Irrigation Project	(1 / 2)	
	Assistance	Area(ha)
Langkemme Irrigation Project (completed Feb. '95)	OECF	12,700
ISSP-II	IBRD	225,000
PIADP (Provincial Integrated Agricultural Development Project)	IBRD	125,000
Bila Irrigation Project I	OECF	6,466
Maloso Irrigation Project	IDB	13,615
Bili-Bili Dam Project	OECF	6,662
Groundwater Development Project	IBRD	4,970
SSIMP-II (Small Scale Irrigation Management Project-II)	OECF	8,135
Bili-Bili Dam III	OECF	3,488
Bili-Bili Multipurpose Dam II	OECF	20,798
Gilirang Irrigation Project D/D	OECF/JICA	6,500
East Region Irrigation Project (SSIMP-III)	OECF	16,400

(2 / 2)		
Name of Irrigation Project	Assistance	Area(ha)
Sulawesi Irrigation Improvement and Water Resources Project	IBRD/CIDA	40,444
Bili-Bili Dam III (Irrigation Project)	OECD	24,750
PIADP II	IBRD	??
Eastern Indonesia Water Resources Development Project	ADB	??
Scattered Medium Scale Irrigation Rehabilitation and Development Project	???	12,000

Source : Dinas PU, Sulsel

### (3) Sadang Irrigation Project

The Sadang Irrigation Project spreads in Pinrang and Sidrap districts, started its design since 1927, with irrigation area of 54,106 ha, which is the third largest irrigation scheme in Indonesia having single headworks. The rehabilitation works were carried by the DGWRD of MPW under the financial assistance from IDA between 1970 and 1984.

Considering the water resources available, the irrigated area can be extended up to 65,000 ha using pumps (ref. Table A.1.3). At present the average cropping intensity is estimated to 175% because of shortage of field access during the rainy season, poor water management and deterioration of irrigation facilities. The harvesting period is in the wet season. The paddy is threshed in the field and transported 2 to 5 km to the road for the selling to the middlemen. The road in the paddy field can not be passed by vehicles, therefore bicycles or horse which are rented from contractors. Sometimes it causes delay in the start of the secondary cropping and results lower quantity and poor quality.

The master plan and detailed design of the farm road was prepared by the Sadang Maloso Irrigation Project Office in Pinrang. The works contain about 578 km of farm roads, about 1,000 of culverts or bridges, about 105 km of drainage canals, 130 km of secondary canal rehabilitation and 739 ha of tertiary development.

### (4) Irrigation Projects for Transmigrates

As shown in Table A.1.1, Luwu and Mamuju Districts have the lowest population density in the Province. They are targeted as transmigrate receiving areas. Especially Luwu District has many transmigration projects, where the Trans-Sulawesi Highway runs at the border between the alluvial plain and mountain area. Some of them were established in 1938, during the Dutch era, and transmigration within the province also exists. They are namely, Kalaena (17,376 ha), Padang Sappa (12,588 ha), Bone Bone (2,817 ha), Kanjiro (1,517 ha), Lamsi (9,842 ha).

The Provincial Irrigated Agriculture Development Project (PIADP) under the financial assistance of IBRD are working out the rural infrastructures including farm roads, drainage canals and tertiary developments in these transmigration project areas. Because of limitation of financial and period, Bone Bone, Kanjiro and Lamsi irrigation project areas are left. Their works include farm roads (80 km in Bone Bone), road crossing structures, drainage canals and tertiary development. The design of these works were completed by Luwu Irrigation Project Office.

(5) Master Plan Study of Water Resources in the Central Part of South Sulawesi Province and Bila Irrigation Project

The Master Plan Study in the area was completed by JICA in 1980. Based on the Master Plan, Lankemme and Bila Irrigation projects were completed or mostly completed under the financial assistance of OECF up to now. And Girilang Irrigation Project has completed the feasibility study and it is going to start its implementation. As that study was made more than 15 years ago, further implementation needs a review and updating of the facts under the changed circumstances in the area, large changes were required in the implementation of nearly completed Bila Irrigation Project such as increase in bottom elevation of the Lake Tempe, additional requirement of farm roads for mechanized farming etc. Not only the irrigation development but also inland fishery has bright potential in the lakes or reservoirs in the Area.

**A.3.2 Water Management and Operation and Maintenance**

(1) Water Management

Until 1983/84, the operation and maintenance of existing irrigation schemes under DGWRD was financed by Provincial Government (APBD). Since 1984/85, the Central Government began to allocate cost for O&M (APBN) to confirmed area that had been rehabilitated, in 10 provinces including South Sulawesi Province, with APBN funds allocated to other area. The Government issued a policy statement for the O&M of irrigation facilities in October 1987. It stipulates that within a period of 15 years, efficient O&M cost will be introduced in irrigation systems throughout the country and that the O&M cost will be directly covered by the beneficiaries. Efficient O&M is applied mainly to main and secondary canals and is implemented



through the Central Government budget for five years from the commencement. After five years it will be transferred to Provincial Governments. On the other hand, O&M costs for the tertiary and quaternary canals will be covered through the introduction of irrigation service fee collected from beneficiaries. Government controlled irrigation systems under 500 ha are scheduled to be handed over to water users' association (WUAs or P3A).

O&M of irrigation system in the model area are not functioning as initially planned, as shown in Sadang Irrigation Project. When there is a delay in land preparation due to delayed harvesting of previous crop and shortage of labour forces/tractors, irrigation water came into the paddy field, which causes difficulty in land preparation, delayed transplanting, and finally lack of irrigation water supply in critical growing periods resulting in low production. Therefore it is necessary to implement more efficient and flexible water management especially in large scale irrigation projects. Conclusively, the training to the staff of O&M and water users' associations is urgently required for the effective use of water and rehabilitation of existing old irrigation facilities such as irrigation canal for reduction of water losses.

## (2) Water Fees

The provisional irrigation service fee (IPEP) are applied in the model area at Rp.5,000 / ha / cropping since 1982. In Sidrap and Pinrang districts, farmers pay the new irrigation service fee (IPAIR) at Rp.12,000 to 20,000/ha/cropping depending on the location of irrigated field since 1990/91 and 1993/94, respectively. But it is not fully applied. At present, only 20% of farmers are paying in the Sadang Irrigation Project Area as shown in the table below.

**Annual Irrigation Water Service Fee Collected**

		(Unit : Rp.)					
Area	Category	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95
Sidrap	IPEP	54,502,876	51,333,445	3,597,620	9,555,405	7,358,530	3,629,235
	IPAIR	0	86,448,000	107,330,000	151,254,000	201,682,000	291,740,179
	Total	54,502,876	137,781,445	110,927,620	160,809,405	209,040,530	295,369,414
Pinrang	IPEP	37,458,555	24,933,725	29,338,740	48,485,525	5,793,850	0
	IPAIR	0	0	0	0	72,413,000	90,239,000
	Total	37,458,555	24,933,725	29,338,740	48,485,525	78,206,850	90,239,000
Luwu	IPEP	0	36,415,050	0	26,723,350	0	25,176,595
	IPAIR	0	0	0	0	0	0
	Total	0	36,415,050	0	26,723,350	0	25,176,595
Province	IPEP	196,506,986	193,521,241	109,325,199	149,810,151	100,933,944	61,226,290
	IPAIR	0	86,448,000	107,330,000	151,254,000	274,095,000	503,657,239
	Total	196,506,986	279,969,241	216,655,199	301,064,151	375,028,944	564,883,529

Source : Data Informasi, Dinas PU Pengairan Propinsi Dati I, April 1995

It is possible to say that the ratio of water fee collection is a degree of farmers participation in the irrigation project. Without collection of water fees from farmers/beneficiaries in the irrigation projects, it is impossible to operate the irrigation system effectively. The water fee collection ratio of 20% is too low, therefore effective extension works by extension workers are urgently required not only for the smooth operation irrigation system but also to awake the business mind of farmers.

#### **A.4 PROPOSED BASIC DEVELOPMENT CONCEPTS**

##### **A.4.1 Development Needs and Constraints**

Rice is the main staple food in Indonesia. The Province, because of rich natural resources in water resources, soil fertility, and human resources, is the most important for rice production outside Java. Its rainfall pattern makes the paddy harvesting through out the year, which make it possible for constant supply and distribution of rice through the year. Under these circumstances, the Province plays an important role as the major rice producing and surplus production province in Eastern Indonesia. According the estimation of Provincial Agricultural Office, about 950,000 ton of rice is surplus in 1993 (Data Base Agribisnis Tanaman Pangan, 1994).

Rice planted area in the province is 700,000 - 800,000 ha. About 25% of the planted area are irrigated in rainy season and 90% in dry season. Luwu, Bone, Sidrap and Pinrang districts are main irrigated areas in the Province.

Main palawija (secondary food crops) cultivated in these areas are maize, soybean, peanuts, green gram, cassava and sweet potato. However, planted area of Palawija is remarkably smaller than that of rice except in Bone District where upland field area is larger than paddy field. The profit per unit area of paddy cultivation is larger than that of palawija cultivation. So farmers intend to cultivate paddy as far as water resources are available. Due to this circumstances, cultivation of palawija crops in paddy field is observed very rarely unless water resources become critically short. The farming practice of triple cropping (for example : paddy - paddy - palawija) is observed to be rare due to the lack of enough labors for this intensive farming. In short, rice is the most profitable crop in irrigated area because of its high productivity. Therefore, an increase of rice production will contribute not only to improve the farmer's income more than that of other crops but also to supply rice to the Eastern Indonesia.

The main constraints for agricultural development in this area are summarized as follows:

##### **(1) Shortage of Agricultural Labor Force**

The agricultural labor force is getting short for proper farming practices, especially for transplanting and harvesting. This shortage of the labor force is overcome to certain extent by the labor flowing into the area from other districts. Therefore, the proportion of labor cost to the total cost of rice production becomes high as much as

50% including 10% for transplanting and 39% for harvesting (refer Table A.2.10).

The shortage of agricultural labour forces are exaggerated by the poor farm road system to the cultivated field especially harvesting of wet season cropping.

According to the Agricultural Census in 1983 and 1993, the Sidrap Districts showed the slight increase in agricultural households (10%), but food crop cultivation households declined at 4.5%, and daily worker employment increased more than 5 times between 1983 and 1993 as shown in Table A.3.1. to Table A.3.4:

**(2) Lack of Farm Road/Bridge**

Lack of sufficient farm road/bridge causes lower operational efficiency because of difficulty in tractor access into the field. In addition, transporting the harvested rice during the rainy season (as shown the cropping pattern of the Area in Fig. A.2.1) from the field to the major road is the most difficult operation among the post-harvest practices due to insufficient farm roads. These works are made using houses and locally developed Speda Taksi (bicycle taxi: strengthened bicycle for heavy duty) by contract basis at Rp. 1,000 - 1,500/100kg-bag

In Sidrap District, farm road improvement plan has been prepared, but they are not yet realized. Some of the farm road improvement are implemented as a part of the PIADP (Provincial Irrigated Agriculture Development Project) under the IBRD in Luwu District during 1991 and 1996.

**(3) Shortage of Qualified Rice Seeds**

The rice produced in the Area is known as high quality rice named "Beras Crystal". But the supply of high quality qualified rice seed to farmers is not enough, even though it is produced in the area. This causes low quality rice production in this Area.

The rice seeds are produced by farmers in the Area under the support of branch office of PT. Pertani and PT San Yang Suri, both are semi-governmental companies. They shall be qualified and certificate by the Food Crop and Horticulture Crop Seed Inspection and Certification Center VI (BPSBTPH) in Maros, but its certification system is poor in quality and technology.

(4) Unstable Supply of Fertilizer

Fertilizer is often not available to farmers when it is necessary for the stage in rice cultivation. Consequently, attaining of yield increase by appropriate application of fertilizer is obstructed.

(5) Rat damage

A substantial damage to rice growing in the field is caused by rats and this is a critical issue on the loss of produce.

According to "Biology and Control of Tropical Rats" <Association for Intentional Cooperation of Agriculture & Forestry, Japan, (AICAF), Feb. 1996>, one of the major destructive rat species in paddy field is *Rattus argentiventer*. The species inhabits paddy fields and swampy grasslands, builds nests in the levees of paddy fields, and feeds on soybeans too. The species can adopt to the dry season as well as the rainy season. Regionally, the damage is the largest in South Sulawesi and Central Java, Jogjakarta and Sumatera provinces, in order. The damages caused by rats to agricultural crops in Indonesia are estimated as follows;

Crop		Estimated Damages
Rice	1979-1980	27% of yield losses of 317,212 ha paddy field
	1980-1981	16% of yield losses of 248,225 ha paddy field
Sugarcane		30-100% of yield losses of 14,000 ha cultivated Area
Maze	1976-1976	damaged area 1,149 ha
Cassava	1976-1976	damaged area 4,676 ha
Soybean	1976-1976	damaged area 1,302 ha
Groundnuts	1976-1976	damaged area 168 ha

Source : Biology and Control of Tropical Rats, Association for Intentional Cooperation of Agriculture & Forestry, Japan, (AICAF), Feb. 1996

(6) Shortage of Dryer for Paddy

Generally, the harvested un-dried rice is sold to public processing organizations, private rice mills or middlemen. One of the largest rice mill in the Area is Mill of PT Pertani in Sidereng, which installed two unit of integrated milling plants under Japanese KR2. It does not equip with dryers and they dry fresh paddy on dry yard under the sun. During the time of exposure to the sun, the quality of paddy is often deteriorated due to rain.

(7) Inefficient use of water resources

In most of the model areas, the irrigation main system installation started in Dutch era. The improvement of tertiary irrigation system is still going on. As shown in the

variation of paddy yield in Pinrang district (4.6 - 6.2 ton/ha as shown in Table A.2.6), paddy yield is still affected by the rainfall caused by the incomplete irrigation system and/or improper O&M of irrigation system.

#### **A.4.2 Proposed Basic Development Concepts**

As stated in sub chapter A.4.1, the Province is the rice bowl of the Eastern Indonesia, therefore the Province shall maintain and develop the rice production for the increasing rice demand in accordance with population increase and increase in unit consumption of rice together with regional economic growth in the Eastern Indonesia. The productivity of rice in the Area shall be maintained and improved for the stable supply for the Eastern Indonesia by effective inputs for production such as agricultural infrastructure, agricultural machinery/equipment, qualified seeds, fertilizer/chemicals, etc.

##### **(1) Promote Appropriate Mechanized Farming**

Among many operations in rice cultivation, transplanting and harvesting need the most labor force. At present, labor force of these two operation relies on the labor moving into this region from the other areas. The development and the extension of labor saving cultivating technique is the most important subject in this area. In this regards, direct seeding and mechanized rice cultivation which is based on labor saving of harvesting operation should be promoted. The final goal of labor saving of harvesting operation is introducing combines, however, it is preferred to be gradually introduced in stages with considerations for price of combines, economical efficiency and farmers' financial abilities.

##### **(2) Improvement of Rural Infrastructures**

In order to ensure the efficiency of production and accessibility to the farm land from main road, rural infrastructure such as farm/village road, drainage system, should be improved.

##### **(3) Promotion of value-adding of agricultural products at farmer' level**

Promotion of value-adding of agricultural products at farmer' level, such as maintain and increase of rice production, maintain the reputation of rice quality, post-harvest of agricultural products, shall be implemented. They shall be extended by the extension services or KUD to the farmers.

**(4) Activation of Agricultural Extension Services**

Without farmers participation to the agricultural development projects, the project targets can not achieved. In order to promote the farmer's participation to the projects for the improvement of farmers living standard, the activation of agricultural extension service is important.

- a. new cultivating technique accompanied by agricultural mechanization
- b. technique for eradication of rats
- c. knowledge necessary for value-adding of agricultural products

**(5) Maximization of Water Resources**

The irrigation projects in the model area were completed gradually since Dutch era. Most of them are handed-over to the provincial government and farmers. Because of deterioration of main and secondary irrigation systems, they need rehabilitation of facilities and introduction of proper water management system to ensure efficient agriculture especially rice production twice a year. In parallel to the rehabilitation of main/secondary irrigation system and completion of tertiary development, the promotion of water management for the maximization of water resources shall be promoted.

**(6) Study for diversification of agricultural crops**

After completion of above developments, the diversification of agricultural crops could be possible. Therefore, it is necessary to study the adaptability of appropriate crops in the area including not only palawija but also vegetables.

**(7) Livestock Development**

There is less activities of livestock in irrigated areas at present. However, the higher potential of developing livestock have been observed in sloping areas adjacent to irrigation area and in Bone District where irrigated paddy field, farm land and grassland are co-existing (refer Table A.2.9). Study on this livestock potential should be conducted for the diversification and integrated agriculture.

**A.4.3 Required Actions for the Development**

In order to achieve the above mentioned development directions, the following actions shall be made:

**(1) Mechanized Farming (Component : 2-23-231, 3-34-342 & 6-61-611)**

In order to cover the shortage of agricultural labour forces, the promotion of agricultural mechanization, the following activities are considered to be necessary:

- a. developing and improving machinery that is suitable for local conditions,
- b. expansion and activate financial / credit system of KUD for the farmers' or farmer group's procurement of agricultural machinery, and
- c. establishing cultivation system that utilize the developed machinery

**(2) Improvement of Rural Infrastructure (Component : 8 & 4-42-421)**

For the promotion of agricultural mechanization, providing sufficient environment such as the following facilities/infrastructure are required:

- a. construction of farm and village roads together with bridges crossing the irrigation canals,
- b. improvement of drainage facilities for drying rice field and maintain the trafficability of machinery, and
- c. if possible, readjustment of land to appropriate size.

**(3) Promotion of Value-Adding of Agricultural Products at Farmers' Level (Component 2)**

To promote the value-adding of agricultural products at farmers' level the following activities of KUD and other agencies shall be strengthened;

- a. producing high quality rice by strengthening and improving seed inspection system for high quality seed distribution,
- b. increasing quantity and quality of produce by realizing stable supply of farming materials such as fertilizer and pesticide,
- c. purchasing harvested paddy at appropriate price, and
- d. executing post harvest processing as a rational facility of large scale to minimize the loss.

**(4) Agricultural Extension Services (Component 3-32 & 33)**

Activating and educating extension officers regarding following subjects are required:

- a. new cultivating technique accompanied by agricultural mechanization



- b. technique for eradication of rats
- c. knowledge necessary for value-adding of agricultural products

**(5) Maximization of Water Resources (Component 2-24 &4)**

In order to maximize the use of water resources, the following activities are required;

- a. rehabilitation of existing main and secondary irrigation facilities
- b. completion of tertiary development
- c. strengthening the water users association and their rearrangement
- d. review of water management
- e. technical guidance of water management to the gate watchmen and water user
- f. review of master plan of basin water resources development including inland fishery development and water quality control

**(6) Diversification of Agricultural Crops (Component : 2-22-221)**

It is necessary to study the diversification of agricultural crops for the integrated agriculture from the present rice mono-culture in the Area. It is necessary to study the adaptability of appropriate crops in the area including not only palawija but also other vegetables for further agricultural development and increase of farmers' incomes.

Table A.1.1 Population in South Sulawesi Province, 1994

	Kabupaten / Kotamadya	Area (km <sup>2</sup> )	No. of Sub- district	No. of Village/ Wards	No. of House- holds	Population 1994				Annual Growth Ratio (1990/1994)	Population Density (head/km <sup>2</sup> )	No. per House- hold	more than 10 years in 1994		
						Total	Male	Female	Female Ratio				Total	Male	Female
1	Selayar	903.35	5	38	25,540	100,476	47,957	52,519	110%	62%	111.2	3.93	37,794	27,669	26,348
2	Bulukumba	1,154.67	7	122	70,064	339,771	162,258	177,513	109%	62%	294.3	4.85	114,372	93,042	80,460
3	Bantaeng	395.83	3	42	29,605	146,892	71,191	75,701	106%	54%	371.1	4.96	58,896	43,300	44,180
4	Jeneponto	737.64	5	111	64,320	305,566	148,394	157,172	106%	60%	414.2	4.75	127,558	92,266	102,916
5	Takalar	566.51	6	73	44,598	210,545	100,577	109,968	109%	57%	371.7	4.72	87,903	60,880	51,912
6	Gowa	1,883.32	9	130	91,954	444,327	216,163	228,164	106%	57%	235.9	4.83	179,040	125,180	102,968
7	Sinjai	819.96	7	68	36,374	197,084	95,458	101,626	106%	58%	240.4	5.42	76,128	56,940	58,875
8	Maros	1,619.12	7	101	53,359	246,193	120,028	126,165	105%	51%	152.1	4.61	79,435	64,565	48,290
9	Pangkajene	1,112.29	9	97	52,128	252,436	119,989	132,447	110%	55%	227.0	4.84	88,875	67,903	53,924
10	Barru	1,174.71	5	54	31,732	148,996	71,081	77,915	110%	65%	126.8	4.70	55,453	40,621	33,855
11	Bone	4,559.00	23	372	121,426	608,045	284,684	323,361	114%	54%	133.4	5.01	226,556	159,498	141,372
12	Soppeng	1,359.44	6	66	51,203	230,531	108,483	122,048	113%	70%	169.6	4.50	81,377	62,622	48,125
13	Wajo	2,506.19	10	176	81,920	396,043	185,550	210,493	113%	66%	158.0	4.83	133,472	92,560	80,055
14	Sidrap	1,885.25	7	66	49,294	234,103	111,555	122,548	111%	56%	124.3	4.75	78,162	59,873	45,923
15	Pangkajene	1,961.77	5	103	61,283	302,171	145,745	156,426	107%	61%	154.0	4.93	106,388	77,545	69,936
16	Enrekang	1,786.01	5	54	30,993	151,839	74,872	76,967	103%	56%	85.0	4.90	60,738	40,969	49,343
17	Luwu	1,779.43	21	407	208,384	745,735	373,831	371,904	99%	55%	41.9	3.58	280,534	197,347	199,453
18	Tator	3,205.77	9	113	70,742	364,525	184,124	180,401	98%	53%	113.7	5.15	131,213	88,406	102,870
19	Polmas	4,781.53	9	173	87,770	423,982	204,482	219,500	107%	55%	88.7	4.83	176,809	114,566	116,996
20	Majene	947.84	4	35	25,242	133,361	64,279	69,082	107%	50%	140.7	5.28	42,774	29,641	26,197
21	Mamuju	11,057.82	6	92	49,432	245,463	125,135	120,328	96%	59%	22.2	4.97	99,266	63,240	76,664
22	Ujung Pandang	175.77	11	142	151,048	979,589	487,314	492,275	101%	59%	5,573.1	6.49	290,708	205,913	16,502
23	Pare Pare	99.33	3	21	18,577	102,772	49,037	53,735	110%	59%	1,034.7	5.53	30,618	21,840	4,200
	Total	62,482.55	185	2,656	1,506,788	7,310,445	3,551,790	3,758,655	106%	58%	117.0	4.85	2,644,486	1,886,586	1,581,358
															59.8%

Source : South Sulawesi in Figures 1994, Statistical Office South Sulawesi

Table A.1.2 Average Monthly Rainfall in South Sulawesi Province

(Unit : mm)

District	Station	Obs. Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Luwu	Palopo	51	208	229	275	316	333	245	186	157	140	164	214	239	2,706
Luwu	Watu	18	179	220	261	353	310	220	230	206	110	100	176	174	2,539
Luwu	Masamba	33	334	311	383	412	398	346	236	207	156	149	200	338	3,467
Enrekang	Enrekang	47	222	214	251	294	238	180	115	82	91	119	173	228	2,207
Sidrap	Pangkajene	13	156	95	134	209	261	172	102	60	32	68	105	97	1,491
Sidrap	Rapang	46	160	154	178	249	300	199	156	115	101	136	158	159	2,065
Pinrang	Benteng	12	169	183	281	229	343	208	124	99	55	114	167	247	2,219
Sengkang	Bungin	16	158	181	201	257	212	178	125	60	85	138	142	185	1,922
Pare-Pare	Pare-Pare	53	524	240	219	206	152	91	65	42	51	102	213	373	2,078
Wajo	Kera	7	82	70	104	201	385	427	216	218	260	127	85	112	2,287
Wajo	Sengkang	44	92	96	128	194	257	221	135	90	54	83	138	105	1,593
Bone	Watampone	63	143	153	205	276	337	325	222	119	87	96	125	151	2,259
Sinjai	Sinjai	90	123	123	146	253	495	437	292	122	71	83	86	114	2,375
U. Pandang	Makassar	72	732	527	430	159	92	64	33	11	12	39	182	582	2,863
Bulukumba	Bulukumba	34	98	90	108	162	286	234	122	50	30	50	44	79	1,353
Banteng	Jenepont	34	289	185	116	73	74	77	39	15	7	16	51	174	1,116

Notes : figure in bold is the maximum monthly rainfall at each station

figures back shaded are monthly rainfall more than 150 mm/month

Source : JICA, "The Study for Formulation of Irrigation Development Program in Republic of Indonesia Vol. 3 : Annex D", Nov. 1993

Table A.1.3 80 % Dependable River Basin Water Depth

(Unit : mm/month)

Name of Basin	Catchment Area(km <sup>2</sup> )	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean	Minimum
Sadang	6,261	82	92	120	140	107	71	43	20	20	41	79	102	76	20
Lasolo	7,426	48	53	59	64	92	73	54	30	13	8	30	34	47	8
Balease	2,703	132	122	157	170	164	139	87	72	48	45	69	135	112	45

Source : JICA, "The Study for Formulation of Irrigation Development Program in Republic of Indonesia Vol. 3 : Annex D", Nov. 1993

**Table A. 1. 4 Gross Regional Domestic Product at Current Market Price**

Industrial Origin	1993		1994	
	in million Rp.	Weight	in million Rp.	Weight
<b>1. Agriculture</b>	<b>2,865,649</b>	<b>38.1%</b>	<b>3,354,202</b>	<b>38.5%</b>
Farm Food Estate Crops	1,825,168	24.3%	2,129,673	24.4%
Farm Non-food Crops	323,309	4.3%	397,328	4.6%
Livestock	126,108	1.7%	137,304	1.6%
Forestry	15,564	0.2%	19,729	0.2%
Fishery	575,499	7.7%	670,167	7.7%
<b>2. Mining and Quarrying</b>	<b>239,882</b>	<b>3.2%</b>	<b>306,897</b>	<b>3.5%</b>
Mining	159,730	2.1%	216,157	2.5%
Quarrying	80,152	1.1%	90,740	1.0%
<b>3. Manufacturing &amp; Industries</b>	<b>873,227</b>	<b>11.6%</b>	<b>1,046,759</b>	<b>12.0%</b>
Large & Medium Manufacturing	618,828	8.2%	755,789	8.7%
Small Scale Manufacturing	254,399	3.4%	290,970	3.3%
<b>4. Electricity, Gas, Water Supply</b>	<b>73,044</b>	<b>1.0%</b>	<b>87,793</b>	<b>1.0%</b>
Electricity	67,986	0.9%	79,631	0.9%
Gas	171	0.0%	212	0.0%
Water Supply	4,888	0.1%	7,951	0.1%
<b>5. Construction</b>	<b>433,502</b>	<b>5.8%</b>	<b>472,798</b>	<b>5.4%</b>
<b>6. Trade, restaurant &amp; Hotel</b>	<b>1,216,104</b>	<b>16.2%</b>	<b>1,384,764</b>	<b>15.9%</b>
Wholesales & Retail Trade	1,123,943	15.0%	1,281,228	14.7%
Hotels	20,249	0.3%	27,044	0.3%
Restaurant	71,912	1.0%	76,493	0.9%
<b>7. Transportation &amp; Communication</b>	<b>432,742</b>	<b>5.8%</b>	<b>511,639</b>	<b>5.9%</b>
Land Transportation	208,501	2.8%	226,778	2.6%
Sea Transportation	78,625	1.0%	96,177	1.1%
Air Transportation	58,884	0.8%	72,601	0.8%
Services allied to Transportation	23,248	0.3%	28,995	0.3%
Communication	63,483	0.8%	87,087	1.0%
<b>8. Financial, Rent &amp; Business Services</b>	<b>462,234</b>	<b>6.2%</b>	<b>549,378</b>	<b>6.3%</b>
Banking	80,045	1.1%	127,281	1.5%
Non-banking Financial Institution	34,828	0.5%	39,923	0.5%
Ownership of Dwellings	323,888	4.3%	357,410	4.1%
Business Services	23,472	0.3%	24,765	0.3%
<b>9. Services</b>	<b>915,389</b>	<b>12.2%</b>	<b>1,004,475</b>	<b>11.5%</b>
Public Administration & Defense	856,362	11.4%	940,769	10.8%
Social Services (private)	29,652	0.4%	31,031	0.4%
Entertainment & Recreational	4,117	0.1%	5,306	0.1%
Personal Household	25,257	0.3%	27,370	0.3%
<b>Gross Regional Domestic Product (GRDP)</b>	<b>7,511,772</b>	<b>100.0%</b>	<b>8,718,706</b>	<b>100.0%</b>

Source : South Sulawesi in Figures 1994, Statistical Office South Sulawesi

**Table A.2.1 Harvested Area, Production and Yield of Food Crops  
in South Sulawesi Province (mean of 1989-1993)**

Crops	Harvested Area (ha)	Production (ton)	Yield (kg/ha)
Paddy	750,360	4,035,805	5,378
Upland Rice	14,449	34,340	2,377
Sub Total	764,809	4,070,145	5,322
Maize	288,466	500,576	1,735
Peanut	49,364	56,436	1,143
Mung bean	43,797	43,906	1,002
Soybean	52,740	75,543	1,432
Cassava	47,864	535,306	11,840
Sweet potato	8,374	65,815	7,860
Sub Total	490,605	1,277,582	2,604
Vegetables	38,398	163,131	4,248

Source: Data base of food crops, Dept. of Food Crops, South Sulawesi Province, 1994

**Table A.2.2 Harvested Area, Production and Yield of Food Crops  
in BOSOWA SIPIILU (mean of 1989-1993)**

Crops	Harvested Area (ha)	Production (ton)	Yield (kg/ha)
Paddy	457,058	2,576,908	5,638
Parawija	210,324	391,458	1,861
Vegetables	19,720	67,437	3,420

Source: Data base of food crops, Dept. of Food Crops, South Sulawesi Province, 1994

Note: Main Rice Producing Districts are Luwu, Wajo, Bone, Soppeng, Sidrap and Pinrang.

**Table A.2.3 Harvested Area, Production and Yield of Food Crops  
in the Model Area (Mean of 1989-1993)**

District	Crops	Harvested Area (ha)	Production (ton)	Yield (kg/ha)
Sidrap	Paddy	60,558	406,679	6,716
	Parawija	3,229	6,612	2,048
	Vegetables	779	2,339	3,003
Pinrang	Paddy	68,126	383,797	5,634
	Parawija	4,209	14,753	3,505
	Vegetables	2,640	3,358	1,272

Source: Data base of food crops, Dept. of Food Crops, South Sulawesi Province, 1994

**Table A.2.4 Comparison of Gross Income of Palawija and Rice**

Item	Maize	Peanut	Mung bean	Soybean	Rice
Yield (kg/ha)	1,735	1,143	1,002	1,432	5,378
Price(Rp./kg)	450	1,200	850	900	400
Gross Income(Rp/ha)	780,750	1,371,600	851,700	1,288,800	2,151,200

Source: Data base of food crops, Dept. of Food Crops, South Sulawesi Province, 1994

Table A.2.5 Area of Irrigated and Non-Irrigated Paddy Field (1993)

Category	District	Irrigated Paddy Field (ha) (A)			Non-Irrigated Paddy Field (ha)			Total(ha) (B)	(A)/(B) %			
		Technical	Semi-Tech.	Public	Village	Subtotal (A)	Rain-fed			Tidal	Fallow	Sub Total
Province	Total	131,494	49,044	47,610	119,269	347,417	249,577	1,999	13,970	265,546	612,983	57
Main Rice Producing Districts (BOSOWA SIPTLU)	Luwu	19,815	8,934	11,799	27,520	68,068	13,799	127	6,615	20,541	88,609	77
	Wajo	0	0	0	7,381	7,381	79,907	0	0	79,907	87,288	8
	Bone	14,403	4,738	7,921	19,022	46,084	35,249	690	0	35,939	82,023	56
	Soppeng	6,442	2,270	6,108	3,357	18,177	3,960	1,182	233	5,375	23,554	77
	Sidrap	20,563	10,100	891	3,451	35,005	10,743	0	0	10,743	45,748	77
	Pinrang	38,752	0	896	3,499	43,147	4,504	0	0	4,504	47,651	91
	Total	99,975	26,042	27,615	64,230	217,862	148,162	1,999	6,848	157,009	374,873	58
Model Area	Luwu	19,815	8,934	11,799	27,520	68,068	13,799	127	6,615	20,541	88,609	77
	Sidrap	20,563	10,100	891	3,451	35,005	10,743	0	0	10,743	45,748	77
	Pinrang	38,752	0	896	3,499	43,147	4,504	0	0	4,504	47,651	91
	Total	79,130	19,034	13,586	34,470	146,220	29,046	127	6,615	35,788	182,008	80
	% of Province	60.2%	38.8%	28.5%	28.9%	42.1%	11.6%	6.4%	47.4%	13.5%		29.7%

Source: Statistics of South Sulawesi Province (DALAM ANGKA) 1994

Table A.2.6 Yearly Variation of Paddy Harvested Area and Paddy Yield

Category	District	Item	1990	1991	1992	1993	1994	Mean
Harvested Area	Sidrap	ha	59,808	53,438	64,464	54,079	63,648	60,557
		Index	99	88	106	89	105	100
		Pinrang	61,859	77,637	77,528	58,533	70,654	69,242
Yield	Sidrap	kg/ha	6,819	6,805	6,761	6,741	6,838	6,793
		Index	100	100	100	99	101	100
		Pinrang	5,404	6,228	6,108	4,672	5,708	5,624
	Pinrang	kg/ha	96	111	109	83	101	100
		Index	96	111	109	83	101	100
		Annual Rainfall	1,039	1,059	1,543	1,598	n.a.	1,310
Annual Rainfall	Pinrang	mm	1,783	n.a.	2,100	2,076	n.a.	1,986
		Index	100	n.a.	118	115	n.a.	100

Source: Statistics of Sidemeng Rappang (DALAM ANGKA) 1994, and Statistics of Kabupaten Pinrang (DALAM ANGKA) 1994

(Paddy Yield in Rainy and Dry Season in Sidrap)

Season	Item	1990	1991	1992	1993	1994	Mean
Rainy Season	Value	6,734	6,723	6,680	6,825	6,972	6,787
	Index	99	99	98	100	103	100
Dry Season	Value	6,913	6,935	6,871	6,645	6,684	6,810
	Index	102	102	101	98	98	100
Mean	Value	6,819	6,805	6,761	6,741	6,838	6,793
	Index	100	100	100	99	101	100

Source: Statistics of Sidemeng Rappang (DALAM ANGKA) 1994

Table A.2.7 Rice Loading and Unloading at Ports in Indonesia (1988-1990)

Province or Area	1988			1989			1990			1988 - 1990 Average		
	Loading	Unloading	Balance	Loading	Unloading	Balance	Loading	Unloading	Balance	Loading	Unloading	Balance
<i>Sumatera</i>	50,196	632,520	-582,324	39,609	703,134	-663,525	74,808	516,087	-441,279	54,871	617,247	-562,376
<i>Java</i>	1,097,494	138,190	959,304	795,979	24,197	771,782	823,684	197,258	626,426	905,719	119,882	785,837
Bali	5,884	15,143	-9,259	329	6,866	-6,537	243	4,552	-4,309	2,152	8,854	-6,702
West Nusa Tenggara	67,008	59,925	7,083	50,087	2,237	47,850	64,889	1,731	63,158	60,661	3,684	56,978
East Nusa Tenggara	5,106	92,366	-87,260	2,039	52,112	-50,073	2,043	84,074	-82,031	3,063	76,184	-73,121
Timor Timur	0	23,833	-23,833	75	31,037	-30,962	0	29,182	-29,182	25	28,017	-27,992
West Kalimantan	1,457	165,533	-164,076	2,145	198,406	-196,261	1,674	181,794	-180,120	1,759	181,911	-180,152
Central Kalimantan	117	4,698	-4,581	122	25,058	-24,936	10	438,559	-438,549	83	156,105	-156,022
South Kalimantan	1,403	69,673	-68,270	3,033	37,155	-34,122	3,684	34,487	-30,803	2,707	47,105	-44,398
East Kalimantan	1,203	71,285	-70,082	389	59,349	-58,960	1,008	95,996	-94,988	867	75,543	-74,677
North Sulawesi	12,817	115,263	-102,446	15,350	40,500	-25,150	7,379	28,899	-21,520	11,849	61,554	-49,705
Central Sulawesi	3,868	19,744	-15,876	5,981	10,639	-4,658	5,104	6,350	-1,246	4,984	12,244	-7,260
<i>South Sulawesi</i>	386,511	2,362	384,149	246,675	1,653	245,022	419,188	7,721	411,467	350,791	3,912	346,879
East Sulawesi	14	22,109	-22,095	850	16,736	-15,886	601	14,261	-13,660	488	17,702	-17,214
Maluku	6,167	58,051	-51,884	2,216	15,425	-13,209	5,221	32,660	-27,439	4,535	35,379	-30,844
Irian Jaya	9,878	54,978	-45,100	644	68,150	-67,506	2,779	50,422	-47,643	4,434	57,850	-53,416
<i>Indonesia Total</i>	1,649,123	1,492,831	156,292	1,163,523	1,292,654	-127,131	1,412,315	1,724,033	-311,718	1,408,987	1,503,173	-94,186

Source: JICA, "The Study for Formulation of Irrigation Development Program, Vol. 2: Main Report", p. 8-14, Nov. 1993

Table A.2.8 Preliminary Assessment of Rice Supply and Demand Balance in 1990

Province or Area	Per Capita Consumption		Consumption (ton)			Paddy Production in 1990 (ton)			Seed, Feed & Loss(ton)	Equivalent Rice (ton)	Adjusted Rice Supply (ton)	Balance (ton)
	Urban	Rural	Urban	Rural	Total	Wetland	Dryland	Total				
<i>Sumatera</i>	147.8	174.9	1,372,858	4,746,084	6,118,942	8,605,696	808,462	9,414,158	780,999	5,611,553	5,515,909	603,033
<i>Java</i>	135.2	142.7	5,183,760	9,872,297	15,056,057	26,301,734	875,688	27,177,422	2,254,639	16,199,809	15,923,696	867,639
Bali	157.6	175.2	115,734	357,932	473,666	848,414	5,229	853,643	70,818	508,836	500,163	26,497
West Nusa Tenggara	166.0	181.0	96,835	504,301	601,136	1,100,757	29,417	1,130,174	93,759	673,670	662,187	61,051
East Nusa Tenggara	148.6	107.9	55,313	312,324	367,637	210,772	119,818	330,590	27,426	197,057	193,698	-173,939
Timor Timur	108.0	95.8	6,287	66,055	72,342	46,109	0	46,109	3,825	27,485	27,016	-45,326
West Kalimantan	141.3	160.8	90,865	416,886	507,751	495,487	164,371	659,858	54,742	393,325	386,622	-121,129
Central Kalimantan	152.9	179.0	37,510	205,916	243,426	216,588	74,285	290,873	24,131	173,382	170,427	-72,999
South Kalimantan	132.9	161.6	93,401	306,008	399,409	934,670	47,497	982,167	81,481	585,446	575,468	176,059
East Kalimantan	155.7	164.8	142,576	158,180	300,756	108,763	121,340	230,103	19,089	137,159	134,821	-165,935
North Sulawesi	160.3	146.2	90,530	279,780	370,310	318,315	20,318	338,633	28,093	201,851	198,411	-171,899
Central Sulawesi	162.0	156.2	45,556	222,138	267,694	368,808	33,094	401,902	33,342	239,564	235,481	-32,213
<i>South Sulawesi</i>	160.1	174.2	269,829	922,483	1,192,314	3,109,850	22,528	3,132,378	259,862	1,867,135	1,835,312	642,998
East Sulawesi	143.0	118.8	32,841	133,001	165,842	135,728	19,510	155,238	12,879	92,533	90,956	-74,886
Maluku	129.7	83.8	45,706	125,570	171,276	8,185	8,921	17,106	1,419	10,197	10,023	-161,253
Irian Jaya	136.4	79.7	53,887	98,335	152,222	15,391	3,006	18,397	1,526	10,966	10,779	-141,443
<i>Indonesia Total</i>	139.6	151.3	7,733,488	18,727,292	26,460,780	42,825,267	2,353,484	45,178,751	3,748,030	26,929,969	26,470,969	10,189

Source: JICA, "The Study for Formulation of Irrigation Development Program, Vol. 2: Main Report", p. 8-15, Nov. 1993

**Table A.2.9 Number of Livestock in South Sulawesi Province,  
Main Rice Producing Districts and Model Area (1993)**

(Unit : heads)

Category	District	Cattle	Buffalo	Horse	Pig	Goat	Sheep
Province	Total	643,250	230,450	128,072	234,300	270,510	2,536
Main Rice Producing Districts (BOSOWA SIPILU)	Wajo	16,694	19,800	8,732	272	3,896	98
	Bone	134,242	22,164	15,896	n.a.	5,172	43
	Soppeng	16,694	242	7,151	n.a.	3,629	n.a.
	Sidrap	10,645	1,431	1,799	n.a.	1,926	354
	Luwu	16,434	26,782	2,111	48,314	8,399	n.a.
	Pinrang	18,303	1,974	2,231	1,059	4,508	212
	Sub-total	213,012	72,393	37,920	49,645	27,530	707
Model Area	Sidrap	10,645	1,431	1,799	n.a.	1,926	354
	Luwu	16,434	26,782	2,111	48,314	8,399	n.a.
	Pinrang	18,303	1,974	2,231	1,059	4,508	212
	Sub-total	45,382	30,187	6,141	49,373	14,833	566
Province	Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Main Rice Producing Districts (BOSOWA SIPILU)	Wajo	2.60%	8.59%	6.82%	0.12%	1.44%	3.86%
	Bone	20.37%	9.62%	12.41%	n.a.	1.91%	1.70%
	Soppeng	2.60%	0.11%	5.58%	n.a.	1.34%	n.a.
	Sidrap	1.65%	0.62%	1.40%	n.a.	0.71%	13.96%
	Luwu	2.55%	11.62%	1.65%	20.62%	3.10%	n.a.
	Pinrang	2.85%	0.86%	1.74%	0.45%	1.67%	8.36%
	Sub-total	33.11%	31.41%	29.61%	21.19%	10.18%	27.88%
Model Area	Sidrap	1.65%	0.62%	1.40%	n.a.	0.71%	13.96%
	Luwu	2.55%	11.62%	1.65%	20.62%	3.10%	n.a.
	Pinrang	2.85%	0.86%	1.74%	0.45%	1.67%	8.36%
	Sub-total	7.06%	13.10%	4.79%	21.07%	5.48%	22.32%

Source: Agricultural Statistics 1994, South Sulawesi Province

**Table A.2.10 Rice Production Cost**

Item	Sidrap District		Pinrang District		Mean Proportion (%)
	Amount (Rp)	Proportion (%)	Amount (Rp)	Proportion (%)	
Seed	17,761	3.21	23,041	5.7	4.46
Pesticide	18,381	3.33	16,204	4.01	3.67
Fertilizer	87,536	15.84	34,474	8.53	12.19
Land Preparation	41,683	7.54	50,089	12.39	9.97
Laborer's wage (transplanting)	246,221	44.55	220,363	54.5	49.53
(Harvesting)	54,668	9.89	41,029	10.15	10.02
(Others)	186,960	33.83	176,252	43.59	38.71
	4,594	0.83	3,081	0.76	0.8
Transport	51,827	9.38	25,199	6.23	7.81
Water Charge	24,309	4.4	8,978	2.22	3.31
Maintenance	14,146	2.56	2,903	0.71	1.64
Tax	23,004	4.16	11,607	2.87	3.52
Others	27,795	5.03	11,509	2.85	3.94
Total	552,665	100	404,367	100	100

Source: Production Cost of Rice and Palawija 1994, South Sulawesi Province



Table A.2.11 Agricultural Machinery in the Province

	Kabupaten / Kotamadya	Total Paddy Harvested in 1994 (ha)	Agro-machinery in 1993 (unit: sets)																	Water Pump		
			2 Wheel Tractor	4 Wheel Tractor (Mini)	4 Wheel Tractor (Small)	4 Wheel Tractor (Medium)	4 Wheel Tractor (Big)	Total of Tractors	Hand Sprayer	Motor Sprayer	Power Sprayer	Swing Fog	Rat Fumigator	Paddy Thresher	Paddy Dryer	Gabah Cleaner	Rice Polisher	Large Rice Mill	Small Rice Mill		Rice Milling Unit (RMU)	Huller
1	Selayar	1,455	0	0	0	0	0	66	0	0	0	0	0	0	0	0	0	0	17	0	0	0
2	Bulukumba	32,258	28	0	0	0	2	30	2,649	65	8	0	73	130	6	2	3	8	308	177	0	3
3	Bantaeng	12,051	3	3	0	0	0	6	1,362	7	0	0	0	68	0	4	0	0	37	121	0	1
4	Jeneponto	14,055	38	2	0	0	0	46	4,464	6	4	0	132	35	0	0	4	0	2	182	51	10
5	Takalar	17,535	206	5	7	0	0	218	817	138	4	1	55	64	8	4	0	2	4	352	40	152
6	Gowa	39,035	117	27	4	0	13	161	3,340	18	0	0	40	188	0	8	12	0	49	424	98	12
7	Sinjai	17,989	10	1	1	0	1	13	2,008	3	0	0	9	565	3	3	2	0	0	368	0	0
8	Maros	33,662	396	35	5	0	5	441	8,446	10	2	4	14	84	1	35	1	3	7	490	0	9
9	Pangkajene	24,038	344	16	2	1	0	363	2,779	2	0	0	7	63	2	5	11	3	2	217	28	11
10	Barru	13,186	110	16	0	0	0	126	1,672	5	2	0	0	21	1	26	0	2	3	186	5	23
11	Bone	112,654	395	96	0	0	0	491	7,254	62	9	0	132	3,040	1,149	0	0	16	7	777	5	27
12	Soppeng	36,330	103	3	38	0	2	146	6,091	19	0	1	20	66	0	53	0	35	73	302	0	289
13	Wajo	91,163	1,937	8	0	0	4	1,949	17,631	46	1	1	73	106	18	21	83	10	171	652	115	36
14	Sidrap	63,585	1,113	12	1	0	8	1,254	7,410	35	2	0	55	621	16	0	266	12	125	178	266	32
15	Pangkajene	70,585	1,099	18	0	0	1	1,135	8,276	38	0	0	103	525	0	1	53	0	175	372	0	48
16	Enrekang	10,967	6	4	0	0	0	10	6,845	0	0	0	10	5	0	0	0	0	0	110	43	7
17	Luwu	104,859	1,040	4	36	0	5	1,038	20,644	38	0	0	342	6,013	12	9	188	8	191	302	292	84
18	Taore	22,678	188	0	0	0	0	188	3,419	0	0	0	4	0	0	0	0	0	123	0	0	0
19	Palmara	41,532	240	20	1	0	1	262	4,065	172	0	84	24	57	1	4	0	1	9	273	30	129
20	Majene	4,543	14	0	0	0	0	14	270	3	0	0	5	0	0	0	0	0	21	0	0	0
21	Mamuju	25,454	0	0	0	0	0	0	814	0	0	0	0	0	0	0	0	0	0	43	0	15
22	Ujung Pandang	3,166	23	2	0	0	0	25	177	0	0	0	0	7	0	2,042	0	1	0	48	0	21
23	Pare Pare	1,091	6	0	0	0	0	6	188	5	0	0	11	3	0	0	0	2	6	11	0	0
Total		793,851	7,416	272	95	1	51	7,835	120,647	652	32	91	1,149	11,531	1,217	2,217	623	103	1,330	5,785	883	1,054
																						1,053

Source : Agricultural Survey Agricultural Machinery by Province and District in Indonesia 1993(PBS)

**Table A.3.1 Comparison of Farm Households in Sidrap District in 1983 and 1993**

	No. of Household		Increase/Decrease	
	1983	1993	Balance	percentage
Sidrap District Total	43,040	48,440	5,400	12.55%
Farm Household	28,609	30,606	1,997	6.98%
Total	73,632	81,039	7,407	10.06%
Weight	66.47%	63.18%	-0.03%	

Source : Kabupaten Dati II Sidrap Menurut Sensus Pertanian 1993, Sidrap District Office, Agriculture - Food Crop Service, Jan. 1995

**Table A.3.2 Food Crop Cultivation Households in Sidrap District in 1983 and 1993**

	No. of Household		Increase/Decrease	
	1983	1993	Balance	percentage
Urban Area	2,050	1,813	- 237	-11.56%
Rural Area	24,107	23,161	- 946	-3.92%
Total	26,157	24,974	-1,183	-4.52%

Source : Kabupaten Dati II Sidrap Menurut Sensus Pertanian 1993, Sidrap District Office, Agriculture - Food Crop Service, Jan. 1995

**Table A.3.3 Rice Cultivation Households in Sidrap District in 1983 and 1993**

	No. of Household		Increase/Decrease	
	1983	1993	Balance	percentage
Urban Area	1,908	1,583	- 325	-17.03%
Rural Area	21,527	20,372	-1,155	-5.37%
Total	23,435	21,955	-1,480	-6.32%

Source : Kabupaten Dati II Sidrap Menurut Sensus Pertanian 1993, Sidrap District Office, Agriculture - Food Crop Service, Jan. 1995

**Table A.3.4 Agriculture Daily Employment in Sidrap District in 1983 and 1993**

	No. of Household		Increase/Decrease	
	1983	1993	Balance	percentage
Urban Area	80	87	7	8.75%
Rural Area	692	4,851	4,159	601.01%
Total	772	4,938	4,166	539.64%

Source : Kabupaten Dati II Sidrap Menurut Sensus Pertanian 1993, Sidrap District Office, Agriculture - Food Crop Service, Jan. 1995

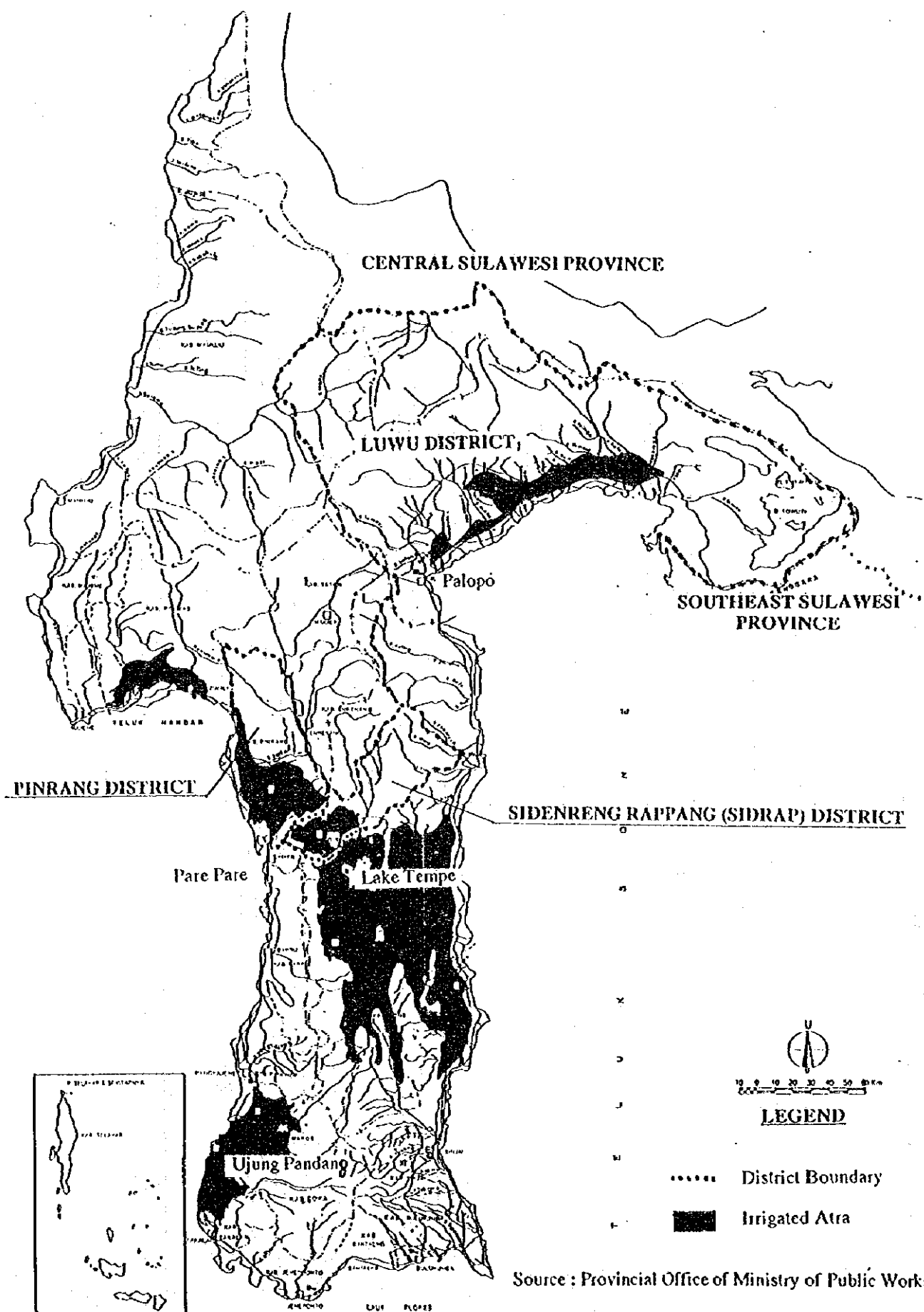


Fig. A.1.1 Distribution of Irrigated Paddy/Palawija Cultivation Area in South Sulawesi Province

Western Region				Eastern Region				Inland Region								
No.	Name of District	Designed Cropping Area (ha)	Apr. - Sep. (Second Crop)	Oct. - Mar. (First Crop)	Total Cropped Area (ha)	Realization	Cropping Calendar	No.	Name of District	Designed Cropping Area (ha)	Apr. - Sep. (Second Crop)	Oct. - Mar. (First Crop)	Total Cropped Area (ha)	Realization	Cropping Calendar	
			Paddy (ha)	Palawja (ha)	Paddy (ha)	Palawja (ha)					Paddy (ha)	Palawja (ha)	Paddy (ha)	Palawja (ha)		
1	Pattani	76,763	30,020	1,000	3,733	35,753	90%		1	Soppeng	24,993	6,422	4,017	8,34	20,986	84%
2	Polmas	17,324	6,184	-	8,850	15,034	87%		2	Sarag	53,343	24,806	20,133	45,939	93%	
3	Majene	90	54	-	29	83	92%		3	Enrekang	1,115	608	371	979	88%	
4	Manuju	874	437	-	356	793	91%		4	Tator	1,616	872	285	1,157	72%	
5	Barru	3,365	616	177	2,540	3,333	99%									
6	Pangkajene	14,790	2,457	-	11,130	13,587	92%									
7	Maree	18,424	5,415	114	9,525	15,054	82%									
8	Gowa	27,976	7,654	4,472	15,066	27,205	97%									
9	Takalar	10,942	3,520	1,089	4,970	9,579	88%									
10	Jenepono	19,137	5,492	148	9,716	15,405	80%									
	Total	189,687	61,349	7,000	99,490	168,884	89%									
No.	Name of District	Designed Cropping Area (ha)	Apr. - Sep. (Second Crop)	Oct. - Mar. (First Crop)	Total Cropped Area (ha)	Realization	Cropping Calendar	No.	Name of District	Designed Cropping Area (ha)	Apr. - Sep. (Second Crop)	Oct. - Mar. (First Crop)	Total Cropped Area (ha)	Realization	Cropping Calendar	
			Paddy (ha)	Palawja (ha)	Paddy (ha)	Palawja (ha)					Paddy (ha)	Palawja (ha)	Paddy (ha)	Palawja (ha)		
1	Bantaeng	8,306	4,081	419	2,954	8,041	97%		1	Soppeng	24,993	6,422	4,017	8,34	20,986	84%
2	Bulukumba	28,859	13,470	-	12,374	26,844	93%		2	Sarag	53,343	24,806	20,133	45,939	93%	
3	Sinjai	10,300	2,664	19	4,412	8,095	79%		3	Enrekang	1,115	608	371	979	88%	
4	Bone	25,578	17,685	40	5,820	25,559	100%		4	Tator	1,616	872	285	1,157	72%	
5	Wajo	2,330	452	138	40	630	27%									
6	Palawa	56,535	25,137	-	24,560	49,697	88%									
	Total	131,888	64,469	616	50,160	118,846	90%									
No.	Name of District	Designed Cropping Area (ha)	Apr. - Sep. (Second Crop)	Oct. - Mar. (First Crop)	Total Cropped Area (ha)	Realization	Cropping Calendar	No.	Name of District	Designed Cropping Area (ha)	Apr. - Sep. (Second Crop)	Oct. - Mar. (First Crop)	Total Cropped Area (ha)	Realization	Cropping Calendar	
			Paddy (ha)	Palawja (ha)	Paddy (ha)	Palawja (ha)					Paddy (ha)	Palawja (ha)	Paddy (ha)	Palawja (ha)		
1	Soppeng	24,993	6,422	4,017	9,713	20,986	84%		1	Soppeng	24,993	6,422	4,017	8,34	20,986	84%
2	Sarag	53,343	24,806	20,133	45,939	93%		2	Sarag	53,343	24,806	20,133	45,939	93%		
3	Enrekang	1,115	608	-	371	979	88%		3	Enrekang	1,115	608	371	979	88%	
4	Tator	1,616	872	-	285	1,157	72%		4	Tator	1,616	872	285	1,157	72%	
	Total	81,067	32,5													

A - 32

Fig. A.2.2 Recommended Crops/Livestock/Fishery of each District in South Sulawesi Province

Items	District														
	Uluwu	Sidrap	Pangkajene	Talor	Wajo	Soppeng	Bone	Sinjai	Bulukumba	Selayar	Bantaeng	Jenepono	Takalar	Gowa	U. Pandang
Paddy & Palawija (A)	○	○	○		○	○	○							○	○
Paddy & Palawija (B)				○				○	○				○		
Fruit Crop															
Orange									○	○	○	○			
Grape				○								○			
Markisa				○									○		
Mango					○		○		○		○	○			
Pinapple			○	○									○		
Papaya				○									○		
Salak			○												
Durian	○								○						○
Watermelon		○												○	
Vegetable															
Cabbage/Cucumber															
Cucumber													○		
Red Onion				○								○			
White Onion															
Potato				○											○
Tree Crops															
Coconut	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Cotton		○		○	○	○	○	○	○	○	○	○	○	○	○
Kapok				○	○	○	○	○	○	○	○	○	○	○	○
Coffee	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Cacao	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Crove Tree	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Jambu	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Pala	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Pepper	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Tobacco Verginia				○											
Tobacco Rayat				○	○	○	○								
Tobacco Burley												○			
Tebu (Sugar cane)		○	○	○	○	○	○					○		○	
Abaca/Ramil(jute)	○														○
Jarak			○			○							○		
Rosella		○	○	○	○	○									○
Vanila	○	○	○	○					○						○
Screh Wangi	○	○	○	○					○						
Kalapa Sawit	○	○	○	○											
Rubber	○	○	○	○					○						○
Tanaman obat-obatan														○	
Siwalan(fan palm)												○			
Melinjo							○			○					
Linen	○														
Tea	○			○										○	
Livestock															
Bali Cow							○								○
Potensial grass land	○	○		○	○		○							○	○
Broller	○	○	○	○	○	○	○		○	○			○	○	○
Goat										○					○
Pig	○			○											○
Fishery															
Sea Fishery (Extension)	○			○		○									○
Sea Fishery (Intensification)	○	○	○	○	○	○		○					○	○	○
Fish Pond	○	○	○	○				○	○						○
Paddy Field Fishery	○	○	○	○		○									○
Tuna										○					○
Sea Weed		○												○	○

Source : Pengwilayahan Komoditi Sebagai Strategi Dasar Pengembangan Wilayah Daerah Propinsi Sulawesi Selatan, BAFEDA Sulsel, Feb. 1988



**APPENDIX B:**  
**RESULTS OF FIELD SURVEY OF WEST JAVA**





**THE STUDY  
ON  
THE THIRD UMBRELLA COOPERATION  
FOR  
INTEGRATED AGRICULTURAL AND RURAL DEVELOPMENT  
IN  
THE REPUBLIC OF INDONESIA**

**DRAFT FINAL REPORT**

**APPENDIX B : RESULTS OF FIELD SURVEY OF WEST JAVA**

**Table of Contents**

	Page
B.1 GENERAL.....	B - 1
B.1.1 Agro-ecosystem of West Java.....	B - 1
B.1.2 The Model Area .....	B - 5
B.2 VEGETABLE PRODUCTION.....	B - 7
B.2.1 General Aspects .....	B - 7
B.2.2 Farming Practice .....	B - 9
B.2.3 Marketing .....	B - 13
B.3 LIVESTOCK .....	B - 18
B.3.1 General Aspect.....	B - 18
B.3.2 Farming Practice .....	B - 20
B.3.3 Milk Production .....	B - 21
B.3.4 Artificial Insemination for Cattle.....	B - 22
B.3.5 Disease Control .....	B - 22
B.3.6 Slaughterhouses .....	B - 23
B.4 PROPOSED BASIC DEVELOPMENT CONCEPT.....	B - 23
B.4.1 Development Needs and Constraints.....	B - 23
B.4.2 Proposed Basic Development Concept.....	B - 27

### **List of Tables**

	Page
Table B.1.1 Area of Cultivating Based on Altitude in Java(1987).....	B - 5
Table B.1.2 The Model Area .....	B - 5
Table B.1.3 General Conditions of the Model Area .....	B - 6
Table B.2.1 Vegetable Production in West Java(1992) .....	B - 8
Table B.2.2 Production Cost for Shallot(Bawang merah) .....	B - 11
Table B.2.3 Production Cost for Cabbage .....	B - 11
Table B.2.4 Fertilizer Usage.....	B - 12
Table B.2.5 Marketing Margin.....	B - 16
Table B.2.6 Items of Marketing Cost .....	B - 16
Table B.3.1 Livestock and Poultry Numbers in West Java Province by District (1994/1995) .....	B - 19
Table B.3.2 Realization of Artificial Insemination (in doses) .....	B - 22
Table B.3.3 Animal Health Institution in the Province .....	B - 23

### **List of Figures**

Fig. B.2.1 Production Share(1992) .....	B - 7
Fig. B.2.2 Vegetable Prices in 1993 - 1994 .....	B - 13
Fig. B.2.3 Model of Market Channel for Vegetable Produce .....	B - 14

### **List of Maps**

Map 1 Geographic Condition of West Jawa .....	B - 2
Map 2 Socio-economic Condition of West Jawa .....	B - 4

## **Appendix B : Result of Field Survey of West Java**

### **B.1 GENERAL**

#### **B.1.1 Agro-ecosystem of West Java**

##### **(1) Objectives of development**

Highland Area was selected as for the agro-ecosystem of West Java and the objectives of agricultural development in third Umbrella Program were understood as described below;

- To promote diversification in agricultural production, especially horticulture and the livestock management, through such projects as quality improvement of seedling and propagation, dissemination of production technology, improvement of post-harvest and processing technology, and promotion of farmers' organization.

##### **(2) Agro-ecosystem**

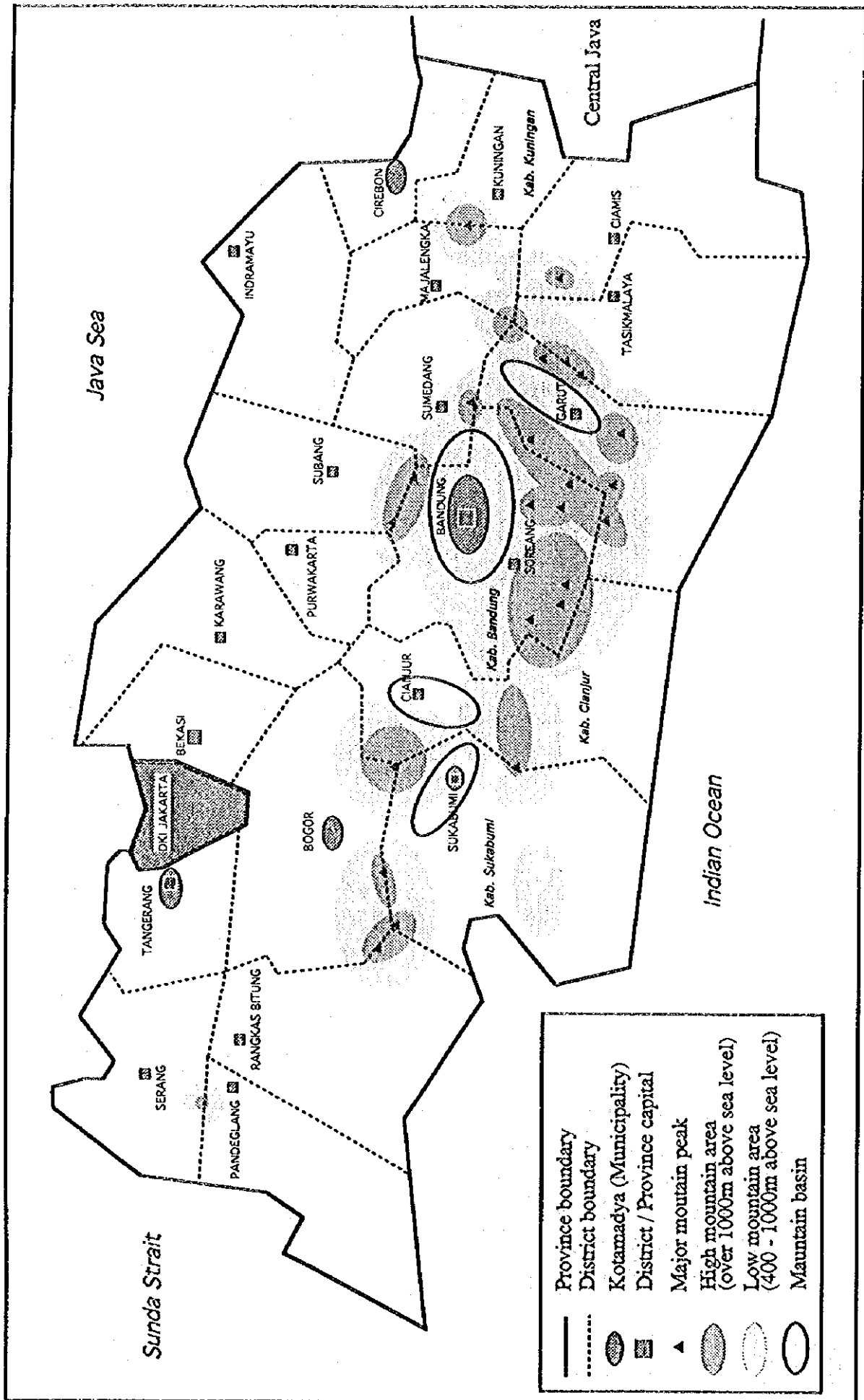
The cool climate in high mountain area and socio-economic conditions in the region specify the fundamental features of agriculture in Highland Area of West Java.

##### **1) Natural conditions**

The province of West Java covers the western part of the island of Java. It covers a land area of 46,600 km<sup>2</sup>, 2.4 % of the total land area of Indonesia. West Java can roughly be divided into three natural regions : 1) The northern plain area, 2) The central mountain area, and 3) The southern coastal area. (geographic condition is shown in Map 1 )

The central mountain area starts around 60 km east of the Western coast and extends around 240 km from west to east. Being relatively narrow in the West and the East, it widens to 60 to 80 km around Bandung and Garut in the center of the province. The volcanic mountain peaks, highest peaks of 3000 m (Mt. Ciremai near Cirebon, Mt. Pangrango south of Bogor) and several peaks of more than 2000 m elevation, surround or neighbor a chain of comparatively low level mountain basins which are extremely fertile due to their volcanic soils. In high mountain area of more than 700/800 m above sea level, average temperature is around 20°C throughout the year.

MAP 1 : Geographic Condition of West Java



Even though there is a variation in annual rainfall distribution, in high mountain area it is more than 2,000 mm. In case of mountain area around Mt. Pangrango, annual rainfall and numbers of rainfall days in Pacet (1100 m above sea level), Sukaresmi (700 m) and Cianjur (450 m) are 2,944 mm/163 days, 2,102 mm/128 days and 1,472 mm/81 days respectively.

## 2) Socio-economic conditions

Based on registration data, total population of province in 1993 was 34.9 million. Adding the Jakarta's population of 8.3 million (1990) to this figure, the total of 43.2 million people, which is nearly one quarter of the Indonesian population is concentrated in West Java and Jakarta.

During 1980 - 1990 period, West Java and Jakarta showed average annual population growth rates of 2.6% and 2.4% respectively. In these ten years, the region's population grew by nearly 10 million people, accounting for 30% of the total Indonesian population growth. Meanwhile, in 1990 already 47% of the population of West Java and Jakarta lived in urban area. The region accounted for 37% of the total urban population of Indonesia. This huge urban population specially concentrates around the three major urban areas ;

- a. Jakarta, Bogor, Tangerang and Bekasi
- b. Bandung
- c. Cirebon

These cities and their surrounding districts (Kabupaten) account for 56% of the region's total population and 84% of the region's urban population.

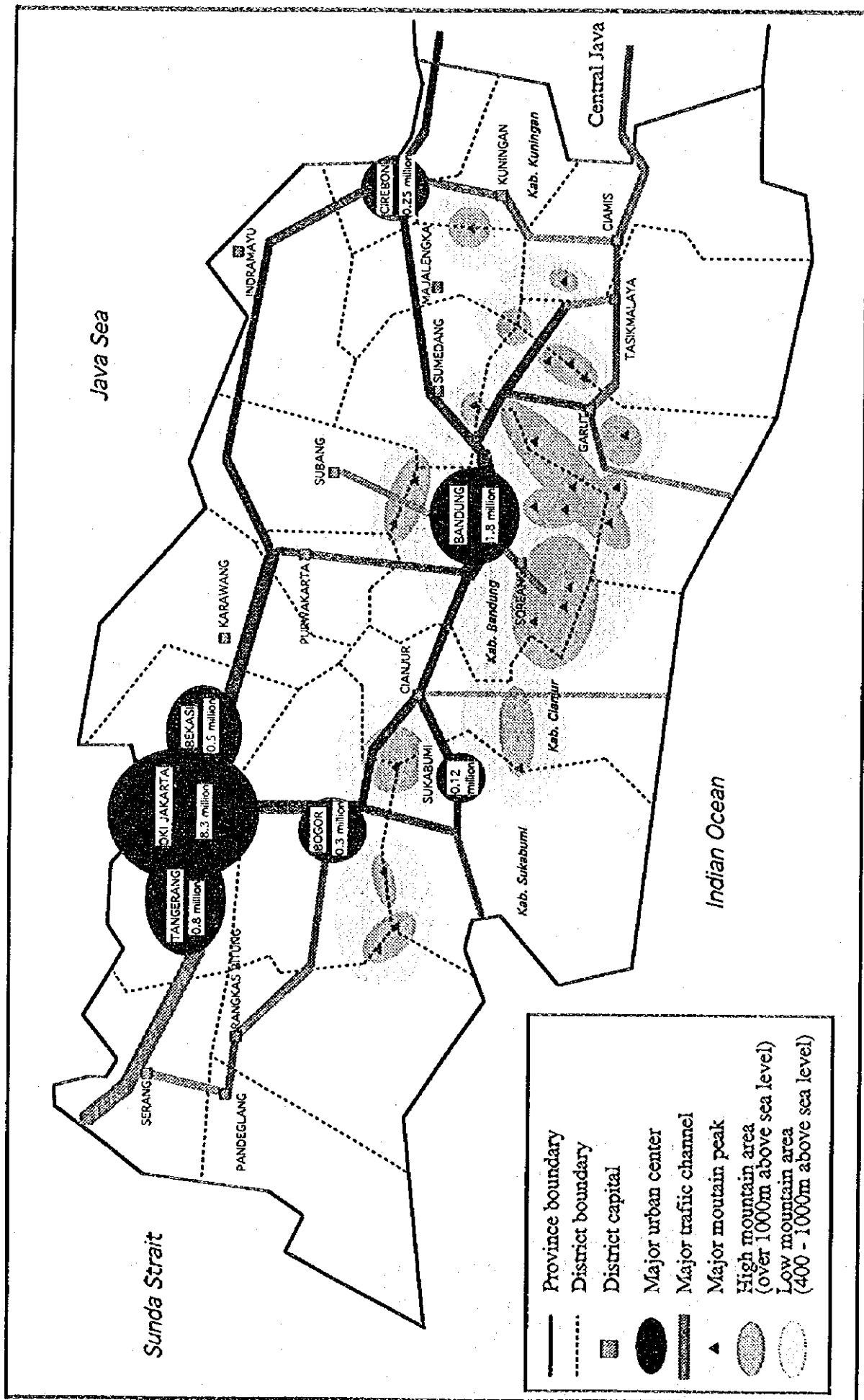
The major traffic channels which connect the mountain area and the urban centers are shown in Map 2.

## 3) Agricultural condition

In high mountain area of West Java, taking advantage of cool climate in tropical zone, horticultural crops and livestock introduced from temperate zone are produced to fulfill the food demand of the urban areas.

In the tropics, the altitude defines the kinds of vegetable being cultivated. Though there is a substantial variation, vegetables in Indonesia are usually classified into highland vegetable and lowland vegetable.

MAP 2 : Socio-economic condition of West Java



Highland vegetable includes most of temperate vegetables, for example tomato, snap bean (buncis), radish, carrot, cabbage, leek (bawang daun), garlic (bawang putih), potato and etc.. Lowland vegetable includes traditional and tropical vegetables like swamp cabbage (kangkung), amaranth (bayam), eggplant, cucumber, yardlong bean, red kidney bean, chili, shallot (bawang merah), pumpkin, etc. Percentage area of cultivation based on type of vegetable and altitude in Java are shown in Table B.1.1.

**Table B.1.1 Percentage Area of cultivation based on altitude in Java (1987)**

	% Lowland Area		% Highland Area	
	0 - 200 m	200 - 450 m	450 - 700 m	700 m over
<b>Highland Vegetable</b>				
Tomato	28	15	24	33
Carrot	0	3	5	92
Snap bean	8	17	24	51
Cabbage	2	4	14	80
Garlic	3	4	25	67
Potato	0	5	13	82
<b>Lowland Vegetable</b>				
Swamp cabbage	79	12	7	2
Amaranth	72	16	7	2
Eggplant	70	15	8	7
Cucumber	72	14	8	6
Yardlong bean	69	18	8	5
Red kidney bean	43	7	12	38
Chili	69	10	11	10
Shallot	71	6	10	13

Source : Grubben (1990), Project ATA-395 Lembang

### **B.1.2 The Model Area**

#### **(1) Model area for the Program**

Considering the objectives and agricultural features of highland area, following districts were proposed as model area.

**Table B.1.2 Model Area**

Proposed District	Name of Mountain	(height)	Production Area	Target urban area	(approx. distance)
Bandung	Mt. Patuha	2434 m	South & Eastern slope	Bandung	70 km
	Mt. Bukit tunggu	2209 m	Northern slope	Jakarta	260 km
Cianjur	Mt. Pangrango	3019 m	Eastern slope	Bogor	70 km
				Jakarta	130 km
Sukabumi			Southern slope	Bogor	75 km
				Jakarta	135 km
Kuningan	Mt. Ciremay	3078 m	Eastern slope	Cirebon	50 km

(2) General conditions of the model area

General conditions in the model area are summarized as shown in Table B.1.3.

Table B.1.3 General conditions of the model area

	West Java	Kuningan	Bandung	Cianjur	Sukabumi
<b>GENERAL</b>					
District Area (km <sup>2</sup> )	43,177	1,117	3,041	3,461	3,932
Provincial weight (%)	(100%)	(3%)	(7%)	(8%)	(9%)
Nos. of sub-district	526	19	41	24	31
Nos. of village	6,711	357	429	307	353
Population	34,941,063	905,833	3,122,479	1,666,598	1,851,993
Household	8,156,375	213,189	720,045	406,102	477,372
Working population	14,615,530	420,682	1,242,112	728,566	801,199
Agricultural working population	5,512,114	231,460	403,843	433,378	422,796
<b>AREA OF LAND (ha)</b>					
Wet Land	Technical irrigation	455,973	4,909	13,696	14,019
	Semi technical irrigation	129,238	8,002	8,928	5,990
	Non technical irrigation	319,902	7,642	27,092	25,619
	Rain Fed	262,470	9,459	11,871	9,241
	Valley	0	0	0	0
	Others	7,967	8	18	4
Dry land	House compound	438,249	8,904	24,735	17,766
	Garden / Dry field	1,023,416	92,237	63,422	101,128
	Grass land	40,448	1,179	1,546	4,293
	Swamps	2,949	0	0	34
	Dyke	28,863	0	0	0
	Pond	31,116	492	1,060	1,450
	Temporary fallow land	57,202	243	440	1,863
	Forested land	244,532	6,389	12,812	10,889
	Estates	380,426	469	47,436	52,301
<b>AGRI. PRODUCTION (1000 ton or head)</b>					
Paddy	Wetland paddy	9,502	254	508	474
	Dryland paddy	358	19	22	36
Palawija	Maize	274	13	30	15
	Soy bean	95	5	3	8
	Peanut	98	4	4	15
	Cassava	1,850	60	117	130
	Sweet potato	417	52	42	22
Vegetable		1,620	23	374	328
Fruit		1,720	23	63	207
Livestock	Beef cattle	187	8	2	4
	Dairy cattle	115	3	79	2
	Buffalo	522	11	19	33
	Goats & Sheep	5,240	230	487	255
	Pig	50	1	9	0
	Native chicken	36,702	919	3,132	1,055
	Layer chicken	13,655	146	277	225
	Broiler	22,189	360	1,410	1,205
	Duck	3,703	45	230	66

Source: West Java in Figures, 1993. BPS

Agricultural Survey Production of Paddy in Indonesia, 1994. BPS

Agricultural Survey Production of Secondary Food Crops in Indonesia, 1994. BPS

Agricultural Survey Production of Vegetable Crops in Java, 1992. BPS

Agricultural Survey Production of Fruit Crops in Java, 1993. BPS

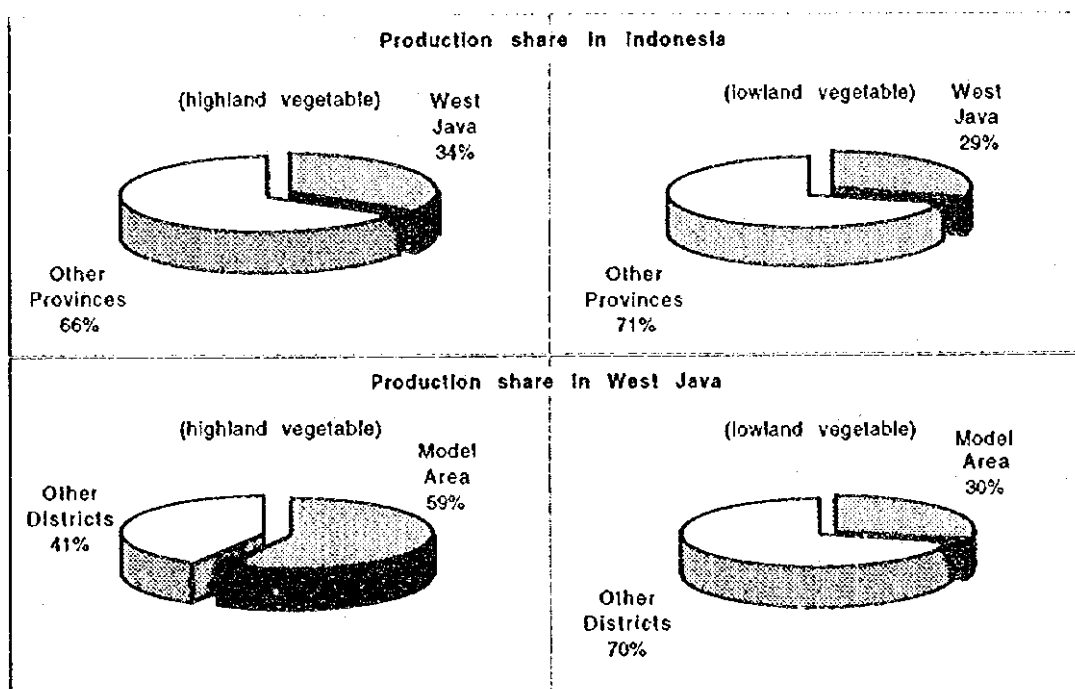
Laporan Tahunan, 1994/1995. Dinas Peternakan Propinsi DT I, Jawa Barat



## **B.2 VEGETABLE PRODUCTION**

### **B.2.1 General Aspect**

According to the statistical data, vegetable production in West Java (1992) is estimated as 162 million ton and it shares 32% of total production in Indonesia. The production share by vegetable types, highland vegetable and lowland vegetable, are shown in Fig. B.2.1. The model area shares 59% of highland vegetable production in West Java, and it is equivalent to 20% of highland vegetable production in Indonesia.



**Fig. B.2.1 Production share (1992)**

**Remarks :**

Statistic data includes 18 kinds of vegetable and they are classified as follow;

**Highland vegetable :** Tomato, Snap bean (buncis), Radish, Carrot, Cabbage, Chinese cabbage, Leek (bawang daun), Garlic (bawang putih), Potato

**Lowland vegetable :** Swamp cabbage (kangkung), Amaranth (bayam), Eggplant, Cucumber, Yardlong bean, Red kidney bean, Chili, Shallot (bawang merah), Pumpkin/ Chayote

Production data of each district are shown in Table B.2.1. Except the model area, Garut district and Majalengka district which have high mountain areas share the large portion of production, especially highland vegetables. Next to these districts, Bekasi, Tangerang and Cirebon districts which are located in lowland and including the major urban

Table B.2.1 Vegetable Production in West Java (1992)

Highland Vegetables

	Tomato	Snap bean	Garlic	Leak	Potato	Cabbage	Chinese cabbage	Carrot	Radish	Total of Highland Vegetable			
Bandung	34370	Cianjur	10637	Bandung	70010	Bandung	119476	Cianjur	80363	Cianjur	8430	Bandung	319321
Cianjur	17821	Bandung	6926	Gant	17882	Majalengka	78800	Bandung	36528	Bandung	14100	Cianjur	263533
Gant	10269	Gant	4284	Kuningan	920	Bogor	27073	Gant	12162	Karawang	5113	Gant	213389
Sukabumi	7713	Sukabumi	2201	Cianjur	11465	Cianjur	14396	Cianjur	11455	Bekas	7101	Bekas	162969
Bogor	2666	Bogor	1403	Majalengka	10923	Kuningan	2071	Sukabumi	7344	Majalengka	2610	Gant	52360
Sumedang	1990	Kuningan	314	Kuningan	3525	Bogor	3025	Bogor	6856	Kuningan	803	Pandeglang	44476
Sarang	1281	Purwakarta	492	Pandeglang	2493	Sumedang	1307	Sumedang	4246	Pandeglang	156	Sumedang	10338
Majalengka	1067	Ciamis	471	Lebak	1667	Sukabumi	1967	Sukabumi	4051	Subang	115	Bekas	8165
Subang	1022	Tasikmalaya	382	Sumedang	1063	Tasikmalaya	478	Subang	268	Karawang	30	Tasikmalaya	7175
Ciamis	596	Majalengka	252	Tasikmalaya	738	Subang	183	Purwakarta	799	Lebak	103	Sumedang	4659
Kuningan	678	Subang	262	Tasikmalaya	429	Pandeglang	767	Pandeglang	768	Sukabumi	0	Bogor	53
Pandeglang	402	Sumedang	131	Ciamis	417	Lebak	0	Lebak	688	Ciamis	0	Bogor	52
Tasikmalaya	352	Pandeglang	122	Chebon	108	Ciamis	51	Tasikmalaya	0	Ciamis	51	Tasikmalaya	4528
Purwakarta	284	Sarang	23	Indramaya	61	Chebon	0	Sarang	0	Majalengka	3	Subang	2566
Chebon	204	Lebak	11	Subang	0	Indramaya	0	Chebon	384	Sumedang	0	Ciamis	1856
Tangerang	201	Chebon	0	Purwakarta	0	Chebon	0	Purwakarta	323	Indramaya	0	Sarang	1816
Indramaya	143	Indramaya	0	Karawang	0	Purwakarta	0	Lebak	139	Purwakarta	0	Karawang	1577
Bekas	126	Karawang	0	Karawang	0	Karawang	0	Subang	95	Karawang	0	Chebon	1400
Lebak	40	Bekas	0	Bekas	0	Bekas	0	Bekas	0	Bekas	0	Purwakarta	241
Kuningan	1	Tangerang	0	Tangerang	0	Tangerang	0	Tangerang	0	Indramaya	0	Lebak	204
										Purwakarta	0	Chebon	
										Tangerang	0	Indramaya	
										Sumedang	0		
										Total	117,271	Total	1102965
										144,227	Total	16,761	Total
										356,600	Total		
										208,868	Total		
										137,292	Total		
										6,242	Total		
										28,685	Total		
										80,804	Total		

Lowland Vegetables

	Swamp cabbage	Amaranth	Shallot	Red kidney bean	Yardlong bean	Chili	Eggplant	Cucumber	Chayote	Total of Lowland Vegetable					
angerang	4922	Bekas	6329	Majalengka	29527	Cianjur	13537	19676	Cianjur	13313	4811	Gant	63788		
Bogor	4127	Tangerang	5078	Bandung	23560	9411	Gant	9411	Bogor	10616	5561	Cianjur	64017		
Bekas	3587	Bogor	2516	Chebon	21042	5633	Bekas	4372	Cianjur	10043	408	Bandung	55084		
Gant	2240	Cianjur	1143	Kuningan	11348	7632	Bandung	4703	Gant	5798	Pandeglang	171	Majalengka	45157	
Cianjur	2030	Gant	763	Gant	7264	Sukabumi	1669	Cianjur	5358	Tangerang	8290	Subang	36936		
Karawang	863	Bandung	543	Indramaya	1647	Bekas	6782	Chebon	3423	Majalengka	138	Tangerang	35089		
Sarang	351	Karawang	361	Sumedang	427	Cianjur	1540	Gant	2700	Sarang	8081	Sumedang	35070		
Purwakarta	290	Sarang	361	Sumedang	427	Cianjur	1540	Gant	2700	Sarang	8081	Sumedang	35070		
Bandung	249	Ciamis	244	Pandeglang	169	Pandeglang	169	Pandeglang	169	Pandeglang	169	Pandeglang	169	Sumedang	24804
Ciamis	238	Purwakarta	180	Sukabumi	177	Sarang	177	Sarang	177	Sarang	177	Sarang	177	Sukabumi	20776
Pandeglang	169	Pandeglang	177	Sarang	177	Sarang	177	Sarang	177	Sarang	177	Sarang	177	Subang	17110
Chebon	168	Lebak	172	Bekas	154	Subang	154	Subang	154	Subang	154	Subang	154	Indramaya	10954
Lebak	168	Lebak	172	Bekas	154	Subang	154	Subang	154	Subang	154	Subang	154	Chebon	16328
Sumedang	96	Subang	76	Tangerang	76	Tangerang	76	Tangerang	76	Tangerang	76	Tangerang	76	Kuningan	13042
Tasikmalaya	93	Indramaya	34	Tasikmalaya	34	Tasikmalaya	34	Tasikmalaya	34	Tasikmalaya	34	Tasikmalaya	34	Purwakarta	8943
Subang	64	Sukabumi	28	Lebak	28	Lebak	28	Lebak	28	Lebak	28	Lebak	28	Pandeglang	6566
Sukabumi	82	Sumedang	14	Bogor	14	Bogor	14	Bogor	14	Bogor	14	Bogor	14	Sumedang	6005
Indramaya	31	Chebon	7	Ciamis	7	Ciamis	7	Ciamis	7	Ciamis	7	Ciamis	7	Bekas	5211
Kuningan	27	Kuningan	0	Purwakarta	0	Purwakarta	0	Purwakarta	0	Purwakarta	0	Purwakarta	0	Tasikmalaya	4942
Majalengka	27	Majalengka	0	Karawang	0	Karawang	0	Karawang	0	Karawang	0	Karawang	0	Lebak	2969
Total	19,403	Total	18,246	Total	104,949	Total	82,930	Total	36,360	Total	111,569	Total	516,569		

Source : Produk Tanaman Sayuran Di Jawa (1992), BPS.

consumption centers in each area have large production amount. Bekasi and Tangerang districts which are neighboring with Jakarta share large production of perishable lowland vegetables such as swamp cabbage and amaranth.

### **B.2.2 Farming Practice**

#### **(1) Types of farming**

The natural and socio-economic conditions as well as marketing ability of farmers influence the farming system including vegetable cropping.

There are several viewpoints in describing the characteristics of type of farming, for example i) importance of vegetable cultivation as their source of income, ii) scale of farming, iii) cropping pattern. Based on these viewpoints, growers in the study area can be divided into those three types.

a) primary source of income or only source of income / year-round production

- 1) small to medium scale
- 2) medium to large scale, with special marketing arrangements with supermarkets or similar sets of buyers.

b) side-line or partial source of income / seasonal production

- 1) small scale

Though farming system of each farmer are not uniform even in a sub-district, type a) is observed to be typical in the production area in Bandung and Cianjur district. On the other hand, type b) is observed to be typical of Kuningan and Sukabumi districts. In Bandung and Cianjur district, farmers or farmers' groups of 2) type are observed as very successful cases of vegetable production. In that case some business minded farmers are always found. These farmers establish business relations with supermarkets and /or wholesalers in urban area and maintain stable relations by satisfying the customer's demand successfully. They unite other farmers for cooperative works in production and marketing and are playing the role of collectors/village traders.

Scale of farming differs by area and by person in a village. According to the Farm Survey data, average farm land (lowland + upland) per farm household is 0.39 ha in

the study area and about 40% of farmers are landless.

## (2) Cropping system

Vegetable production area has been increasing with the introduction of vegetable cropping into traditional cropping system based on the rice and /or palawija production. The way of introducing vegetable crops are different depending on the local conditions but always palawija crops were replaced at first. Though there is substantial variation, cropping patterns including vegetable production can be classified as follow;

	<u>Dry season</u>	<u>Wet season</u>
a) steep slop where narrow terraces are formed		
a-1) enough water both in rainy & dry season	multiple vegetable cropping	
a-2) enough water only in rainy season	palawija	vegetable
b) foot of mountain where wider terraces are formed		
b-1) enough water both in rainy & dry season	multiple vegetable cropping	
	vegetable	rice
b-2) enough water only in rainy season	palawija	vegetable

The following factors are considered to have an influence on the way of introducing vegetable cropping.

- i) access to urban area (market channel: infrastructure and institutional system)
- ii) initial capital
- iii) water resource
- iv) leading farmer and his marketing ability

## (3) Inputs for Production

The input and the cost of vegetable production differ depending on the kind of vegetable, method of husbandry practice and other local farming conditions. In general, 30% - 40% of total cost is shared by labor cost and the rest is for other input materials. Cost of production of most of vegetables is higher than that of rice and palawija. As for examples, production costs for shallot and cabbage are shown in Table B.2.2 and B.2.3.

**Table B.2.2 Production cost for Shallot (Bawang merah)**

		cultivation area : 1 ha	
		cultivation period : about 3 months	
<b>PRODUCTION COST (in Rp.)</b>		<b>5,672,775</b>	<b>100%</b>
1) Land lease fee		187,500	3%
2) Production materials		3,575,275	63%
seed (1200kg x 2000 Rp/kg)	2,400,000 (42%)		
fertilizer	425,275 (7%)		
Manure	400,000 (7%)		
pesticides	750,000 (13%)		
3) Labourer		1,410,000	25%
land preparation	450,000 (8%)		
planting	160,000 (3%)		
fertilizer & weeding	450,000 (8%)		
pest control	150,000 (3%)		
harvesting & postharvest treating	200,000 (4%)		
4) Other		500,000	9%
<b>SALES &amp; PROFIT</b>			
Sales (yield:12.5 ton x unit price:800 Rp/kg)		10,000,000	
Profit		4,327,225	
source : Rahmat Rukmana "Bawang merah, Budidaya & Pengolahan Pascapanen"			
Penerbit Kanisius 1994			

**Table B.2.3 Production cost for Cabbage**

		cultivation area : 1 ha	
		plant density : 30,000/ha	
		cultivation period : about 3 months	
<b>PRODUCTION COST (in Rp.)</b>		<b>2,763,000</b>	<b>100%</b>
1) Land lease fee		187,500	7%
2) Production materials		885,500	32%
seed (20 g pack x 10 x 12,000 Rp/pack)	120,000 (4%)		
nursery material	72,000 (3%)		
fertilizer	293,500 (11%)		
Manure	400,000 (14%)		
pesticides	400,000 (14%)		
3) Labourer		1,260,000	46%
land preparation	400,000 (14%)		
nursery raising	80,000 (3%)		
planting	370,000 (13%)		
fertilizer & weeding	260,000 (9%)		
pest control	60,000 (2%)		
harvesting & postharvest treating	90,000 (3%)		
4) Other		430,000	16%
<b>SALES &amp; PROFIT</b>			
Sales (yield:30 ton x unit price:150 Rp/kg)		4,500,000	
Profit		1,737,000	
source : Rahmat Rukmana "Bertanam KUBIS"			
Penerbit Kanisius 1994			

Including the labor cost for application, cost of pesticide shares 14% of total cost for shallot and 15% for cabbage. In highland area, moderate climate throughout the year suits not only for multiple cropping of vegetables but also breeding of pests. In the study area, knapsack hand sprayer is a indispensable tool for vegetable production (7746 units in Cianjur, 7178 units in Sukabumi, 36433 units in Bandung and 8462 units in Kuningan district) and various agricultural chemicals are used for crop protection. Through the field survey, over application of pesticides were observed in some area. Farmers applied pesticides too often in order to secure their yield and no attentions were paid for residue of pesticide and food safety.

Manure from either goat or chicken is commonly used as base dressing. Manure is supplied either by other farmers or the processors of manure and they say that there is no difficulty in obtaining the necessary amount.

Chemical fertilizers are applied as base dressing and supplements. It is reported that the type of apprication and amount of fertilizer vary from region to region and from season to season and the amount of fertilizer used is often high compared to the recommendation given in several production manuals. The result of evaluation of fertilizer usage made by BINUS from production costs is shown in Table B.2.4.

**Table B.2.4 Fertilizer usage**

	Manure	N	P	K
Shallot	over	OK	under	over
Chili	under	over	over	over
Yardlong bean	OK	over	over	over
Potato	over	under	over	under
Cabbage	over	over	under	under

In case of shallot, cost of seed bulb is remarkably high and it reaches 40% of total cost. High quality seed of highland vegetable such as cabbage, cauliflower, tomato, carrot, radish, turnip, celery are hybrid and are imported from USA, Japan, China, Taiwan, etc.. Those imported seed can be purchased at the shops in major cities like capital of districts. Some advanced farmers import necessary seed variety by themselves.

#### (4) Irrigation Water

In general, high mountain area have relatively large amount of rainfall throughout the year compared to the area in mountain foot. And on the slope of mountains,

mountain stream or spring water are utilized for irrigation in dry season. However, each water resource is small and sporadic and it limits the irrigated area. In addition to it, the complex topographical configuration increases the difficulty of utilizing water. These conditions are the one of the reasons to limit the vegetable cultivation in dry season in some areas.

### B.2.3 Marketing

#### (1) Price development

The wholesale market prices in several production area of the study area and in consumption area (Jakarta) for highland vegetables are shown in Fig.B.2.2.

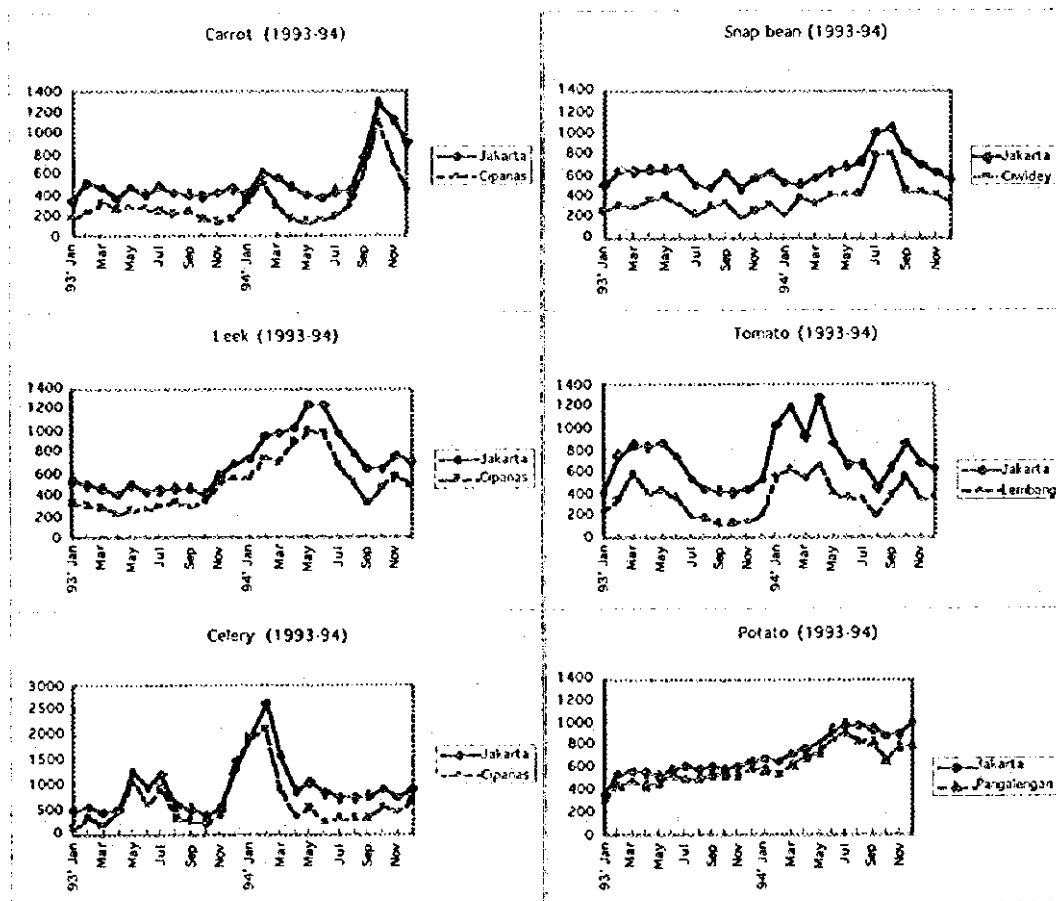


Fig. B.2.2 Vegetable prices in 1993 -1994

Source: Vademekum, pemasaran 1984 -1994. Directorate General of Food Crops and Horticulture Market price data in Cipanas. Dinas Pertanian Kab. Cianjur

In the above production area, multiple cropping of vegetables is common.

Though the pattern of price movement are different depending on the area and kind of vegetables, price fluctuation is significantly large. Wholesale prices in Jakarta follow the movement of price in production area very well.

## (2) Marketing channel

Marketing channel of vegetable is commodity specific and regional specific, but some features are similar for all the commodities and throughout regions. The model of marketing channel in West Java is shown in Fig. B.2.3.

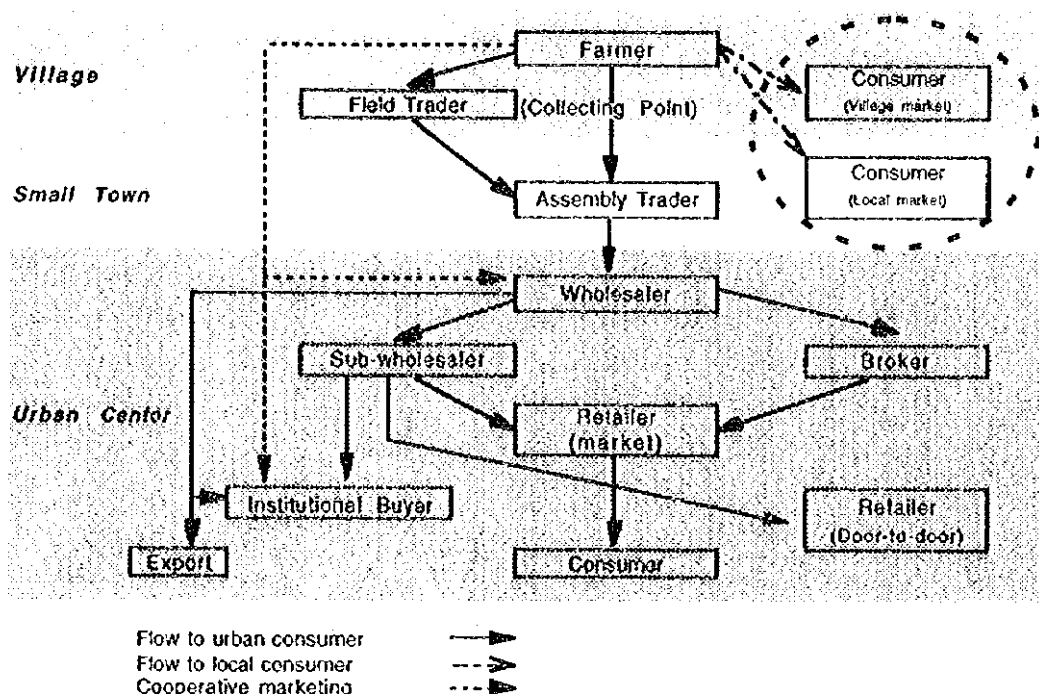


Fig. B.2.3 A Model of Market Channel for Vegetable Produce

Due to the small scale of vegetable production and scattering of production sites over large area, assembly channels in production area play very important role for collection in the channel for the urban centers. Due to the scattered production sites, most prevailing market channel for urban centers have long channel including 4 - 5 intermediaries. Usually, vegetables pass through this long channel in a very short time, one or two days at most. According to the case studies done by CGPRT center in West Java, the separation of the channels for local consumption from the channel for urban consumption and export were reported as one of the characteristics of vegetable marketing in West Java.



The intermediaries play important roles and functions in marketing of perishable products, not only in collecting and transporting but also in cleaning, grading, packaging, pricing and risk burdening. But the evaluation of their roles differs by the area. In production area of Kuningan district, farmers are affirmative about the presence of intermediaries in general. In some village, field traders (village collectors) are considered as essential for marketing of vegetable. On the other hand, in Cianjur and Bandung district where production is further commercialized, farmers and PPL (extension worker) are negative to the presence of intermediaries. And it is believed that shorter channels (less intermediaries in a channel) would improve the income of farmers. This idea is created by paying attention to the difference between retail price and farm gate price.

At present, most of farmers are just "persons who produce" and sell their produce at farmyard or at collecting point to field traders. Though the cooperative sales either by KUD or farmers' group are still very minor, several successful cases, in which vegetables are supplied directly to supermarkets and/or wholesalers, were observed in Bandung and Cianjur districts. In those cases, some business minded farmers are always found.

### (3) Marketing margins

As an example, marketing margins of broccoli trading in the channel from Lembang in Bandung district to city of Bandung is shown in Table B.2.5 and B.2.6.

Total margins shares 74% of retail price and 44% of total margin is accounted as retailer's profit. Marketing cost for intermediaries are in similar level. Losses shares more than half of the total marketing cost in this case.

Producer/retail price ratio is calculated as 26% and this ratio is low compared to the ratios reported in the CGPRT research paper. In this paper, producer/retail price ratios for some vegetables between 1987 - 1991 in West Java were reported. The ratios were 36 - 60% range (average 49%) for cabbage, 60 - 72% range (av. 68%) for potato, 49 - 98% range (av. 68%) for shallot and 50 - 79% (av. 64%) for chili.

**Table B.2.5 Marketing margin**

	1	2	3	1+2+3=4	2+3=5	
	Purchased price	Marketing cost (*1)	Profit	Sales price	Total margin	Retail price ratio
	(Rp/kg)	(Rp/kg)	(Rp/kg)	(Rp/kg)	(Rp/kg)	
Farmer	--	--	--	375.00	--	26%
Field Trader	375.00	70.30	33.00	478.30	103.30	7%
Assembly Trader	478.30	114.90	48.40	641.60	163.30	11%
Wholesaler	641.60	109.40	124.00	875.00	233.40	16%
Retailer	875.00	101.50	473.50	1450.00	575.00	40%
Consumer	1450.00	--	--	--	--	--
Total	--	396.10 (37%)	678.90 (63%)	--	1075.00 (100%)	74%

Source: Vademekum, pemasaran  
Directorate General of Food Crops and Horticulture

**Table B.2.6 Items of marketing cost (\*1)**

	Field Trader	Assembly Trader	Wholesaler	Retailer	Total	%
	(Rp/kg)	(Rp/kg)	(Rp/kg)	(Rp/kg)	(Rp/kg)	
weighing fee	1.00	1.00	0.80	0.80	3.60	1%
grading, sorting	2.30	2.70	2.30	--	7.30	2%
storage fee	0.80	1.00	5.10	10.00	16.90	4%
losses	28.10	65.60	70.50	43.80	208.00	53%
package material	17.50	19.10	17.80	12.50	66.90	17%
loading fee	1.10	1.40	--	--	2.50	1%
unloading fee	--	--	3.00	6.70	9.70	2%
transportation fee	8.70	11.80	--	18.40	38.90	10%
labour	9.80	10.00	8.90	8.30	37.00	9%
other	1.00	2.30	1.00	1.00	5.30	1%
Total	70.30 (18%)	114.90 (29%)	109.40 (28%)	101.50 (26%)	396.10 (100%)	100%

Source: Vademekum, pemasaran  
Directorate General of Food Crops and Horticulture

#### (4) Post-harvest practices

Post-harvest practices necessary for fresh produce to be sold in market, such as cleaning, grading, weighing, packaging, labeling, storing and transporting, are in practice in accordance with the customers' demand, availability of material, scale of trade, etc.. At present in most cases, those practices are done by the intermediaries. Therefore, few postharvest facilities for farmers' use are existing.

Commodities supplied to the supermarkets directly from farmers' group are packed

in small units for display according to the instructions of supermarkets. Beans and carrots are packed in vinyl bags (200g and 500g). Tomato are packed with urethane trays. Leafy vegetables such as leek and amaranth are bundled with tape to a unit for sale. Voluminous vegetables such as radish and cabbage are packed in large vinyl bag (about 20 kg). These works are all done manually.

Though packaging of supermarket commodities are done beautifully, most of the vegetable which pass through wholesale market are not packaged or just packed into cloth bags. This simple packaging is done just for handling convenience and less attentions are paid for protecting these perishable vegetables from physical damage. It is reported that nearly 20% of total supply to the Kramatjati Central Market in Jakarta are abandoned. The reasons for the loss are supposed as ; i) insufficient cleaning and grading before arriving at market, ii) mechanical damages during transportation, iii) excessive cleaning and grading at market, iv) high temperature in tropic region and improper condition of storing.

According to a study done in Lembang Horticultural Research Institute, the losses are estimated as follows;

a) Percentage of waste (quantitative loss)

10% for potato, shallot, garlic, pepper and bean;

25% for the others.

b) Percentage of damage (qualitative loss) due to post-harvest handling:

2 - 10% for potato, tomato, pepper, shallot;

1 - 7% for orange;

25 - 40% for cabbage and Chinese cabbage.

(5) Market information

Market price information can be obtained through the Price Information Service which broadcasts vegetable prices daily. But most farmers expect more detailed marketing information regarding their sales activities such as "where", "when", and "how much" to sell, because it is difficult to judge market conditions from mere data of prices. Price notice boards are installed in some collecting points along side the main road around Pacet in Cianjur district. But they did not seem to be utilized very well by farmers.

In case of farmer or farmers' group having contracts with supermarkets, telephone is

indispensable tool to keep contacts with their buyers.

#### **(6) Quality Standard**

At present, only the supermarkets impose their own standard on fresh vegetable. Their standard have been playing a role of disseminating the concept of quality standard among farmers. Due to lack of definite standard in other market channel to evaluate the quality of produce, farmers are distrustful of pricing.

### **B.3 LIVESTOCK**

#### **B.3.1 General Aspect**

In areas where there exists facilities for milk marketing, milk from cow is becoming an important source of income for small holding farms. In total, nearly one-thirds the dairy cattle in the country are found in the West Java Province. The highest cow number is recorded in Bandung district with Garut, Bogor, Kuningan, Sukabumi and Cianjur districts.

On the basis of the annual reports prepared by the provincial office of the livestock services, the West Java Province, the population of livestock in 1993 was estimated by districts and are shown in Table B.3.1. It is estimated that 113,800 heads of dairy cow are reared in the Province corresponding to 32% of the total dairy cows in the country.

**Table B.3.1 Livestock and Poultry Numbers in the West Java Province by Districts (1994/1995)**

(head/unit)

Rank	Beef Cattle		Dairy Cattle		Buffalo		Horses		Goats		Sheep	
	Districts	Number	Districts	Number	Districts	Number	Districts	Numbers	Districts	Numbers	Districts	Number
1	Sumedang	29,721	Bandung	78,837	Lebak	73,698	Bandung	4,660	Pandeglang	227,749	Bandung	383,686
2	Camis	28,319	Garut	16,623	Serang	70,554	Garut	1,220	Cianis	211,042	Garut	276,816
3	Bogor	20,485	Bogor	6,545	Pandeglang	48,239	Cianjur	1,140	Lebak	191,125	Cianis	253,498
4	Tasikmalaya	16,115	Kuningan	3,316	Fangerang	36,689	Sumedang	634	Indramayu	161,362	Bogor	211,549
5	Sukabumi	16,078	Sukabumi	2,917	Bogor	34,494	Tasikmalaya	633	Bogor	143,322	Indramayu	206,177
6	Purwakarta	13,660	Cianjur	2,031	Cianjur	33,033	Kuningan	630	Serang	118,270	Majalengka	183,563
7	Subang	12,532	Sumedang	1,943	Tasikmalaya	32,269	Serang	598	Bandung	102,759	Pandeglang	183,064
8	Bekasi	10,153	Tasikmalaya	1,259	Cianis	29,794	Cirebon	568	Cianjur	98,629	Sumedang	179,615
9	Karawang	9,142	Majalengka	520	Sukabumi	24,314	Bogor	478	Sukabumi	86,831	Kuningan	179,132
10	Tangerang	7,817	Tangerang	222	Bandung	19,260	Cianis	372	Garut	74,313	Tasikmalaya	178,703
11	Kuningan	7,744	Subang	174	Purwakarta	18,679	Sukabumi	291	Sumedang	73,201	Sukabumi	161,633
12	Indramayu	5,206	Cirebon	153	Indramayu	18,639	Purwakarta	280	Tasikmalaya	69,207	Cianjur	155,688
13	Cianjur	3,750	Bekasi	64	Garut	14,343	Tangerang	232	Subang	66,935	Cirebon	150,508
14	Garut	2,856	Serang	53	Subang	13,705	Indramayu	107	Tangerang	55,455	Lebak	148,114
15	Bandung	1,663	Karawang	20	Cirebon	12,657	Pandeglang	93	Bekasi	53,873	Subang	132,502
16	Lebak	704	Purwakarta	4	Sumedang	11,928	Subang	71	Kuningan	50,621	Karawang	93,082
17	Serang	460	Pandeglang	0	Kuningan	11,534	Karawang	35	Karawang	47,700	Serang	80,874
18	Majalengka	373	Lebak	0	Bekasi	7,460	Lebak	0	Purwakarta	32,236	Purwakarta	67,710
19	Cirebon	110	Cianis	0	Majalengka	6,495	Bekasi	0	Majalengka	28,114	Bekasi	50,311
20	Pandeglang	8	Indramayu	0	Karawang	4,371	Majalengka	0	Cirebon	18,703	Tangerang	49,430
	Total	186,896	Total	114,681	Total	522,155	Total	12,042	Total	1,914,447	Total	3,325,655

Rank	Figs		Native Chicken		Layer Chicken		Broiler		Duck	
	Districts	Number	District	Number	District	Number	District	Number	District	Number
1	Tangerang	33,208	Cianis	5,325,371	Bogor	5,078,520	Cianis	4,486,700	Indramayu	997,669
2	Bandung	9,040	Bundung	3,132,191	Tangerang	4,927,339	Bogor	4,295,768	Cirebon	394,697
3	Bogor	2,432	Bogor	2,572,212	Bekasi	994,353	Tangerang	2,991,430	Karawang	248,038
4	Subang	1,317	Tangerang	2,389,032	Sukabumi	776,295	Sukabumi	1,768,404	Bandung	230,115
5	Majalengka	883	Pandeglang	2,336,405	Tasikmalaya	536,780	Serang	1,592,000	Subang	190,601
6	Sumedang	794	Sukabumi	2,008,661	Bandung	277,271	Bandung	1,409,584	Tangerang	182,573
7	Karawang	650	Karawang	1,960,102	Cianjur	224,660	Cianjur	1,205,008	Tasikmalaya	175,325
8	Kuningan	499	Tasikmalaya	1,874,688	Kuningan	145,669	Bekasi	685,211	Serang	158,375
9	Cirebon	417	Bekasi	1,748,551	Cirebon	136,376	Tasikmalaya	621,240	Bogor	214,757
10	Bekasi	409	Indramayu	1,612,021	Serang	122,600	Purwakarta	478,000	Sukabumi	138,324
11	Serang	0	Serang	1,559,110	Sumedang	97,250	Subang	363,000	Lebak	116,519
12	Pandeglang	0	Cirebon	1,556,336	Indramayu	91,836	Kuningan	359,719	Garut	109,857
13	Lebak	0	Lebak	1,487,658	Purwakarta	85,000	Garut	316,950	Cianis	104,497
14	Sukabumi	0	Garut	1,434,175	Cianis	79,200	Cirebon	314,842	Bekasi	101,411
15	Cianjur	0	Majalengka	1,124,735	Garut	40,440	Pandeglang	298,890	Majalengka	82,919
16	Garut	0	Cianjur	1,055,496	Majalengka	30,173	Majalengka	266,700	Sumedang	73,915
17	Tasikmalaya	0	Purwakarta	930,196	Karawang	6,650	Karawang	248,038	Cianjur	66,116
18	Cianis	0	Kuningan	919,290	Subang	4,700	Lebak	220,000	Kuningan	44,672
19	Indramayu	0	Subang	845,325	Pandeglang	0	Indramayu	134,820	Pandeglang	43,704
20	Purwakarta	0	Sumedang	830,125	Lebak	0	Sumedang	132,700	Purwakarta	29,330
	Total	49,649	Total	36,701,680	Total	13,655,112	Total	22,189,004	Total	3,703,414

Source: Laporan Tahunan 1994/1995. DINAS Peternakan Propinsi DTI, Jawa Barat.

### **B.3.2 Farming System**

#### **(1) Dairy Cattle**

In the West Java Province, particularly in the Highland Area, mainly zero grazing systems (cut and carry system) are practiced by small holding farmers, the government organizations and private enterprises. Rather modern dairy farming with Holstein cattle is prevailing in the Highland Area. Bandung district is now leading dairy zone employing leading techniques in West Java Province. It is becoming popular especially in mixed farming small holder area. Zero grazing dairy farming systems has gained popularity in areas with high population densities. In most districts in Highland Areas, however, this system includes pasture and fodder development, disease control program, systematic breeding through artificial insemination (A.I.) and concentrate feed supplementation have been applied to a very limited extent. In Highland Area, managed pasture has been less developed, but fodder crops such as Napier grass, King grass are cultivation.

#### **(2) Beef Cattle**

Beef industry is least developed compared with dairy production. In the Highland Area, beef industry is still in its primitive stages and mainly local breed such as Ongole and their crosses are found there. Most of the slaughter cattle are transported from other provinces.

#### **(3) Water Buffalo**

Buffalo is traditionally raised by crop farmers. The production system, however, is much determined by the condition of land-man ratio and the availability of grazing land. In West Java Province, buffalo feeding practice is a combination of cut-and-carry system and limited grazing on newly harvested crop area. Buffalo development program is directed mainly to increase its population, and productive quality in order to improve farmer's income, power supply for farming works and meat production.

#### **(4) Sheep and Goats**

Sheep and goats are also important source of meat for Indonesians. They are raised mainly in low and marginal potential areas.

#### **(5) Poultry**

There are some large scale hatchers, large scale egg layers and broilers in the Highland Area. Broiler farming is unpopular among small holding farmers. The local indigenous

birds are still predominant due to their high disease resistance. Egg and meat from the exotic breeds are marketed in most urban centers. It is interesting to note that the growth in the production of native chickens substantially outpaces the growth in human population. This tasty and chewy bird continues to be in demand and typically at premium prices to commercial broiler. This versatile bird performs many other functions including entertainment, speed control on country side roads, transmitter of poultry diseases, diversion for the family dog, insect control and waste management.

### **B.3.3 Milk Production**

#### **(1) Milk yield**

The milk yield of cow varies widely by cattle strain and management system. One milking cow produces around 10 - 30 liters per day.

#### **(2) Marketing of Milk**

Milk is collected by co-operative societies and delivered to milk processing plants in Jakarta and partly in Bandung. Indomilk Co., (Jakarta) and Ultra Jaya Co., (Bandung) are the main purchasers of milk and is allowed to market processed milk in main urban center of the country.

#### **(3) Milk Prices**

An example calculation is as follows, where farmers are paid a chilling center price of Rp. 500 - 550 per liter for raw milk (at 3.3% fat and 8.3% Solid-Not-Fat), KUD's resale price to factory is Rp. 700 - 720 per liter, resulting in a retail price of pasteurized milk of Rp. 3,450.00 per liter.(in Jakarta market)

#### **(4) Dairy Co-operative Society (KUD)**

Milk producers co-operative societies have increased and are present in every main milk production districts. Data obtained by the study team from the visits to various dairy co-operatives in Bandung district are given in Table 2. The KUD can also be effective entities in the provision of input services. They have daily contact with all their members through the operation of the milk collection service - their principal activity. Their functions include receiving milk from all members twice daily, determining the quantity and composition of each farmers milk, organizing the delivery of milk to the processor and paying the farmer on a regular basis. Milk is

collected by co-operatives and its delivery into own bowzers, Co-operatives are in an excellent position to provide a conduit for cattle feed supply, fodder crop promotion, A.I. services, veterinary and animal husbandry, farmer credit, cattle insurance etc.

#### **B.3.4 Artificial Insemination for Cattle**

Artificial Insemination (A.I.) is a major mean for improving cattle and buffaloe production. Frozen semens provided by National Lembang A.I. Center have been decreasing in recent years compared to main dairy production areas of East Java Province where another National A.I. Center exist. Table B.3.2 below shows the number of inseminations by Jawa Island in the past few years. A.I. is free of charge.

**Table B.3.2 Realization of Artificial Insemination (in doses)**

Province	1989	1990	1991	1992	1993
West Java	36,162	29,363	168,855	140,233	109,945
Central Java	63,839	111,058	236,346	352,412	334,973
East Java	133,625	185,026	418,747	481,229	709,951

Source: Buku Statistik Peternakan, 1994.

#### **B.3.5 Disease Control**

Government's present investment in infrastructure facilities and personnel to support nation-wide disease control programs is not being effectively utilized, while major opportunities exist in cost effective livestock development for the control of specifically identified livestock diseases. In the Province, there are many animal health institutions but mostly lack sufficient facilities. It is quite evident that they are not operational due to a variety of reasons, the main ones are as follows;

- (1) lack of basic diagnostic equipment and vehicles,
- (2) ineffective management standard and testing services.



**Table B.3.3      Animal Health Institutions in the Province**

Classification	Location
DIC Type B	Bandung, Cirebon
DIC Type C	Cirebon, Tasikumalaya, Karawang
Animal Health Post	Bandung, Kuningan, Cianjur, Sukabumi, Bogor Sumedang, Majalengka, Cirebon, Indramayu, Garut, Tasikumalaya, Ciamis, Bekasi, Serang, Tangerang

Notes : \*DIC=Disease Investigation Center

Block letters existing in Highland Area.

Main diseases found in this Region are Brucellosis, Haemorrhagic Septicaemia, Anthrax, Mastitis, Milk Fever, Tetanus and Diarrhea in calves.

### **B.3.6 Slaughterhouses**

Most meat livestock are slaughtered in small authorized abattoirs located near major markets. There are approximately 185 registered slaughterhouses in the Province. Unclean areas, carcasses contamination with rumen and intestinal contents are common features. Typically there is no proper waste disposal system. Waste materials are commonly dumped with sewage materials only a short distance away from the slaughterhouses where it can breed flies and emits odours, or worse still, is dumped in passing streams or nearby swamps. It is not only the environment destruction from this type of action which is of concern, but also there is the chance that disease will spread along the course of the waterway. As most meat is sold fresh, and then cooked well soon after, the lack of cleanliness and poor quality is of little consequence to the consumer. It is among the growing supermarket shoppers who buy prepackaged meat and small goods which prepared and kept under refrigeration where the effects of poor quality meat become an issue.

## **B.4 PROPOSED BASIC DEVELOPMENT CONCEPTS**

### **B.4.1 Development Needs and Constraints**

The highland areas of West Java plays an important role in supplying fresh vegetables and livestock produce to the urban area where the food demand is increasing and diversifying. The needs and constraints for the development in this model area are summarized as follow :

## **(1) Development Needs and Constraints for Vegetable Production**

### **1) Difficulty in acquiring quality seed**

Any effort to improve vegetable production cannot be accomplished if high quality seeds are not available. Most of high quality seeds are hybrid and are imported from Japan, Korea, USA, Taiwan, Germany and etc. Small farmers still have difficulties in acquiring high quality seed because of its high cost.

### **2) Irrigation water in dry season**

Generally, mountain stream or spring water are utilized for irrigation in dry season on the slope of mountains. However, each water resource is small and sporadic. In addition to it, the complex topographical configuration increases the difficulty of utilizing water. These are one of the reasons that limit the vegetable cultivation in dry season in some areas.

### **3) Insufficient use of fertilizer and pesticide**

Many farmers do not have proper understanding of usage of fertilizer and pesticide. They seem to be occupied with an idea that more fertilizer and more pesticide will result in higher yields and tend to disregard the concepts of balancing nutrients and food safety. Also, these over usages are unnecessary extra costs of production.

### **4) Extension of technology**

High productivity can be achieved through proper crop management practices. Not only the fundamental techniques such as use of chemicals and cropping system but also many kinds of crop management technologies for specific agroecological zones have been reported. However, many farmers claim that they did not know these technologies. Thus farmers need intensive and continuous guidance but, in general, the agricultural extension service workers have been trained in rice and secondary food crop technologies with few trained personnel in horticultural technology. In addition, present extension services are mainly focused on production aspects although the support for marketing management are very important for the farmers.

### **5) Marketing system**

It is the customary practice that the farmers sell their produce in their farm yards to field trader and marketing is out of the hand of the farmers. Most prevailing market

channels of vegetables for urban centers have long channel including 4-5 intermediaries due to scattered production sites. Those intermediaries play important roles and functions in marketing vegetables, for example collecting, distributing, transporting, cleaning, grading, packaging, pricing and risk burdening. Although, it is widely believed by farmers that shorter channels would improve the income of farmers. This idea is created by paying attention to the difference between retail price and farm gate price.

**6) Farmers' leader**

For the majority of farmers who have no business experience and whose individual production scale is small, it is very difficult to establish direct business relation with the merchants in the urban area. As an example of the successful vegetable production, some business minded farmers are always found. These farmers establish business relations with supermarkets and/or wholesalers in urban area and maintains stable relations by satisfying the customer's demand successfully. They unite other farmers for cooperative works in production and marketing and are playing role of collectors/village traders. Though it is very difficult to find a good and powerful leader among farmers, it is essential to develop farmers' group for realizing shorter market channel and for acquiring the bargaining power.

**7) Post-harvest**

At present in most cases, post-harvest practices necessary for fresh produce to be sold in market, such as cleaning, grading, packaging, storing and transporting, are done by the intermediaries. To shortening the market channel, it is necessary to have farmers to conduct these practices by themselves.

**8) Information services**

Market price information can be obtained through the Price Information Service which broadcasts vegetable prices daily and also through the price information board installed in some collection points. But most of farmers expect more detailed marketing information regarding their sales activities such as "where", "when" and "how much" to sell, because it is difficult to judge market conditions from price information.

**9) Quality standard**

At present, only the supermarkets impose their own standard on fresh vegetable.

Due to lack of definite standard in other market channel to evaluate the quality of produce, farmers are distrustful of pricing. The lack of proper standard reduces efficiency of pricing, specially in mass trading.

#### 10) Price fluctuation

The price fluctuations of vegetables are large and show different patterns for each commodity in each year. It is important to adopt a proper crop combination and selection of vegetable for gaining maximum benefit from limited area of cultivating land. But these uncertain fluctuation patterns increase the difficulty of determining the cropping plan.

#### 11) Credit

For small scale farmer, non-commercial credit (local and trade short term credit , average 20% interest) is the only available credit at present. To promote vegetable production and farm level agro-business, the farmers expect low interest and easy application procedure for crediting.

#### 12) Infrastructure for transport

9% of total villages in West Java Province have no access road. Even of access roads are provided, the road condition in the village is extraordinarily improper for transporting the produce in some areas. This improper condition limits the access to the markets and prevents farmers from producing vegetables.

### (2) Development Needs and Constraints for Livestock

#### 1) Feeds management

There is very low utilization of high energy feeds such as by-products of cereals, root crops and miscellaneous concentrates which are abundant in the region. The management of livestock feeding varies widely due to difference in KUD's extension services. There is a great need to develop and popularize particularly the grass chopping system using the special tools.

#### 2) Health management

Ticks and other external parasites cause substantial losses in cattle, especially in exotic breed.

### 3) Marketing

There is a need to establish a quality control system for livestock products. It will create an incentive for the farmers to raise high quality livestock products. At present, marketing and transportation system of various livestock products, except fresh milk, are not well organized.

### (3) Consideration for environment

#### 1) Soil erosion

In West Java where relatively steep topography exists, the consideration to prevent soil erosion such as avoiding development in such area is necessary. And even in the case of executing development, the countermeasures to soil erosion such as mulching with grass are essential to protect land surface erosion.

#### 2) Decrease in quality of water due to livestock industry

Some projects regarding livestock industry in West Java have been proposed. The main problem concerning the development of livestock industry is the destruction of vegetation because of over pasture. Besides, the careful considerations to prevent the water contamination caused by inadequate treatment of muck in slaughterhouse are also necessary.

### **B.4.2 Proposed Basic Development Concepts**

Based on the needs, constraints and present conditions of the model area, the following basic concepts are proposed :

- To extend and enforce the supporting systems for improvement of vegetable marketing.
- To improve production system of livestock based on the potentiality of feed production and marketability in the region.

Based on the proposed concept, following activities will be required.

**(1) Vegetable Production**

**1) Dissemination of production technology**

- a. Promotion of extension activities (321) for production & post-harvest processes.  
Strengthen the extension activities on vegetable cultivation and post-harvest technology necessary to reduce production cost and to improve quality of produce.

**2) Improvement and strengthening of marketing activity.**

- a. Strengthening of extension activities (321) for marketing to PPL.

Marketing activities such as market-oriented management guidance, opening up new field of post-harvest practice shall be added to the PPL's conventional extension activities. It shall include education of agribusiness and management knowledge about processing which adds value to products.

- b. Promotion of farmers' organization (6)

- b-1 Strengthening activities of agricultural cooperatives (61)

Introduce or strengthen the post-harvest activities by group of farmers and/or with the KUD as a nucleus for contriving efficient marketing and strengthening of bargaining power.

- b-2 Development of farmers' group (62)

Foster talents of leading farmers who shall be the leader of farmers' group and contrive adoption of joint collection and marketing.

- c. Strengthening the supply of marketing information.

Strengthen system and activities of marketing information services to small farmers.

- d. Development of standardization (721).

Introduce standard system (quality standards), necessary for the efficient flow of merchandise and fair pricing. The standards must contribute to the profit of both producers and consumers.

- e. Development of post-harvest processing and marketing facilities (712)

Improve marketing facilities necessary to promote cooperative works in collection and post-harvest treatment by farmers' group with advantageous ways.

3) Improvement of sub-district and village road (821)

Improve transportation infrastructure (roads) necessary to increase vegetable production and encourage group collection, treatment and marketing by farmers.

4) Development of small scale irrigation and drainage systems (412).

Develop small scale irrigation and drainage system necessary to increase vegetable production in dry season for upland field.

5) System development and fund preparation for agricultural credits (51).

Improve existing official financing system to facilitate easy financing of low interest loans necessary to increase vegetable production and to encourage farmers independence in marketing.

(2) Livestock

The following advantages are recognized for the future livestock development in the region.

- i. High marketability of livestock products in the whole of Indonesia as well as neighboring countries.
- ii. Suitable climate for dairy cattle and other improved livestock types of breeds to be introduced.
- iii. High yield potential in grass production, if proper management will be practiced, and
- iv. High availability of raw materials for livestock feed such as grain bran, soybean curd waste, and agricultural food by-products.

Based on the proposed concept and advantages, following activities will be required.

- 1) Improve the overall productivity of livestock by improving availability of high quality breeding stock;
- 2) Organize and improve stock raising activities of small scale farmers through demonstration of effects of model farms as well as provision of training and technical extension services.

- 3) Promote livestock feeding systems through the improvement of fodder crop production and pasture grasses, the production of supplementary feed and the encouragement of home grown protein crops; and
- 4) Establish intensive systems of stock raising, especially in high population density areas.

In view of present situation in the region and the recent policy emphasized, the strategy presented above should aim firstly to increase milk production and secondly to increase meat (beef) production. Other objectives are expected to be attained to a certain extent in the course of fulfilling these more important objectives.



**APPENDIX C:**  
**RESULTS OF FIELD SURVEY OF WEST NUSA TENGGARA**



**THE STUDY  
ON  
THE THIRD UMBRELLA COOPERATION  
FOR  
INTEGRATED AGRICULTURAL AND RURAL DEVELOPMENT  
IN  
THE REPUBLIC OF INDONESIA**

**DRAFT FINAL REPORT**

**APPENDIX C : RESULTS OF FIELD SURVEY OF WEST NUSA TENGGARA**

**Table of Contents**

	Page
C.1 GENERAL .....	C - 1
C.1.1 Agro-ecosystem .....	C - 1
C.1.2 General Aspect in NTB .....	C - 1
C.1.3 The Model Area .....	C - 3
C.2 AGRICULTURE .....	C - 6
C.2.1 General Aspect in Paddy Field and Upland .....	C - 6
C.2.2 Farming Practice .....	C - 10
C.2.3 Supporting System .....	C - 15
C.3 WATER RESOURCES AND IRRIGATION .....	C - 19
C.3.1 Previous Studies for Water Resources .....	C - 19
C.3.2 Present Condition of Irrigation Scheme .....	C - 19
C.3.3 General Aspects of On-going Projects .....	C - 20
C.4 PROPOSED BASIC DEVELOPMENT CONCEPTS.....	C - 21
C.4.1 Development Needs and Constraints .....	C - 21
C.4.2 Proposed Basic Development Concepts .....	C - 23
C.4.3 Proposed Activity in NTB .....	C - 24
Reference for NTB .....	C - 26

### **List of Tables**

	Page
Table C.2.1 Land Utilization for Food Crops .....	C - 7
Table C.2.2 Area and Production of Major Palawija and Vegetable in 1994 ..	C - 8
Table C.2.3 Net Profit of Paddy, Palawija and Vegetable in 1994 .....	C - 10
Table C.2.4 Price of Paddy, Palawija and Vegetable in NTB in 1994 .....	C - 13
Table C.2.5 Number of Animals in NTB in 1993 .....	C - 15
Table C.2.6 Number of KUD and Members and Supporting Facility in NTB	C - 17
Table C.2.7 Number of BPP and Extension Personnel in NTB in 1994 .....	C - 17
Table C.3.1 Previous Water Resources Studies and Investigations .....	C - 19
Table C.3.2 Summary of On-going Irrigation and Drainage Projects in NTB ·	C - 20

## APPENDIX C : RESULT OF FIELD SURVEY OF WEST NUSA TENGGARA

### C.1 GENERAL

#### C.1.1 Agro-ecosystem

According to M/M signed on 16 May, 1995, the objectives of agricultural development in the third Umbrella Program for each agro-ecosystem are discussed. As a result of discussion, the objectives for agro-ecosystem (Lowland [rainfed] area) in West Nusa Tenggara (NTB) were understood as described below;

- To promote appropriate production system in the region through projects such as selection of appropriate crop and development of production technology and its extension, development of small scale water resources.

Based on the above mentioned objective and the results of field survey, the conception of agro-ecosystem was summarized in the following table;

West Nusa Tenggara (Low land [rainfed] Area)	
Natural Conditions	The area is located in low flat land area with altitude 50 ~ 500 m in the tropical zone. The annual rainfall is estimated as approximately 1,700 mm in the Lombok Island and 1,300 mm in the Sumbawa Island, and about 85% of annual rainfall is distributed in the rainy season (November ~ April)
Socio-economical Conditions	There is no main economical activity other than agriculture and 65% of labour forces is engaged in the agricultural sector. Most of all main trunk roads are paved, but rural and farm roads are not yet improved.
Agricultural Conditions	Main crop is rice for rainy season and Palawija for dry season. Irrigation facilities are improved in more than 50% of agricultural land, however, it is estimated that only 40% of that are irrigated in the dry season.

#### C.1.2. General Aspect in NTB

##### (1) Climate

The temperature ranges from 26.3-36.0 centigrade. The highest temperature is in November while the lowest in July. Being located in the tropical zone, West Nusa Tenggara (NTB) has relatively high humidity within a range of 95-100 percent. Generally, annual mean rainfall is 1,000-2,000 mm with 72-96 rainy days. Rain period is 4-5 month, relatively less at East and south Lombok as well as at Sumbawa, while dry period is 7-8 month. Rainy season starts early in November except East Lombok

and Sumbawa where it delays 7 days to 10 days generally.

**(2) Soil**

66.5% of total area of the agricultural land in NTB is the Regosol, Litosol and Renzina, 23.2% is the Brown Forest, Noncalcic brown, Mediteran and remaining 10.3% is the Alluvial, Grumosol and Andosol. The Grumosol soil mostly occupies parts of central and east Lombok with more than 23,000 ha.

**(3) Topography**

The land area of the NTB consists of Lombok and Sumbawa islands. In the Northern parts of Lombok, mountain range consists of 7 relatively high mountains (highest is Mt. Rinjan 3,775m) and occupies about 20% of area where there is only available water resources for the agricultural land. Undulating to rolling hills are found in the southern part of Lombok. Flat plains are only found in the central part of Lombok with slope 0-20%. Most of the area is covered by lowland rice. The topography of the Sumbawa island is represented by hilly and mountainous land.

**(4) Population**

The total population of NTB in 1994 is 3.6 million, 2.6 million in Lombok and 1.04 million in Sumbawa island respectively. Lombok island is overpopulated (540 persons/km<sup>2</sup>), while Sumbawa island has less population (61 person/km<sup>2</sup>) and it causes lack of agricultural labors. Agricultural sector employs about 60% of population, commercial sector 15%, government officials 11%, industry 7%, construction and transportation 6% and others.

**(5) Education**

51.5% of total population in NTB have not graduated from primary school. 28.1% is graduated from primary school, 9.4% from junior high school, 9.5% from high school and 1.5% from college or university respectively.

**(6) Land holding**

An average agricultural land holding in NTB is only 0.3 ha per farm household. There are about 2.3-5.3% of landless farmers who work as agricultural labor.

**(7) Land use**

Agriculture employs the majority of local population at present, which is their major

source of income and to be supplemented by off-farm employment. The present farming system is the rice in rainy season, palawija crops and cash crops in dry season. There are also combination of annual food crops and perennial tree crops at upland rain-fed area. Rice is for substance consumption, palawija and fruit crops are for cash earning. Livestock raising is also one of the major source of income.

### **C.1.3 The Model Area**

10 villages are selected from 3 regions , 2 from Central Lombok, 4 from East Lombok and 4 from Sumbawa region as the model area for bench mark survey of agricultural and socio-economical development in future.

#### **(1) Rembitan village**

Rembitan village is located at Pujut district, in Central Lombok. The village consists of 1,300 households with 4,980 population. Farmer households are 864, among which 14 are land owners, 700 are owner cultivator, 88 are tenants and 62 are agricultural labors. There are 882 ha of rain-fed paddy field, 325 ha of upland and 17 ha of farm yard. Major crops are rice (direct sowing) and corn in rainy season, soybean and cassava in dry season. There are 361 head of cows and 797 head of buffaloes in the village.

Problems in this area are land plowing in heavy Grumosol paddy field by man power which costs more than 300,000 RP/ha and low production of paddy (4,481 kg/ha ) and soy bean (705 kg/ha) due to lack of water.

Many young peoples go abroad (Malaysia, Brunei and Arab countries ) for seeking jobs.

#### **(2) Teruai village**

Teruai village is located at Pujut district, in Central Lombok region. The village consists of 4,398 households with 17,905 population. Farmer households are 3,250, among which 2,731 are owner cultivator, 818 are tenants and 201 are agricultural farm labors. There are 1,326 ha of rain-fed paddy field, 890 ha of upland and 680 ha of farm yard in the village. Major crops are paddy and corn in rainy season, soybean and cassava in dry season. An average yield of paddy is 4,100 kg/ha, 770 kg/ha of soy and 2,085 kg/ha of corn. There are 2,450 head of cows, 1,185 head of buffaloes. Teruai

village has almost same problems as Rembitan village.

**(3) Jerowaru village**

Jerowaru village is located at Keruak district, in East Lombok region. The village consists of 3,259 households with 14,119 population. Farm households are 1,955. There are 2,020 ha of semi-irrigated paddy field, 708 ha of upland, 261 ha of farm yard and 54 ha of ponds in the village. There are 901 fisher men and 3,250 labors in the village. Major crops are paddy in rainy season and soybean, chili (704 ha) and water melon (150 ha) in dry season. An average yield is 4,560 kg/ha of paddy, 3,678 kg/ha of corn, 2,200 kg/ha of chili, 22,000 kg/ha of water melon and 979 kg/ha of soy bean. The labor cost is relatively low (2,000 RP/day) because of labor surplus in this area.

**(4) Pemongkong village**

Pemongkong village is located at Keruak district in East Lombok. The village consists of 2,300 households with 10,028 population (4,525 male and 5,503 female). Farm households are 2,166 among which 25 are land owners and 2,141 are owner cultivators. There are 2,237 fisher men and 695 of labors in the village.

There are 180 ha of rain-fed paddy field, 1,174 ha of upland, 95 ha of farm yard and 6,772 ha of seashore forest area. Major crops in this area are beans (625 ha) and corn (520 ha) in rainy season and crops are not cultivated in dry season. An average yield of paddy is 2,500 kg/ha, 800 kg/ha of beans and 3,000 kg/ha of corn. This village is located near the sea and upland area is abandoned because of luxurious growth of weeds and serious damage by locust. The area is utilized as a grass field to feed cattle.

**(5) Pringgabaya village**

Pringgabaya village is located at Pringgabaya district in East Lombok. The village consists of 3,755 households with total population of 13,195 persons. 6,947 persons are engaged in agriculture, 332 in officers, 695 in business and 393 in industry employment. There are 416 ha of semi-irrigated paddy field and 1,443 ha of upland. There are 1,448 land owners, 950 owner cultivators, 1,098 tenants and 917 farm labors.

Major crops in this area are paddy (416 ha in rainy season and 346 ha in dry season), shallot, tobacco, banana and coconut. The inter-crop cultivation with fruit trees and



palawija crops or vegetables are common in upland area.

There are 13 units of pump irrigation which cover around 100 ha. There is possibility, according to local officers, to increase more units of pump irrigation.

(6) Swella village

Swella village is located at Pringgabaya district in East Lombok. The village consists of 1,030 households (519 farm households) with total population of 4,465 persons. There are 379 ha of semi-irrigated paddy field, 150 ha of rain-fed paddy field and 257 ha of upland field. Paddy is planted 60 ha in dry season and 379 ha in rainy season. Corn is planted 225 ha in dry season and 120 ha in rain season at the upland. Many farmers are not able to introduce shallot in this area, due to lack of fund to buy seed and be obliged to plant corn.

(7) Lopok village

Lopok village is located at Lape/Lopok district in Sumbawa region. The village consists of 1,596 households (1,267 farm households) with 5,921 population. There are 1,276 ha of irrigated paddy field from Mamak dam which was constructed in 1992 and 958 ha of upland. There are 19 land owners, 1,250 owner cultivators, 19 tenants and 77 farm labors. The paddy is planted 1,299 ha in rainy season but only 149 ha in dry season due to lack of irrigation water. Palawija crops such as soybean, mung bean and corn are planted 1,184 ha in rainy season and 1,079 ha in dry season. An average yield of paddy is 4,066t/ha, 1,260 kg/ha of corn and 941 kg/ha of soy bean. The labor cost is relatively high (3500 RP/day) compared with Lombok island because of labor shortage. The harvesting share of paddy is 1/6.

(8) Lape village

Lape village is located at next village to Lopok. The village consists of 875 households, 847 farm households among which 834 are owner cultivators, 3 are tenants and 10 are farm labors, with total 3,843 population. There are 848 ha of irrigated paddy field and 329 ha of upland. Paddy is planted 848 ha in rainy season but only 75 ha in dry season. Soybean is planted 640 ha in dry season and 499 ha in rainy season.

(9) Labangka II village

Labangka II village is transmigration village located at Plampang district in Sumbawa. Administration of this village belongs to Ministry of Transmigration (entered in 4th

year after settlement). The village consists of 346 households, 337 farm households, with population of 1,431. There are 587 ha of upland. A family of transmigrante receives total 2.00 ha of land, 0.25 ha of farm yard, 0.75 ha for food crop production and finally receives 1.0 ha of land for perennial crops. In case, a child gets married, he receives 1 ha of land.

The land preparation will be done by manpower in group. The area that can be planted depends on the capacity of land plowing before rainy season starts. 371 ha of paddy (3,500 kg/ha of yield), 41 ha of peanut (1,700 kg/ha of yield), 111 ha of corn (1,500 kg/ha), 67 ha of chili and 27 ha of soybean (1,100 kg/ha of yield) are planted in rainy season. There are 3 cows, 105 goats and 2,022 of local chickens in the village. Problems of transmigration area are lack of animal power for land plowing.

**(10) Labangka IV village**

Labangka IV village (entered in fifth year after settlement) is located at next to Labangka II. The village consists of 575 households (563 farm households) with total population of 2,264. There are 646 ha of upland. 474 ha of paddy (3,00 kg/ha of yield), 28 ha of peanut (1,700 kg/ha of yield), 107 ha of hybrid corn (4,500 kg/ha of yield), 69 ha of chili (3,500 kg/ha of yield) and 30 ha of soybean (1,100 kg/ha of yield) are planted in 1994. 1,100 ha of fruit trees (mango, cashew, jack fruit and others) are planted. There are 45 head of cows, 12 head of buffaloes, 62 head of goats and 2,950 of local chickens in the village. Farmers in transmigration area can get max. 220,000 RP/season of production material loan from the project with 14% of interest. Problem of this area is how to manage production cost after finish of transmigration project from next year.

**C.2 Agriculture**

**C.2.1 General Aspect in Paddy Field and Upland**

**(1) Paddy field**

There is 315,959 ha of cultivated land for food crops in NTB (165,147 ha in Lombok, 150,812 ha in Sumbawa ) and 205,844 ha is covered by paddy in lowland and 18,048 ha in the upland which produced 1,187,513t of paddy or approximately 748,000t of rice. The utilization of land is shown in Table C.2.1

**Table C.2.1 Land Utilization For Food Crops**

(Unit : ha)

Region	Irrigated Lowland		Rain-fed	Upland	
	Single Crop paddy	Double Crop paddy	Single Crop paddy	Paddy	Palawija
West Lombok	15,185	3,748	2,229	1,898	20,660
Central Lombok	700	15,876	18,493	705	7,273
East Lombok	24,552	23,194	701	1,151	10,266
Sumbawa	22,352	10,386	9,607	6,590	29,831
Dompu	6,437	5,811	2,056	4,599	6,010
Bima	10,864	11,762	5,305	3,105	19,197
Total	80,090	70,777	38,391	18,048	93,237

Source: Agricultural statistic, KANWIL in NTB

## (2) Upland

Palawija crops and vegetables are planted both at lowland, after harvesting paddy in dry season , and at upland in rainy season. Major palawija crops are soybean, cassava, maize, peanut and mung bean which are produced 130,300 ton, 108,191 ton, 51,700 ton, 24,000 ton and 16,500 ton respectively.

Major vegetable crops are shallot, garlic, and chili which, 70,379t of shallot, 18,000 ton of chili and 12,379 ton of garlic are produced respectively. 12,083 ha of tobacco, cash earning crop, is planted mostly in Central and East Lombok region and 10,210 ton is produced in 1994.

Major perennial crops planted by small holders are Banana, Guava, Water apple, Mango and Jack fruit, which are produced 90,597 ton, 35,143 ton, 18,768 ton, 16,814t and 15,996t respectively. Beside, Coffee, Clove, Cacao, Sapodilla, Durian, Papaya, Avocado, Rambutan, Orange, Langsat lanzon, Salacia, Vanilla and Cashew are planted.

Area and production of major palawija and vegetables are shown in Table C.2.2

**Table C.2.2 Area And Production Of Major Palawija And Vegetable In 1994**

Region	Corn		Soy Bean		Mung Bean		Shallot	
	Area (ha)	Production (ton)	Area (ha)	Production (ton)	Area (ha)	Production (ton)	Area (ha)	Production (ton)
West Lombok	4,889	8,700	13,243	13,615	1,220	702	1,536	9,780
Central Lombok	1,828	3,411	33,271	34,309	264	151	-	-
East Lombok	4,868	9,663	4,307	4,056	1,750	1,000	2,213	12,194
Sumbawa	6,139	11,909	29,735	29,465	24,707	14,129	69	303
Dompu	1,915	2,436	12,919	12,624	211	113	128	18
Bima	8,123	15,528	38,492	36,215	706	388	5,676	48,084
Total	27,762	51,647	131,967	130,284	28,858	16,483	8,086	60,599

Source: Agricultural statistic, KANWIL in NTB

### (3) Cropping system

About 63% of cultivated area is used for rice cultivation and remaining area is used for mainly palawija crops (5% is used for upland rice). Irrigation system is installed at more than 80% of paddy field; however, as there is not sufficient irrigation water, palawija crops are planted at most of the paddy field during the dry season. The cropping system in irrigated paddy field is expected to be applied as "rice-rice-palawija", however, that of "rice-palawija" is applied for around 60% of irrigated paddy field due to lack of water resources for irrigation. Rice, palawija crops, vegetables and fruit trees are mainly planted in the upland area as inter-crop or mixed cropping.

### (4) Intensification program

Guidance programs for intensification are going on to the paddy, corn and soybean cultivation. About 51.7%, 15.7% and 5.1% of total rice cultivation area, is covered by the program of Insus, Super Insus and Insus packet D respectively.

About 22.4% and 0.2% of corn cultivation area, 51% and 3.4% of soy bean cultivation area are covered by Insus and Super Insus program. An average fertilizer application for Super Insus is 265 kg/ha of Urea, 54 kg/ha of TSP and 5 kg/ha of KCL respectively in 1994.

### (5) Fertilizer & chemicals

41,554 ton of Urea, 4,608 ton of TSP, 798 ton of ZA, 512 ton of KCL, 10 ton of

Urea tablet and 2,011 liter of Daiazinon are distributed to the farmers by PT. Pusri through KUD organization in 1994.

28.3% of TSP application is reduced because of price increase, on the other hand application of KCL is increased 52% compared with 1993.

#### (6) Farm machinery

Land preparation is done by cow or buffalo(50%), manpower(40%) and by machine(10%) at the irrigated paddy field.

52 units of 4-wheel tractors(government institution), 600 units of hand tractors, 612 units of centrifugal pumps (2,4,6 and 8 inch), 66 units of irrigation pumps (2,4 and 6 inch), 17,589 units of hand sprayer, 1,241 units of mist blowers, 3,310 units of pedal thresher and 227 units of power threshers are existing in NTB at farmers level with good condition.

PT. Pertani has 23 units of 4-wheel tractors(55HP), supplied by KR-2 program, and contract base plowing has been practiced at paddy direct sowing area(Gogo rencha), it covers 16,000 ha of Guromosol area in Central and East Lombok region. The cost of land preparation is 175,000 Rp. per hectare by 4-wheel tractor while by man power costs 300,000 Rp. per hectare.

#### (7) Production cost & profit

Among 3 components of production cost (labor, production materials and others), the labor cost shows highest of 47.1% of paddy, 56% of palawija crops and 34.3% of vegetable crops. Labor distribution for rice cultivation shows 27% for land preparation, 25% for harvest, 18% for weeding and 15% for transplanting respectively. Labor requirement is highest for garlic(190 man/day) cultivation and lowest for soybean (50 man/day) cultivation.

An average labor employment from total labor requirement is 81% for shallot, 77% for rice, 75% for garlic, 66% for soy bean and 37% for chili cultivation respectively. Net profit of paddy, major palawija and vegetable crops are shown in Table C.2.3.

Net profit per season of rice (10%) and corn (28.7%) in NTB is higher than national average because of lower labor cost. On the other hand, net profit per season of soy bean (12.6%) and mung bean (46%) are lower than its national level due to lower yield