SECTION II BASIC DEVELOPMENT PLAN OF EIGHT MODEL AREAS AND SELECTION OF PRIORITY MODEL AREAS

CHAPTER 3 BASIC DEVELOPMENT PLAN OF EIGHT MODEL AREAS

3.1 The Study Area

3.1.1 Location

Location of model areas of the Study is shown in the following table. (Refer to Location Map)

Location of Model Areas

Area	District	Subdistrict	Distance from Bandung (Trip hours by car)
Mekarjaya	Bandung	Arjasari	24 (1.5)
Langensari	Bandung	Lembang	12 (1.0)
Tugumukti	Bandung	Cisarua	14 (1.0)
Gekbrong	Cianjur	Warungkondan	70 (3.0)
Cisurupan	Garut	Cisurupan	80 (2.5)
Tanjungkarya	Garut	Samaran	70 (2.0)
Mekarmukti	Sumedang	Buadua	65 (2.5)
Cisantana	Kuningan	Cigugur	120 (5.0)

General plans of present conditions of the model areas are given in Figures 3.1.1 to 3.1.8.

3.1.2 Natural Conditions

(1) Topography, Water Resources and Rivers

Ground elevation, topography, and average ground slope of cultivated lands, related water resources and rivers in the model areas are summarized in the following table.

Elevation, Topography, Water Resources and Rivers

Area	Elevation (m amsl)	Ground slope	Related water resources, rivers
Mekarjaya	850 - 1200	13 % (average)	Ciremes spring, Cikuya spring, Citiis river (originates from a spring), Cienggan river
Langensari	1100 - 1200	5 – 40 %	Cikukang river, Cibogo river, Cikole spring
Tugumukti	1100 - 1200	5 % (average)	Kali Cimahi river, Cilayung river, Cipogor river
Gekbrong	1150 - 1250	10 % (average)	Cibeleng river (originates from a spring)
Cisurupan	950 - 1250	10 – 30 %	Cihaleumas spring, Cigambira spring, Ciburial spring, Cimanuk river
Tanjung-karya	1100 - 1250	5 % (average)	Ciasaat river (originates from a spring), Cidadalilebak spring, Cilembang spring, Tanjungpura spring, Cilatung spring, Ciloyong river
Mekar-mukti	150 - 250	10 % (average)	Ciliang spring, Ciakar river, Cisaat river, Cimanut river
Cisantana	750 - 1200	5 – 15 %	Cipager river (originates from a spring)

(2) Climate

General climatic characteristics of the Highland Area are as follows:

- Comparatively long wet season from October to April with monthly rain days of 20 on the average,
- Abundant precipitation between 1,800～3,000mm, and
- Average temperature in a day ranges from 15ºC to 20ºC.

Average meteorological features are given below:

Climatic Norms in Bandung (1989～1998)

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Temp. (℃)	23	23	23	23	23	23	23	23	23	24	23	23	23.1
Humidity (%)	82.3	81.7	81.6	82.2	79.9	77.2	74.2	71.8	70.6	75.3	70.8	81.2	77.4
Wind (m/s)	1.6	1.5	1.3	1.2	1.1	1.1	1.3	1.4	1.7	1.5	1.4	1.5	1.4
Sunshine (%)	44.9	50.4	57.3	58.7	64.5	69.6	77.0	78.5	77.3	63.1	49.4	49.2	61.7
Rainfall (mm)	236	240	307	256	159	84	54	75	84	132	301	265	2192

Source : BMG, Bandung

(3) Water Source

Water availability was evaluated on the water sources which are supposed to be

utilized for rural water supply and irrigation in each model area. Run off coefficient and river base flow which were derived by analyzing relationship between observed river discharge and catchment rainfall in Tugumukti model area statistically. Besides, discharge measurement and field observation were also conducted at each water source in order to estimate the monthly available water at the sources. Present water use on the water sources were also taken into account by deducting certain amount from the available water. So the "available water" means not only the dependable discharge but also the amount of water which can be diverted to the proposed area.

In general, the irrigation water sources in the highland area are small, having few rainfall and/or river gauge stations in the catchment. Accordingly, it is necessary to estimate the available water by using simple runoff analysis methods, which focus on the low flow by applying the runoff coefficient for the base flow.

The available water by the proposed water source in the model area is given along with description of the water sources in the following table:

Water Availability by Model Area (1/2)

Source (Catchment area)	Monthly Available Water (m^3/s)											
	1	2	3	4	5	6	7	8	9	10	11	12
	Description on the Water Source											
Mekarjaya Model Area												
Citiis River ($4.6km^2$)	0.10	0.10	0.09	0.12	0.10	0.07	0.04	0.03	0.04	0.04	0.06	0.12
	Main water source flowing to the east of the area. Having water users on the opposite bank by neighboring village (Desa Baros), only 50% of the dependable flow is regarded as "available water". The water is to be diverted on the upstream of the area.											
Cisurupan Model Area												
Springs of Cihareumas, Cigambira, Ciburial ($6.0km^2$)	0.18	0.17	0.16	0.21	0.17	0.12	0.07	0.05	0.07	0.07	0.10	0.20
	Cihareumas is utilized for irrigation and domestic purposes. Cigambira and Cibrial are the water sources of an irrigation project (PIK) for paddy rice handled by the World Bank . The land of Cibrial spring is owned by private farmers. Two thirds of the water from the springs flow into the area.											
Tanjungkarya Model Area												
Cisaat River ($5.5km^2$)	0.25	0.25	0.23	0.29	0.24	0.17	0.10	0.08	0.09	0.10	0.14	0.28
	Water source of Ciloyong river which flows through the area. Located on the upstream of the area with stable of about 100l/s, the river possibly accommodates most of the area.											
Cidadalileba k spring ($0.95km^2$)	0.04	0.04	0.03	0.03	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.02
	Located on the up-most reach in the area with Tanjungpura spring. Suitable for the domestic purpose even the discharge is small, because the water can be taken directly at the water spring by capt uring facilities.											
Tanjungpura spring ($0.45km^2$)	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
	Similar to Cidadalilebak. The up-most area can be irrigated by the spring.											

Water Availability by Model Area (2/2)

Source (Catchment area)	Monthly Available Water (m^3/s)											
	1	2	3	4	5	6	7	8	9	10	11	12
	Description on the Water Source											
Cilembang spring (—)	0.13	0.12	0.11	0.11	0.13	0.12	0.09	0.07	0.06	0.07	0.07	0.08
	Located in the mid of the village, it accommodates lower reach of the area. The discharge being stable, the water is also utilized for paddy rice cultivation.											
Mekarmukti Model Area												
Ciliang spring ($3.0km^2$)	0.08	0.10	0.10	0.09	0.09	0.08	0.07	0.06	0.06	0.06	0.06	0.07
	Stable discharge through the year. The water is used for domestic purpose in Mekarmukti village by using a hammer pump, while another village on the down stream also receives water for the domestic purpose. 60 % of the water is used in the proposed target area.											
Cisantana Model Area												
Cipager River ($14.6km^2$)	0.65	0.56	0.62	0.60	0.43	0.43	0.24	0.24	0.20	0.17	0.22	0.38
	Conjunctively used for irrigation and domestic purposes. Improvement of existing irrigation facilities is being carried out by the World Bank program (PIK). The river is a desirable water source both in terms of quantity and quality.											

Water quality is examined for samples taken at the water sources. The following items were evaluated to check if they conformed to the Indonesian standard authorized by the Ministry of Health and Welfare.

Checked Items on Water Quality

Turbidity, color, odor, taste, pH, Nitrate nitrogene (NO2-N), COD (Potassium permanganate consumed), Nitrate nitrogene (NO3-N), Total hardness, Residual chlorine, Chloride, Cyanogen, Hexavalent chromium, Iron, Copper, Zinc, Bacteria coliform, Bacillus coliform

Some water sources were found to be “not suitable” for drinking purpose as they are. However, taking into consideration a common practice in the area, namely boiling of the water for drinking for 20 to 30 minutes, little problem is foreseen in using the water for the domestic purpose.

The water is suitable for irrigation purpose.

(4) Soil and Land Suitability

Soils in the model areas are evaluated to be suitable or highly suitable for vegetable cultivation. However, countermeasures of terracing, or contour farming method should be taken in order to prevent soil erosion in sloped land. Serious erosion occurs partly in steeply sloped areas in Mekarjaya, Gekbrong, and Cisantana.

Andosols, Latosols, Granosols, and Regosols cover the Study areas. The soil classification is shown in the following table:

Soils in the Model Areas

Model Area	Name of Soils	Parent Materials of Soils	Physiography	Soil Erosion	Suitability for Vegetable Cultivation
Mekarjaya	Andosols, and Regosols in high elevation area	Volcanic ash and colluviall deposits	Talus	moderate to severe	suitable
Langensari	Andosols	Tuff	Terrace	moderate	highly suitable
Tugumukti	Andosols	Tuff	Terrace	moderate	highly suitable
Gekbrong	Andosols	Volcanic ash	Talus	moderate to severe	highly suitable
Cisurupan	Andsols and Brown Latosols	Tuff and colluviall deposits	Terrace and talus	moderate	highly suitable
Tanjungkarya	Brown Latosols	Tuff and colluviall deposits	Talus	moderate	suitable
Mekarmukti	Red Brown Latosols and Grumsols	Tuff and colluviall deposits	Talus	moderate	suitable
Cisantana	Andsols, and Brown Latosols in low elevation area	Volcanic ash and tuff	Talus	moderate to severe	highly suitable

(5) Geology

Geology of the model areas mostly consists of comparatively new volcanic deposits, whereas downstream reach of Mekarmukti model area is composed of alluvial river deposits. Potential of groundwater is considered “moderate” from hydro-geological viewpoint. Discharge of five liters per second is expected at a tubewell.

3.1.3 Present Condition of Socio-economy and Rural Society

(1) Administration Jurisdiction

West Java Province is administratively divided into 26 districts, 415subdistricts and 6,754 villages (ref.:West Java in Figures 1997). Such administrative composition in Bandung, Cianjur, Garut, Sumedang, and Kuningan districts which are all related to the model areas is as shown in the table below.

Number of Subdistricts and Villages in Districts and Subdistricts Related to Model Area

Districts Covering Model Area		Subdistricts Covering Model Area		Villages Having Jurisdiction Over Model Area
Name of District	No. of Districts	Name ofsubdistricts	No. of Villages	
1.Bandung	42	Arjasari	11	Mekarjaya
		Lembang	16	Langensari
		Cisaruna	8	Tugumukti
2.Cianjur	24	Warungkondang	19	Gekbrong
3.Garut	31	Cisurupan	22	Cisurupan
		Samarang	24	Tanjungkarya
4.Sumedang	18	Buhadua	18	Mekarmukti
5.Kuningan	19	Cigugur	9	Cisantana
Total	134	8subdistricts	127	8 villages

Source: Annual Report (1995-1998) of each District Agricultural Service Office

The village is a terminal administration unit. The model areas are under direct

jurisdiction of villages whose names are the same with those of the model areas. Each village is divided into several blocks called RW and it is further divided in several neighborhood groups called RT. The representatives are appointed at both levels of RW and RT, and play an important role in collection of land taxes and information distribution to the household level.

(2) Population and Households

The population and households in each model area are estimated as shown in the table below. The total population is about 9,700 persons. The model areas with comparatively larger population are Mekarjaya, Cisurupan, Mekarmukti and Cisantana. The total number of households in 8 model areas is 2,200, and an average size of household is about 4.4 persons.

Population, Households and Average Size of Household in Model Areas

Model Area	Study Area (ha)	Population					Total H'hold (No.)	Ave. Size of H'hold (persons)
		Male		Female		Total		
		(persons)	(%)	(persons)	(%)	(persons)		
1. Mekarjaya	160	716	52.5	646	47.5	1,362	320	4.25
2. Langensari	110	388	55.4	313	44.6	700	150	4.67
3. Tugumukti	80	106	58.6	74	41.4	180	40	4.50
4. Gekbrong	80	110	58.3	79	41.7	189	40	4.72
5. Cisurupan	190	889	49.2	916	50.8	1,805	370	4.88
6. Tanjungkarya	130	412	51.5	388	48.5	800	140	5.71
7. Mekarmukti	270	873	52.1	804	47.9	1,677	460	3.64
8. Cisantana	330	1,455	48.6	1,537	51.4	2,992	690	4.34
Total or Average	1,350	4,948	51.0	4,757	49.0	9,705	2,210	4.39

Source: Farm Household Interview Survey, JICA Study Team (October - November 1999)

Other demographic characteristics in the model area are summarized below[1/].

a) As for male and female ratio, male population is larger than female population in six model areas. Female population is larger than male in only two model areas of Cisurupan and Cisantana.
b) The proportion of woman headed households is comparatively high at more than 13% in Mekarjaya, Cisurupan, and Mekarmukti. On the other hand, such proportion is comparatively low at less than 3% in Langensari and Gekbrong. As the whole model area, the woman headed households' proportion is about 9% on average.
c) The proportion of absentees who are absent from the village for more than four months in a year is comparatively low at less than 1% in Mekarjaya, Langensari, Tanjungkarya and Mekarmukti. However, the proportion is comparatively high in Tugumukti (10%) and Cisurupan (9%). Most of them are absent due probably to schooling reasons, because education level is

[1/] The present socio-economic conditions including demography in each model area were clarified through execution of the farm household interview survey. Details of the survey results including explanations on the survey methodology are presented in Annex IV.

comparatively high in these two model areas.

d) The education level of adult population (over 18 years old) is low in Mekarjaya, Gekbrong, and Tanjungkarya. In these model areas, the adult population classified into "no formal education" or "not complete primary school" is about 30%, 23% and 27%, respectively. On the other hand, the education level is comparatively high in Tugumukti, Cisurupan and Cisantana. In these model areas, the adult population classified as "high school graduates" and "educated more than high school" totals about 20%. As for the education levels of males and females, the males' level is higher than the females' in model areas with the exception of Gekbrong and Cisantana. The education levels are comparatively low in Gekbrong, and comparatively high in Cisantana both for males and females.

e) Occupation status of economically active population (15-60 years old) is summarized in the table below.

Percentage Distribution of Economically Active Population by Occupation

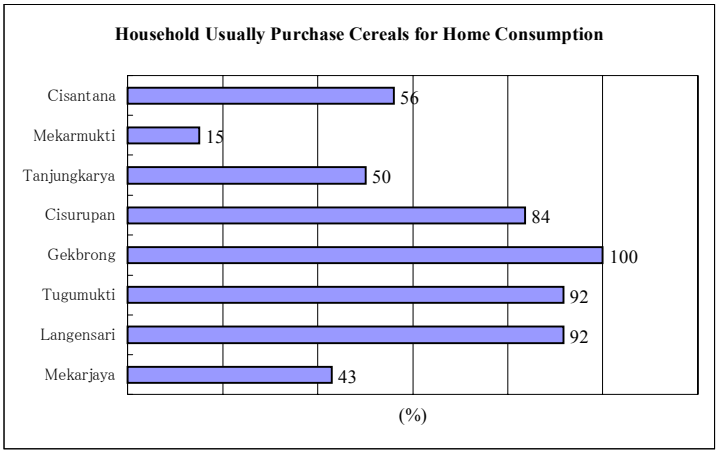
Model Area	Farmer (%)	Wage Labor On-farm (%)	Wage Labor Off-farm (%)	Salary Worker (%)	Privete Business (%)	Others (%)	Farmer + Wage L. On-farm (%)	Total (%)
1. Mekarjaya	41.5	17.6	2.1	6.3	2.1	30.3	(59.2)	100.0
2. Langensari	48.7	7.0	5.2	1.7	7.8	29.6	(55.7)	100.0
3. Tugumukti	41.1	15.9	2.8	0.9	5.6	33.6	(57.0)	100.0
4. Gekbrong	45.7	25.0	1.1	3.3	5.4	19.6	(70.7)	100.0
5. Cisurupan	38.5	13.2	2.6	6.9	4.0	34.8	(51.7)	100.0
6. Tanjungkarya	47.7	10.3	1.9	0.9	10.3	29.0	(57.9)	100.0
7. Mekarmukti	71.5	1.5	4.6	4.9	3.4	14.1	(73.0)	100.0
8. Cisantana	61.9	3.6	1.5	7.1	2.4	23.5	(65.5)	100.0
Total or Average	51.8	9.7	2.7	5.1	4.3	26.4	(61.5)	100.0

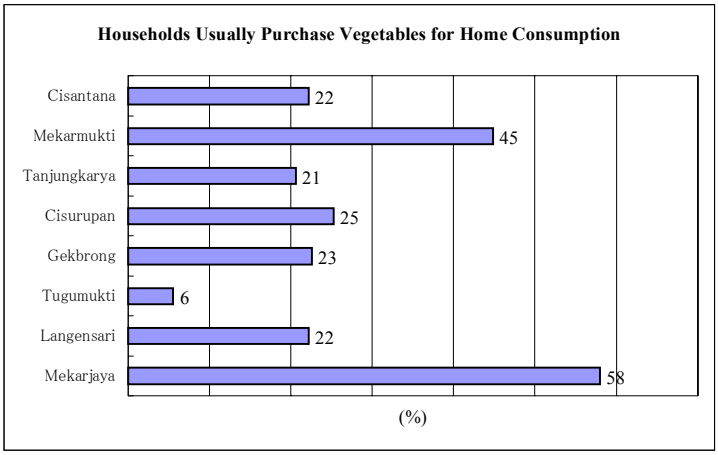
As seen in the table, about 40-70% of the population is a farmer (operator) in the model areas. The proportion of farm labors is the highest in Gekbrong (25%) and the lowest in Mekarmukti (2%). This result reveals that the most of farming works are conducted by family labors in the latter area, which belongs to paddy production area. The proportion of economically active population in private business (e.g. shop managers and middlemen) is generally low in the model areas, except for Tanjungkarya (10%) and Langensari (8%).

(3) Degree of Food Self-sufficiency

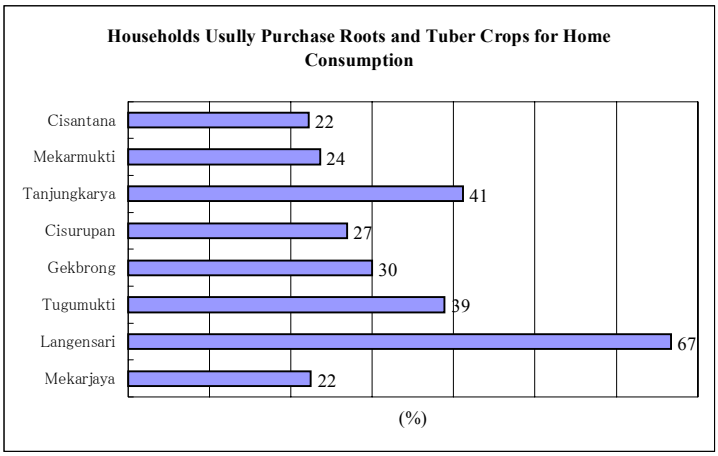
The degree of food self-sufficiency in the households was surveyed for five food items, i.e. cereals, vegetables, roots and tubers, meat, and fishes.

As for cereals, the proportion of households always purchasing for home consumption is considerably high at more than 90% in Langensari, Tugumukti, and Gekbrong. These three model areas belong to the vegetable production area. On the other hand, this proportion is comparatively low in Mekarmukti in the paddy production area (see the figure on the right).





As for vegetables, the proportion of households always purchasing for home consumption is comparatively high in Mekarjaya and Mekarmukti. However, the proportion is comparatively low in other areas (see the figure on the right).



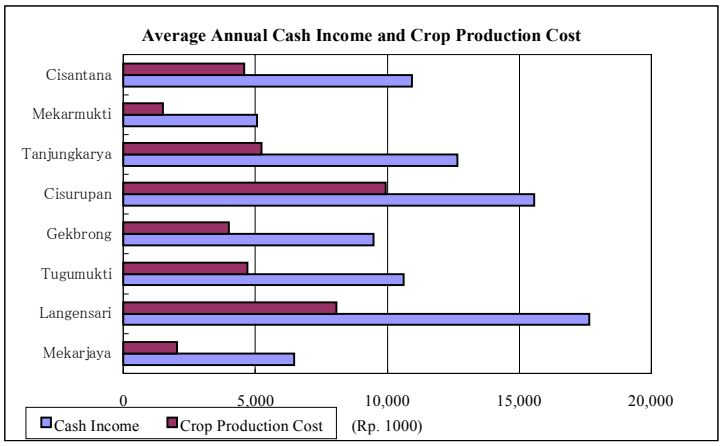
As for roots and tubers, the proportion of households always purchasing for home consumption is extremely high in Langensari. In this area, the farmers may dislike to cultivate low profitable crops such as roots and tubers in their small farmland. In other areas, this proportion is ranging from 22% to 41% (see the figure above).

As for meat, there are small differences between the model areas, and more than 90% of the households are always purchasing. As for fishes, about 80-100% of households are always purchasing, with the exception of Tanjungkarya where

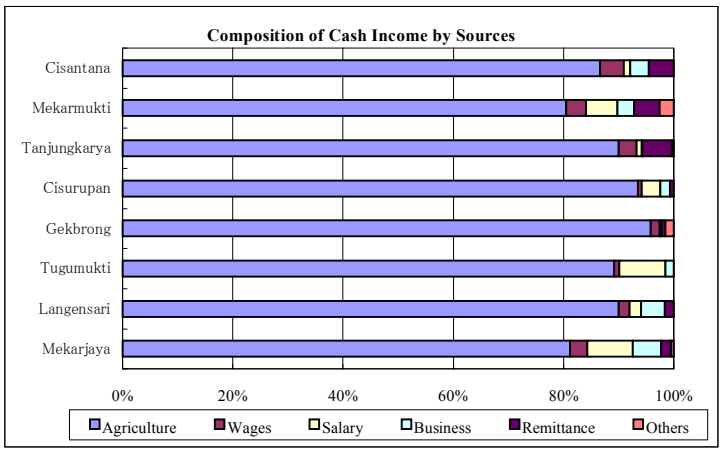
water availability for fishponds is better than other model areas.

(4) Farm Household Income and Farming Expenses

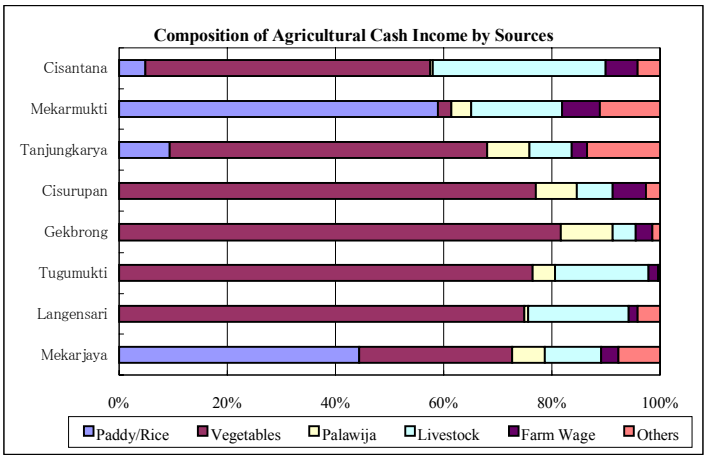
The average farm household income (farm and non-farm incomes) is shown along with farming expenses in the figure on the right. In Mekarmukti and Mekarjaya, where paddy cultivation is predominant, though the household income is low, the farm expenses are also low. While household income in the areas where the vegetable production is the main farming activities is high, but the farming expenses are also high. The capacities to pay in the vegetable-dominant areas are larger than the paddy-dominant areas.



The main cash income source of households is the agricultural production in all the model areas. Even in Mekarmukti having the smallest proportion of agriculture income, this proportion is 81% of the average annual cash income of household (see the figure on the right).



The composition of agricultural cash income by sources is as shown on the right.



Based on the above figure, the model areas can be classified into the following groups.

a) The model areas in which most households' cash income (more than 70% on

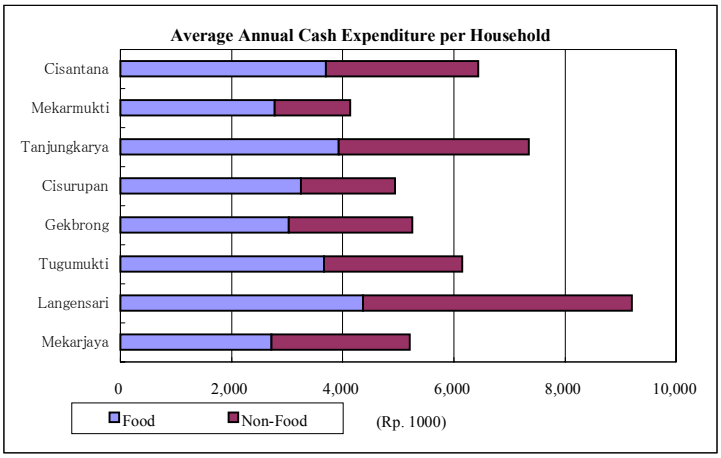
an average) is derived from vegetable production: Langensari, Tugumukti, Gekbrong, Cisurupan and Tanjungkarya.

b) The model area in which paddy production is the major cash income source: Mekarmukti

c) The model area in which both vegetables and paddy production are the major cash income sources: Mekarjaya

d) The model area in which both vegetables and livestock productions are the major cash income sources: Cisantana.

(5) Living Expenditure



The differences of average value of living expenditure (in terms of cash) are relatively small among the model areas, if compared with those in the cash income and crop production cost. Langensari stands highest at Rp.9.2 million and Mekarmukti remains lowest at Rp.4.1 million. In the latter area, however, the expenditure is much higher probably up to the level of Cisurupan, if the value of home consumption paddy is taken into account (see the figure above).

The farm household income depends on the farming system, whether the main income comes from the horticulture cropping or paddy cropping. Mekarmukti and Mekarjaya, where the income level is lowest in the model areas, rely on the paddy cropping for 40 to 60 % of the household income, and earn 20 % of the income from non-farm activities. Mekarmukti lies in low elevation area compared with other highland areas (200 m in elevation), which receives sufficient water for paddy cultivation in the rainy season, sometimes occurring with ill-drainage, but faces to the lack of water for farming in the dry season. Under these situations the economic activities are stagnant. Mekarjaya is also considered under the same situation. The sufficient water in the rainy season seems to be a determinant factor in the prevailing farming system. Cisurupan, Gekbrong, Tugumukti and Langensari, where no paddy cropping is practiced, maintain high levels of income.

3.1.4 Present Condition of Agriculture

(1) Land Use

Land utilization of the model areas was made clear by field investigation and aerial photographs. Land utilization types are classified into five categories: i) cultivated land, ii) tree-crop land including estate-crop land, iii) grazing/pasture land, iv) forest/wood land, and v) others (residential, facility, water surface, etc.). The cultivated land is divided into two sub types: wet land paddy field, and dry land crop field in which Palawija and/or horticulture crops are planted. Present land use of the model areas is shown in Table 3.1.1.

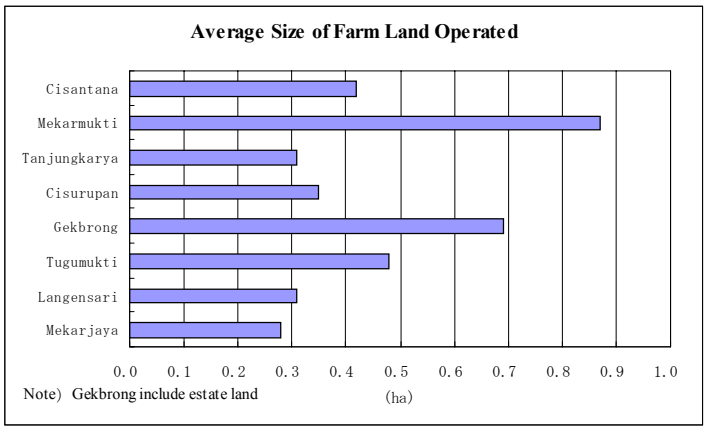
The cultivated lands of Mekarjaya, Langensari, Tugumukti, Gekbrong, and Cisantana are fully occupied by dry crop field. Cisurupan and Tanjungkarya include paddy field, 71% and 38%, respectively, which are irrigated by traditional irrigation system. The cultivated land of Mekarmukti is mostly occupied by rainfed paddy field.

(2) Land Holding and Land Tenure

The land holding and land tenurial status in the model area were clarified in the course of the farm household interview survey. The results of the survey are summarized hereinafter. Average and typical land holding sies are shown in the figures.

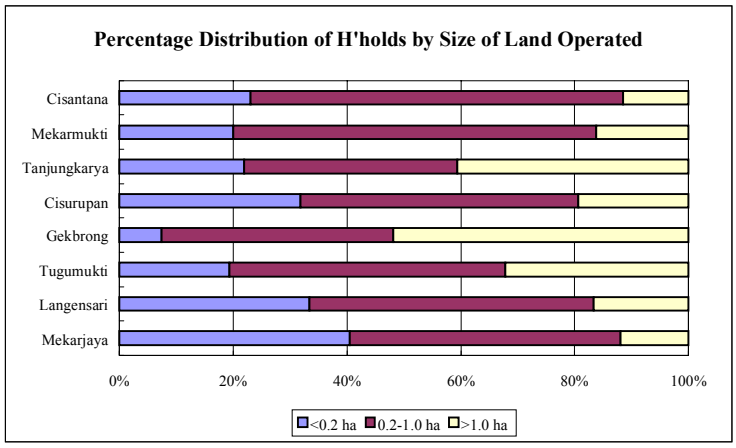
1) Land Holding Size

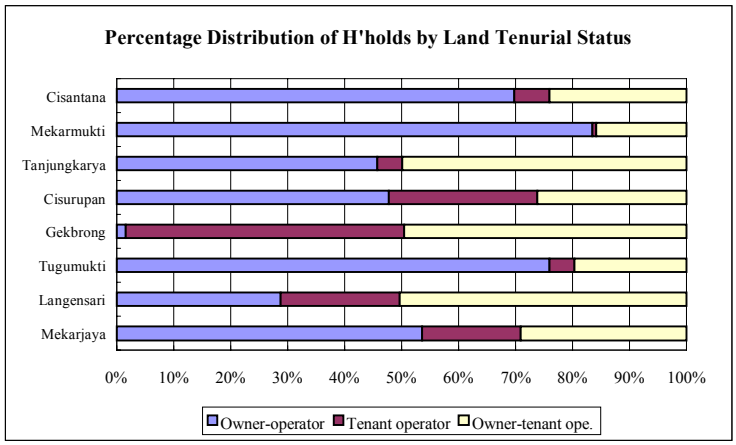
The average size of land operated per household differs between the model areas. It is comparatively large in Mekarkukti (0.87 ha), and Gekbrong（0.42 ha）.



The proportion of small land operators is comparatively high in Mekarjaya, Langensari and Cisurupan. In these model areas, more than 30% of the households operate small land less than 0.2 ha. On the other hand, the proportion of large land operators whose lands are more than 1 ha is comparatively high in Gekbrong, Tanjungkarya and Tugumukti (see the figure above).

The typical land holding size (median of distribution) is 0.12 ha (Mekarjaya) to 0.37 ha (Gekbrong).





2) Land Tenure

The households in each model area are classified into "owner operators", "tenant operators", "owner-cum-tenant operators" and "owner-non-operators (who are land owners, but non-operators)". As seen in the figure on the right, the proportion of owner operators is comparatively high in five model areas, i.e. Mekarjaya (57%), Tugumukti (65%), Tanjungkarya (56%), Mekarmukti (85%), and Cisantana (73%). As a matter of course, the proportion of tenant operators is comparatively low in Mekarmukti (2%) and Tanjungkarya (9%). The proportion of tenant operators is extremely high at 56% in Gekbrong in which the proportion of owner operators is only 7%. The proportion of tenant operators is comparatively high in Mekarjaya, Langensari, Tugumukti, and Cisurupan. In these areas, however, existence of owner-non-operators was not confirmed except in Cisurupan. This result may indicate that a certain proportion of lands is owned by city landowners who invested in land in vegetable production areas. The proportion of land owned by such city landowners is considerably large in Langensari, Tugumukti and Gekbrong.

More than 70% of farmland is operated by owner operators in Tugumukti, Mekarmukti and Cisantana. On the other hand, farmland operated by tenant operators is extremely high at 49% in Gekbrong. However, such proportion is comparatively low, less than 26% in other areas.

The existence of farm labor households was also clarified in the farm household interview survey. According to the survey results, the proportion of farm labor households is comparatively high at about 18% both in Mekarjaya and Cisurupan,

and is comparatively low in Mekarmukti (2%) and Langensari (0%).

(3) Crops and Farming Practices in the Highland Area

Many kinds of vegetables are planted in the West Java Province having high advantage of large consumer market of Jakarta and Bandung cities and suitable climate conditions of the highland for vegetable cultivation. Statistics on vegetable production are available in the annual report of Provincial Agricultural Service (PRAS) of West Java. The statistics present on 18 kinds of vegetables.

Vegetable production in five districts relevant with the Study area is gradually increasing on quantity, planted area and share in the provincial total. The production in five districts occupied ranging from 65% to 70% of the total of West Java Province in recent 3 years. As shown in the table below and Figures 3.1.9 and 3.1.10, temperate vegetables such as potato, cabbage, etc. are dominant in the five districts. These temperate vegetables are sold to consumers in the market as more favorable vegetables comparing with tropical vegetables in the lowland. In the five districts, vegetable productions of Sumedang and Kuningan districts have occupied only less than 2%, however, welsh onion and red onion of Kuningan district are special products of the district.

Share of Vegetable Production in the Five Districts to the Total in West Java Province

More than 75 %	Potato, Cabbage, Carrot, Kidney bean (kacang merah), Tomato, Chayote, French bean (kacang buncis), Garlic, Chinese radish
50 - 75 %	Welsh onion (bawang daun), Chili, Chinese cabbage(petsai)/Mustard green (/sawi),
25 – 50 %	Red onion (bawang merah), Eggplant
Less than 25 %	Yardlong bean (kacang panjang), Amaranth (bayam), Swamp cabbage (kacang kung), Cucumber

Source: Prepared from Annual report of PRAS West Java.

Ratios of planted area (harvested area in the statistics) of vegetable in the five districts are shown in the table below. This table presents that priority vegetables and botanical groups in the highland area are tomato, potato and chili (solanaceous crops), cabbage, chinese cabbage and mustard green (cole herb crops), red onion and welsh onion (allium crops), and carrot. The chili, which is a competitive vegetable with lowland area, is increasing in production and planted area in the high land. Garlic and chinese radish may have a potential of expansion by increasing of consumers' demand and introduction of new cultivation technology. Eggplant and cucumber, which are major vegetables in the lowland, may be expanded into the highland area by introduction of suitable varieties for natural conditions of highland. Production of sweet corn, which has not been presented in the statistics, is recently increasing by expansion of consumption.

Ratio of Planted Area of Major Vegetables in the Five Districts

(%)

Vegetables	Area ratio	Vegetables	Area ratio	Vegetables	Area ratio
Tomato	**7.0**	Amaranth	0.8	**Red onion**	**6.9**
Chili	**9.9**	Cucumber	3.1	**Welsh onion**	**8.5**
Eggplant	2.2	Chayote	1.3	Garlic	0.7
Potato	**13.6**	**French bean**	**4.2**	**Carrot**	**4.4**
Cabbage	**13.2**	**Red kidney bean**	**11.2**	Chinese radish	0.6
Petsai/Sawi *	**6.7**	Yardlong bean	5.0	Swamp cabbage	0.8

Note: **Bolds** are major vegetables in the highland
Petsai/Sawi: Chinese cabbage and mustard green
Source: Annual report of PRAS West Jawa,

Each model area is characterized by planted crops, cropping conditions and farming technology level as summarized in the table below.

Cropping Conditions in the Model Areas

Area /cultivated area (ha)	Major vegetables	Major food crops	Estimated cropping intensity (%)		Remarks
Mekarjaya (50 ha)	Tomato, Chili, French bean, Cabbage, Potato, Petsai, Red onion, Carrot, Sweet con	Sweet potato, Maize, Cassava, Paddy (local)	vegetable paddy palawija total	88 13 80 181	Relatively low level on vegetable farming, paddy dominant in low elevation area
Langensari (72 ha)	Tomato, Petsai, Cabbage, Cauliflower, Sawi, Lettuce, Chili, Potato, French bean	None	vegetable paddy palawija total	229 0 0 229	Most progressive farming on vegetable with high level input and farming technique
Tugumukti (50 ha)	Cabbage, Tomato, Chili, Cauliflower, Potato, Petsai, Sawi, Carrot, Sweet corn	None	vegetable paddy palawija total	186 0 0 186	High level farming technique, but low cropping intensity due to water shortage
Gekbrong (50 ha)	Tomato, Cabbage, Sawi, Carrot, Sweet corn, Potato, Petsai,	Maize, Sweet potato	vegetable paddy palawija total	146 0 28 174	Medium – high level farming technique on vegetable, low cropping intensity due to water shortage
Cisurupan (140 ha)	Cabbage, Potato, Tomato, Chili, Sawi, Petsai, French bean, Red onion, Sweet corn	Paddy (HYV, local), Maize, Sweet potato, Soybean	vegetable paddy palawija total	59 129 18 206	71 % of area planted paddy in wet season, remaining 29 % cultivated vegetables
Tanjungkarya (80 ha)	Cabbage, Tomato, Chili, French bean, Red onion, Sawi, Petsai, Sweet corn	Paddy (HYV, local), Maize, Soybean	vegetable paddy palawija total	149 56 10 215	19 % of area planted paddy twice a year, 19% paddy and vegetable/ palawija, remained 62% mainly vegetables
Mekarmukti (167 ha)	very few	Paddy (HYV, local), Soybean, Groundnut	vegetable paddy palawija total	1 109 9 119	Rainfed paddy area excepted 15 ha, very few vegetables in the village
Cisantana (250 ha)	Welsh onion, Carrot, Potato, French onion, Tomato, Chili, Sawi, Petsai, Red onion	None	vegetable paddy palawija total	213 0 0 213	Producing competitive special vegetable, “welsh onion”, with high farming technique

Cropping patterns in the model areas are summarized in the following table.

Cropping Pattern in the Model Area

Cropping pattern			Model areas applied *	
Wet season	Dry season I	Dry season II	Major pattern	Miner pattern
Vegetable	Vegetable	Vegetable	2, 3, 8	1, 5
Vegetable	Vegetable	-	1, 2, 3, 4, 5, 6, 8	-
Vegetable	-	-	1, 3, 4, 8	2, 5, 6
Palawija	Vegetable	-	1, 4,	6
Paddy	Vegetable	-	6	5
Palawija	Palawija	-	1,	4
Paddy	Paddy	Paddy/Palawija	5, 6,	-
Paddy	Paddy/Palawija	-	5, 6,	1, 7
Paddy/Palawija	-	-	5, 7,	6

* No. of model area
1: Mekarjaya 2: Langensari 3: Tugumukti 4 :Gekbrong
5: Cisurupan 6: Tanjungkarya 7: Mekarmukti 8: Cisantana

(4) Major Problems of Vegetable Production in the Model Areas

Eight model areas are characterized with the different crops grown, cultivation conditions, technical levels of cultivation, etc., which are made clear on the basis of the field investigations and the problem analysis carried out in village PCM workshops. The summary is as shown below.

1) Mekarjaya

High elevation land in Mekarjaya, which has very limited irrigation water, is planted vegetables in the wet season, while in the dry season, not planted due to water shortage. In the middle to lower elevation land, palawija and vegetables are planted in both seasons. A small part of lower land is planted local/ upland paddy in the wet season. The farming technology level of vegetables is relatively low. The problems on vegetable farming posed by farmers in the PCM workshop are:

- Low productivity because of poor farming technology, low inputs (lack of capital) and severe damage by pest/disease, and
- Low price of products because of low quality of products and low price in the harvest season.

2) Langensari

Langensari is one of the most progressive areas of vegetable production in terms of farming technology and productivity in the Study area. The farmers concentrate to produce vegetables. However, due to the limitation in land resources, continuous cropping of same crops, farming system became intensive in terms of farm inputs and labor requirement. It is supposed that the farming system is no longer sustainable due to the high

application of agro-chemicals and chemical fertilizer. The problems on vegetable farming posed by farmers in the PCM workshop are:

- Low price of products because of low quality, small production in the dry season and over production in the wet season, and unstable market price,
- Poor quality because of low farming technology and lack of high quality seed,
- Low production because of water shortage in the dry season, damage by peat/disease and low input (lack of capital), and
- Over dosage and high input cost because of severe damage of pest/disease.

3) Tugumukti

This area is also one of the most progressive areas of vegetable production. The farming practices are similar to those of Langensari area. However, due to the shortage of irrigation water in the dry season, the cropping intensity is lower comparing with Langensari. The problems on vegetable farming posed by farmers in the PCM workshop are:

- Low price of products because of low quality of products, over production in same season, and unstable market price,
- Low production because of lack of irrigation water in the dry season, severe damage by pest/disease in the wet season, low input (lack of capital), and poor farming technology, and,

4) Gekbrong

Vegetables and palawija (mainly maize) are planted in the model area. Farming technology and productivity are on medium to relatively high level. The problems on vegetable farming posed by farmers in the PCM workshop are:

- Low production because of severe damage of pest/disease, water shortage in the dry season, low farming technology, and low inputs (lack of finance), and
- Low price of products because of low quality of products, over production in same season.

5) Cisurupan

About 20% of farmers in Cisurupan cultivate paddy, and remaining 80% of farmers cultivate mainly vegetables. Farming technology and productivity are relatively high to medium. The problems on vegetable farming posed by farmers in the PCM workshop are:

- Low production because of water shortage in the dry season due to damaged canal system, severe damage by pest/disease, low farming technology, and low inputs (lack of finance), and
- Low price of products because of over production in same season and low quality of product.

6) Tanjungkarya

About 70% farmers in the model area plant paddy in the wet season, and 15% of farmers cultivate only paddy both season according to the farm household survey. Farming technology and productivity are medium to low. The problems on vegetable farming posed by farmers in the PCM workshop are:

- Low production because of water shortage in the dry season, severe damage of pest/disease, low farming technology, and low inputs (lack of finance), and
- Low price of products because of poor quality of product, over production in same season and little availability of high-quality seed in the village.

7) Mekarmukti

Mekarmukti is presently occupied by rainfed paddy land excepting about 15 ha. The cropping intensity is low even including palawija, which is mainly composed of soybean planted after paddy using residual soil water. Vegetable cultivation is rarely seen in the model area, even in the village. The problems on farming posed by farmers in the PCM workshop are:

- Low paddy production because of shortage of water in the dry season (no irrigation system) and low inputs (lack of finance), and
- Lack of vegetable farming technology, little availability of improved vegetable seeds, damaged by pest/disease.

8) Cisantana

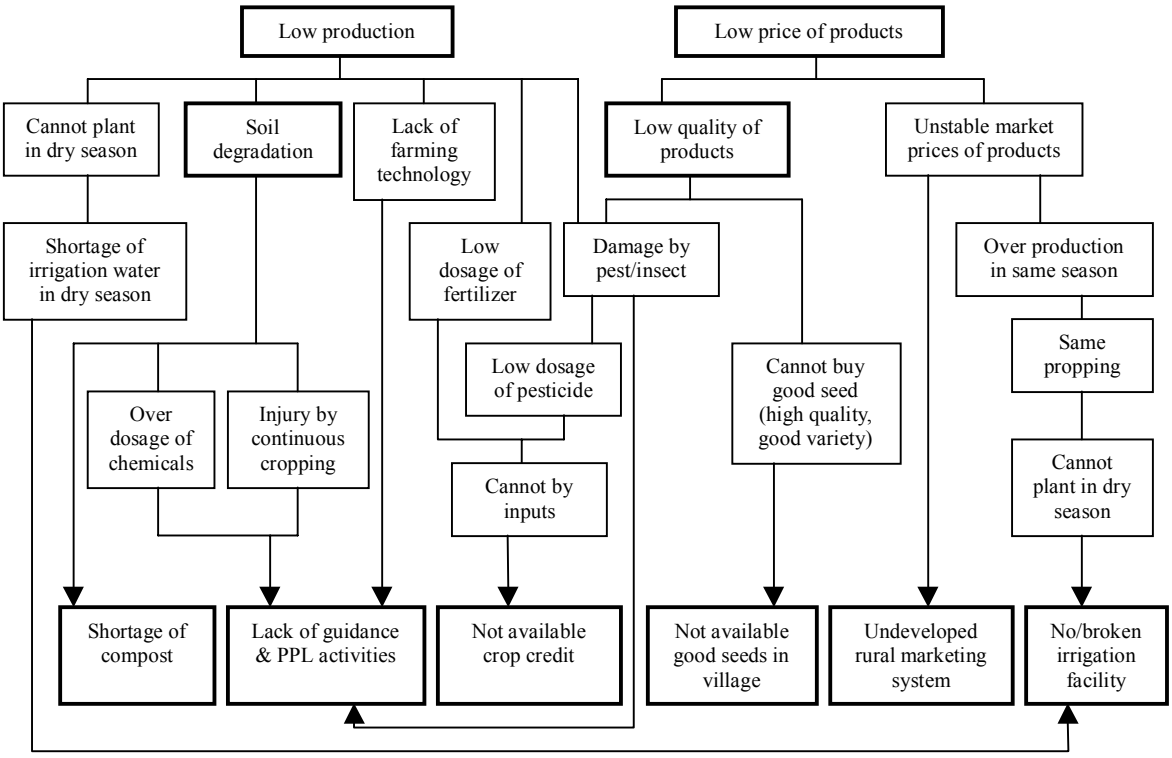
This model area has a special vegetable, “welsh onion” with high farming technology and high productivity. Planted area of welsh onion occupies about 70 % of the total planted area. Other vegetables such as carrot, potato, etc. are planted in the remaining area. The problems on vegetable farming posed by farmers in the PCM workshop are:

- Low production because of water shortage in the dry season, and low inputs (lack of finance),
- Low price of products because of impossible cropping in the dry season, damage by pest/disease, over production in same season and lack of

good variety seeds around the village,

- Degradation of soil productivity because of low application of compost (shortage of compost), damage by continuous cropping of welsh onion, over dosage of chemical fertilizer/agro-chemicals, and
- Difficulty of new crop introduction because of lack of good variety seeds in/around the village, and lack of farming technology.

Farmers participated in the problem analyses of PCM workshops, posed problems on vegetable production: "Low production", Low quality", "Low price of products" and "Soil degradation. The problem tree can be summarized below:



Problem Tree of Vegetable Production

These problems are evaluated with degree of severity in the following table.

Major Problems of Vegetable Production in the Model Areas

Problems of vegetable farming		Major problems in model areas *							
		1	2	3	4	5	6	7	8
Low production		●	○	○	○	○	●	●	○
· Low farming technology	Lack of technical guidance, low PPL activities	●	○	○	●	●	●	●	●
· Shortage of irrigation water in dry season	No / broken irrigation system	●	●	●	●	●	○	●	●
· Severe damage of pest/disease	Continuos cropping & damage by pest/disease in wet season	○	●	●	○	○	○		●
· Low input (chemicals/fertilizer)	High cost, not available credit	●	○	○	○	○	○		○
Degradation of soil	Continuos cropping, lack of compost, over dosage of inputs	○	●	●	○	○	○		●

Low price of products (unstable market price)		●	○	○	○	○	●		○
・ Producing in same season (same cropping pattern)	Not available irrigation water in dry season	●	●	●	●	●	●		●
・ Over production same crop	Decline of market price	○	●	●	○	○	○		●
Low quality of products		●	○	○	●	●	●	○	●
・ Damage by pest/disease	Not effective pest/disease control	●	●	●	●	●	●	●	●
・ Not available high quality seed at near location	Shortage of high quality seed in village	●				○	○	●	●
・ high price of quality seed	Not available credit	●	●	●	●	●	●	●	●
Degradation of soil		○	●	●	○	○	○		●
・ Over dosage of chemicals	Sever damage by pest/disease	○	●	●	●	○	○		●
・ Not available compost (high price/shortage)	No livestock	●	●	●	●	○	○		○
・ Continuos some crop cultivation	Not proper cropping pattern	○	●	●	○	○	○		●
・ Difficult to introduce new crops	No technology, not available seeds	○				○	○	●	●
Attitude/Intention for vegetable production		●	●	●	●	●	●	○	●
* Model Areas 1: Mekarjaya 2: Langensari 3: Tugumukti 4 :Gekbrong 5: Cisurupan 6: Tanjungkarya 7: Mekarmukti 8: Cisantana									
●: Severe major problems/High attitude of farmers for vegetable production ○: Major problems/Medium attitude of farmers for vegetable production									

Tea estate farms are located in the villages of Mekarjaya and Gekbrong. Every model area is planted with fruit trees, however, income from estate and fruits is little for the farmers.

Estate Crops and Major Tree Fruits in the Model Areas

	Estate crops	Major tree fruits
Mekarjaya	Tea : tea estate area 11 ha in the village	mango, banana, jack fruits, guava, avocado,
Langensari	-	banana, guava
Tugumukti	-	banana, guava
Gekbrong	Tea: tea estate are 118 ha in the village	banana, guava,
Cisurupan	-	banana, guava
Tanjungkarya	-	banana, guava
Mekarmukti	-	mango, coconut, banana, jack fruit, guava
Cisantana	-	banana, guava

(5) Farming Practices

1) Labor Requirement

Almost all of on-farm works for crop cultivation are carried out manually because farm machinery is not available due to the steep slope and lack of farm road. Farm works are practiced under conditions of extremely intensive labor input. These conditions provide employment opportunities for farm labors and small-holder-farmers. Otherwise, labor shortage for farming practices incidentally occurs in the busy season, namely, land preparation and harvest seasons. In case of intensive vegetable farming in the Study area, labor requirement for on-farm works ranges from 400 to 600 man-days per hectare according the interview survey on farming practices conducted by the Study Team. Among the labor requirements, land

preparation including seeding/transplanting and harvest including hauling/post-harvest handling occupy 30% to 35% and 15% to 20% of the total, respectively. Manual irrigation works including water hauling from the water source occupy 5 to 15% of the total in the dry season.

According to the field interview survey, hired labor ratios in total labor requirement are about 15% in the case of operated farm size 1.0 – 2.0 ha; 40 – 60 % in the case of operated farm area 0.5 ha. Generally the hired labor ratio is relatively high in the Study area.

2) Farm Inputs

Applied dosages of inputs, chemical fertilizer and agro-chemicals, widely range by financial conditions of farmers. Progressive farmers who get high yields generally apply 100 – 175 kg/ha of N, 50 – 100 kg/ha of P, and 50 – 100 kg/ha of K by chemical fertilizer. Furthermore, they spray with frequency of more than once a week in the wet season, and every two weeks in the dry season for the pest/disease control. Farmers requires technology on effective fertilizer application, proper control of pest/disease, and credit for purchasing of input. Herbicide and soil fungicide are not used in the Study area.

Shortage of organic manure (compost) is a serious problem in vegetable cultivation. Farmers tend to use generally 10 – 20 ton/ha of compost for vegetable cultivation. However, the compost, which is a distribution commodity in the province due to the shortage, is in short supply in the Study area. As a result, price of compost has risen to Rp.50–150 /kg in the area. Consequently, compost cost for vegetable cultivation occupies 10–20% of total input cost.

Vegetable seeds of good varieties generally are not available except in big cities such as Bandung and Lembang; therefore, farmers in isolated area, Cisurupan, Tanjungkarya Mekarmukti, and Cisantana have to use local varieties or recessive seeds. In West Java Province the Development of High Quality Seed Potato Multiplication System Project has been executed under JICA program with encouraging results.

3) Harvest Season

As mentioned in the succeeding section of Agro-processing and Marketing System, market prices of vegetable fluctuate widely by year and by season. Farmers intend to market products in the high price season. However, sometimes the over-production makes the market price drop. Furthermore,

water shortage in the dry season hampers proper cropping pattern for marketing.

(6) Crop Yield and Production

Productivity and planted area of crops in the Study area are estimated based on the interview survey with farmers and PPLs, and statistics of PRAS and KCD. These data and information sometimes disagree with each other. Yields of vegetables range widely by farmers technology level and quantity of input even in one model area. Total vegetable production in eight model areas amounts to 18,500 ton, which occupy about 0.9% of total production in West Java Province, and 1.4% of total production in the five relevant districts. Planted area, unit yield, and production are shown below:

Planted Area in the Model Areas

(Unit: ha)

	Vegetables					Food Crops			Total
	Tomato	Leaf vegetables	Bean vegetables	Others	Total	Paddy	Palawija	Total	
Mekarjaya	20	12	18	38	88	13	80	93	181
Langensari	58	65	15	35	173	0	0	0	173
Tugumukti	40	27	10	16	93	0	0	0	93
Gekbrong	24	16	3	30	73	0	14	14	87
Cisurupan	25	26	8	24	83	180	25	205	288
Tanjungkarya	43	34	15	27	119	45	8	53	172
Mekarmukti	0	0	0	2	2	182	15	197	199
Cisantana	94	50	45	344	533	0	0	0	533

Yield and Production of Vegetables in the Model Areas

(Unit: ton/ha, ton)

	Tomato		Leaf vegetables		Bean vegetables		Others	Total
	Yield	Production	Yield	Production	Yield	Production	Production	Production
Mekarjaya	10 - 20	300	15 - 20	195	7 - 12	162	381	1,038
Langensari	15 - 50	1,160	18 -30	1,301	7 - 12	135	343	2,939
Tugumukti	15 - 50	800	18 -30	578	7 - 12	90	185	1,653
Gekbrong	10 - 25	360	15 - 25	314	6 - 10	21	470	1,165
Cisurupan	10 - 25	500	15 - 25	512	7 - 12	72	323	1,407
Tanjungkarya	10 - 25	860	15 - 25	760	7 - 12	135	162	1,917
Mekarmukti	-	0	-	0	6 - 10	0	18	18
Cisantana	10 - 25	1,410	15 - 25	810	6 - 10	315	5,832	8,367

(7) Livestock and Fishery

Livestock subsector has an important role for farmers income in the highland area. Major livestock are milk cow and goat/sheep in the Study Area. Milk cow husbandry has been active in Langensari, Tugumukti, Mekarmukti, and Cisantana. On the other hand, in Mekarmukti, Gekbrong, Cisurupan, Tanjungkarya Mekarmukti, goat and sheep are major animals. Poultry, chicken, duck and goose, are raised by traditional manner. A milking cow produces 8 – 12 lit of milk per day in Cisantana. Livestock also supplies compost to vegetable

cultivation. As mentioned above, the compost is in short and distributed at high price in the Study area. Husbandry of milk cow and goat/sheep contributes to vegetable production by compost supply.

In livestock sector, shortage of forage is a severe problem especially in dry season. According to the farm household survey, nearly 30% of farmers who raise milk cow and goat/sheep answered that forage for animals are in short or very short in the dry season. Few farmers conduct aqua-culture using spring water, but the ratio is very small in income. Present conditions of livestock and fishery in the model areas are summarized below:

Livestock and Fishery in the Model Areas

		No. of animals and raising farmers ratio *		Ratios of farmers and income **	
		Milk cow	Goat/sheep	Livestock	Fishery
Mekarjaya	(A)	13	720	15.7	3.9
	(B)	2.0	41.0	3.1	1.2
Langensari	(A)	64	50	16.7	-
	(B)	16.7	5.6	3.1	-
Tugumukti	(A)	112	10	38.9	-
	(B)	55.5	8.3	9.9	-
Gekbrong	(A)	-	46	21.9	-
	(B)	-	28.1	0.3	-
Cisurupan	(A)	19	380	24.3	-
	(B)	10.3	25.2	4.6	0.2
Tanjungkarya	(A)	16	190	14.3	8.6
	(B)	2.9	34.3	1.6	0.4
Mekarmukti	(A)	162	550	21.5	-
	(B)	19.6	28.0	8.5	-
Cisantana	(A)	1,765	220	44.5	-
	(B)	50.9	9.1	21.7	-

Note *: (A) Upper row: population of animals, (B) Bottom row: ratio of animal raising farmers
**: (A) Upper row: Ratio of farmers earned from sector, (B) Bottom row: ratio of income to total income
Source: Estimated by results of farm household survey

(8) Agricultural Production Values

Estimated agricultural production values in the model areas are shown in the following table. Production values per ha range from Rp 6.170 million of Mekarmukti to Rp 43,87 million of Langensari, which are typical areas of farming types of paddy and intensive vegetable cultivation, respectively.

Agricultural Production Values in the Model Areas

Model area	Total production value (Rp million)			Production value (Rp 1,000/ha)	Ratio of vegetable production value (%)
	Vegetables	Food crops	Total		
Mekarjaya	1,346	430	1,776	17,760	76
Langensari	3,158	-	3,158	43,870	100
Tugumukti	1,725	-	1,725	34,490	100
Gekbrong	1,248	64	1,311	26,230	95
Cisurupan	1,676	1,013	2,689	19,210	62
Tanjungkarya	2,030	256	2,286	28,580	89
Mekarmukti	23	1,007	1,031	6,170	2
Cisantana	8,173	-	8,173	32,690	100

Note: Figures are not included fruits, livestock and fishery

(9) Crop Budget and Farm Economy

Typical crop budgets in the Study area are shown in Table 3.1.2. The crop budgets present the case of higher yield and better farming in the Study area. The family labor cost is included in the production cost. It shows that ratios of net income to gross income range from 10% to 60%, and the net income values are generally sensitive to fluctuation of unit prices and unit yields.

Net profit of each model area is roughly estimated under conditions as mentioned above. Net profits per ha are distributed between Rp 9 million and Rp 13 million in the model areas in which vegetables are mainly planted, and Rp 1.4 million and Rp 5.7 million in the model areas in which food crops are mainly planted.

Agricultural Production Values in the Model Areas

	Total net profit value (Rp million)			Net profit value (Rp 1,000/ha)	Ratio of vegetable net profit (%)
	Vegetables	Food crops	Total		
Mekarjaya	387	140	526	5,270	73
Langensari	953	-	953	13,240	100
Tugumukti	554	-	554	11,080	100
Gekbrong	440	18	458	9,170	96
Cisurupan	573	230	803	5,740	71
Tanjungkarya	595	59	654	8,180	91
Mekarmukti	14	223	237	1,420	6
Cisantana	2,904	-	2,904	11,620	100

Note: Figures not included fruits, livestock and fishery

3.1.5 Present Agricultural Support Services

(1) Government Organization

Agricultural administration responsible for food crops and horticulture in West Java Province is West Java Agricultural Service (PRAS West Java) under the provincial government. PRAS functions as a regional organization of Directorate General of Food crops and Horticulture (DGFCH) of MOA. The Provincial Agricultural Office of Central Line Agency (KANWIL), which is a regional office of MOA, providing administrative coordination between MOA and PRAS together with livestock and fishery sectors including extension services. District Agricultural Service (DIAS) and Subdistrict Agricultural Office (KCD) are set up in District and Subdistrict governments respectively. PRAS has about 200 permanent staff. The organization chart of PRAS West Java is illustrated in Figure 3.1.11. DIAS has a similar organization structure to that of PRAS.

(2) Agricultural Research

Agricultural research activities in Indonesia are conducted under the Agency of Agricultural Research and Development (AARD) of MOA. AARD has eight

central research institutes on, agriculture socioeconomic, food crops, horticulture, animal science, etc., and regional research institutes. Research Institute for Vegetables (RIV), which is one of the regional research institutes, is located at Lembang. RIV has responsibilities of:

- To improve variety and seed technology on vegetables,
- To improve vegetable crop management,
- To improve post-harvest technology for vegetables, and
- To collect and disseminate socioeconomic data/ information.

Lembang Assessment Institute for Agricultural Technology (LAIAT) is one of the 17 regional AIAT/AUATs (Assessment Unit for Agricultural technology), which are supervised by the Center for Agriculture Socioeconomic Research. LAIAT covers West Java province and Jakarta city. Task and function of LAIAT include:

- To research agricultural commodities in covering area,
- To verify appropriate technology on agricultural production,
- To function as a channel of feed back to improved research program, and
- To disseminate package of improved technology as extension materials.

PRAS has units on agricultural technology, Implementation Unit of Technology (UPTD). UPTD consists of three sub units, paddy, palawija and horticulture. The Coordination center of UPTD for horticulture is located at Sumedang, which has five branch stations. BBU Marhagayu located at Lembang is one of branch stations of UPTD horticulture. BBU Marhagayu is responsible for farming technology and production and distribution of seed/seedling of flowers and vegetables as follows:

- Research on flowers and vegetables
- Production and multiplication of seeds/saplings of flowers and distribution of seed/sapling
- Field trail of crops and farming
- Dissemination of information on farming technology
- Training of PPLs and farmers

(3) Agricultural Extension Services

Agricultural extension services in Indonesia are a task of district and subdistrict governments under supervision of KANWIL, and coordination/guidance by PRAS and District Agriculture Service (DIAS). Extension services in field level are provided by field extension workers (PPLs). In each subdistrict relevant with the

Study area, there is one Rural Extension Center (BPP). Six to nine PPLs are appointed in each BPP for eight to 24 villages which are covered by BPP; viz. a PPL has to cover two - three villages. PPL is assigned to responsible village(s) or farmers groups. PPLs are working under Training and Visit system (T&V system). PPL provides guidance on farming technology through contact farmers to farmers groups, also PPL formulates farmers groups himself for technical guidance and credit supply to groups.

A Pest/Disease Observer (PHP) is assigned in each subdistrict; however, a PPL holds PHP post in Buahdua subdistrict, Sumedung.

Farmers in PCM workshop posed that activities, guidance and its frequency by PPLs are limited, especially on activities of vegetable farming. PPLs generally have not been trained on vegetable farming because of priority on food crops, therefore, in general, they have little knowledge on vegetable farming.

A District Center for Agricultural Extension Information (BIPP) has been established in each district under district government. BIPP is responsible for coordination of BPPs in the district and technical guidance/information dissemination to PPLs.

Organization chart of extension systems in Indonesia from national to village level is illustrated in Figure 3.1.12.

(4) Agricultural Credit Services

The formal loan scheme of farmers credit (*Keredit Usaha Tani*; KUT) which is the major production loan for the farmers in the model areas is supplied through the following three channels.

- Village Cooperative (*Koperasi Unit Desa*; KUD)
- Farmers' Cooperative (*Koperaasi Tani*; KOPTAN)
- Public Self-supporting Organization (*Lembaga Swadaya Masyarakat*; LSM)

KOPTANI and LSM are the recently established new organizations following the revision of "cooperative laws" in 1998. As of October 1999, there are 966 KOPTANIs and 116 LSMs in West Java Province. On the Contrary, the number of KUDs which establishment commenced in 1973 is still 462 in West Java Province. This fact indicates rapid increase of KOPTAN and LSM within only about one year.

The activities of these new organizations are concentrated on financing services, in contrast with KUD that generally serves widely covering collection and sales of products, farm input supply and financing. KOPTAN and LSM can also take

charge of wider activities. For these new organizations, however, the handling of KUT may be the easiest activity as the one for the initial stage[1/].

The characteristics of KUT are summarized as follows:

a) KUT is supplied covering 100% of farm inputs for the production of strategic crops like paddy and maize. However, it covers only 24% of the production cost for vegetables. Under such condition, access to KUT is difficult for most vegetable farmers.
b) There is a tendency of slow supply of KUT due mainly to a long time procedure in documentation of KUD.
c) KUD which still remains as major KUT handling agency is located usually at subdistrict's capital. Accordingly, KUT is difficult to borrow for farmers in remote villages.
d) Participation rate of farmer groups is considerably low, although KUT application is arranged on the farmer group basis.

Because of these characteristics, KUT is not sufficiently utilized in the model areas[2/], and "lack of capital" is analyzed as the core problem in the village PCM workshop in five model areas (see Subsection 4.1.2).

The KUT supply system in each model area can be described as follows:

a) Mekarjaya: The newly established KOPTAN in June 1999 have just started KUT handling, although its service capacity is still unknown. Before KOPTAN establishment, only limited number of farmers were loaned KUT, because of poor access to KUD in Arjasari (capital of Subdistrict).
b) Langensari: KUT is supplied for some vegetable farmers (chili and potatoes, etc.) by KUD in Lembang (capital of Subdistrict).
c) Tugumukti: KUT is supplied for some vegetable farmers (chili and potatoes, etc.) by KUD in Cisaruna (capital of Subdistrict). In addition, this KUD provides different type of loan from KUT to some milk cow farmers.
d) Gekbrong: Major source of KUT is LSM, since KUD in Sukamukti that is responsible for Gekbrong is nearly non-functional.
e) Cisurupan: KUT is available from both KUD in the village and LSM.
f) Tanjungkarya: KUT is available from both KUD in Samarang (capital of subdistrict) and LSM.
g) Mekarmukti: KUT is available from both KUD in the village and LSM.
h) Cisantana: KUT is available from both KUD in the village and LSM.

1/ Interest rate of KUT is 10.5% per annum, of which 5.0% is paid as a commission to the handling agencies (i.e. KUD, KOPTAN and LSM).

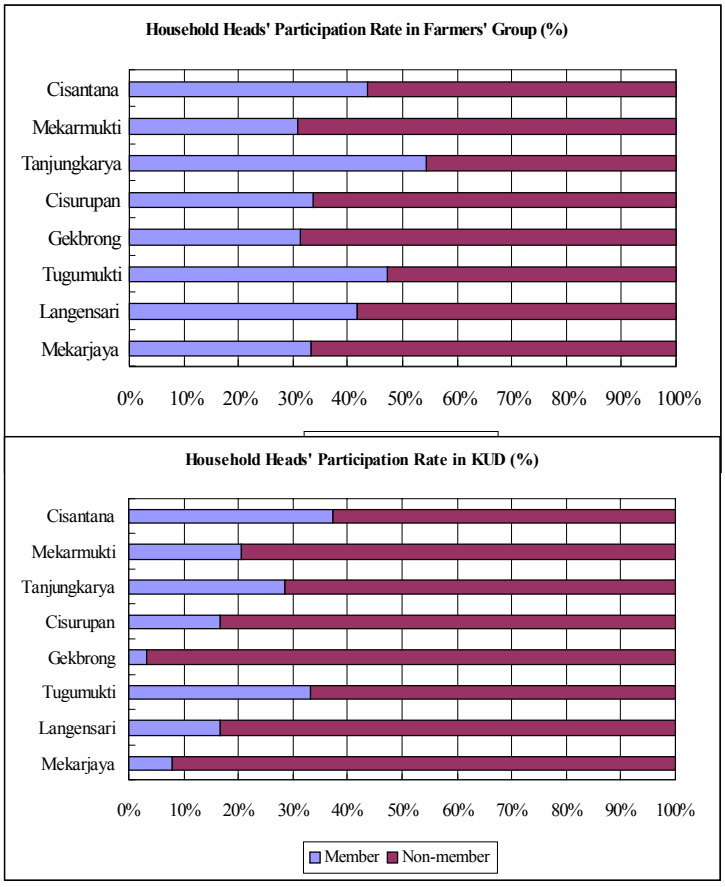
2/ Reliable data on the utilization of KUT in each model area could not be obtained. However, the proportion of farmers using KUT is estimated to be less than 10% according to the information from the respective village offices.

(5) Farmers' Organizations

In the farm household interview survey, participation rates of household heads and their wives to the farmers' organizations were clarified. The organizations surveyed are listed as follows:

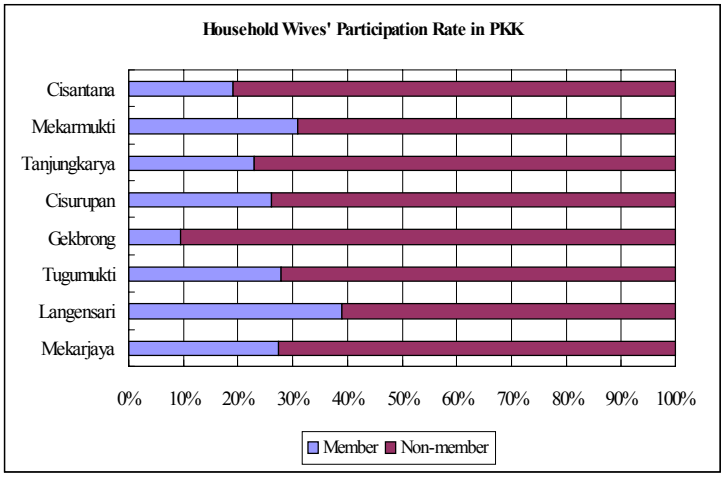
- Farmer group which is a unit of extension and credit services,
- KUD which is a multipurpose primary agricultural cooperative usually located at subdistrict level covering some 10 to 20 villages,
- Women's Association (PKK) which is an organization nation-wide in its scope. At village level, PKK supports women's health and hygiene betterment,
- Religious organization which supports Islamite at village level,
- Young farmer group which is a farmer group for youth,
- Farm water users association (WUA) which is an organization responsible for operation and maintenance of irrigation facility, and
- Other organizations.

The participation rate of household heads to the farmer group is the highest at 54% in Tanjungkarya, and the lowest at 31% in Mekarmukti (see the figure on the right). In case of wives, the participation rate to the farmer group is generally low in model areas, and about 10% even in the model areas showing comparatively higher rates (Tugumukti, Tanjungkarya, and Cisantana).

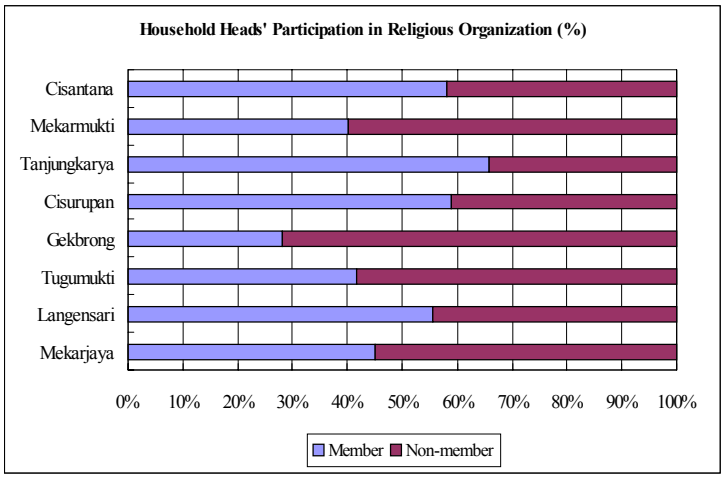


The participation rate of household heads to KUD is comparatively higher in Tugumukti (33%) and Cisantana (37%), and lower in Gekbrong (3%) and Mekarjaya (8%) as shown in the figure on the right. In case of wives, the participation rate is less than 10% in all the model areas.

As for PKK, the participation rate of wives is the highest at 39% in Langensari, and the lowest at 9% in Gekbrong (see the figure on the right).



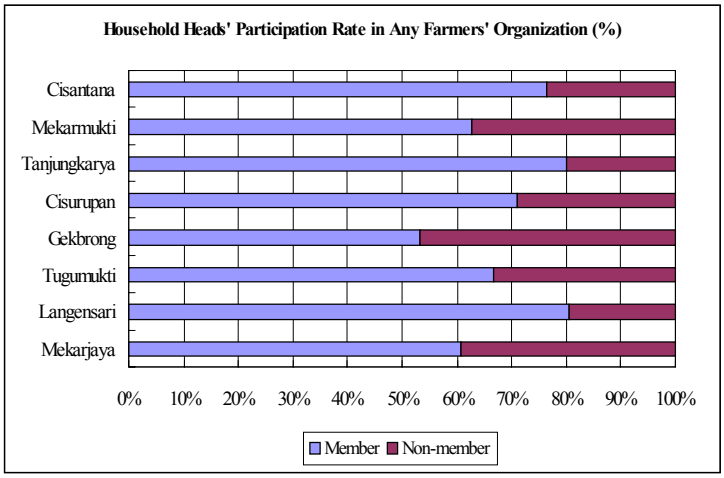
As for religious organization, the participation rates are comparatively high both for the household heads and wives in all the model areas ranging from 30% to 60%. However, the participation rates are about 28% for the household heads and 25% for the wives in Gekbrong (see the figure above for the household heads).



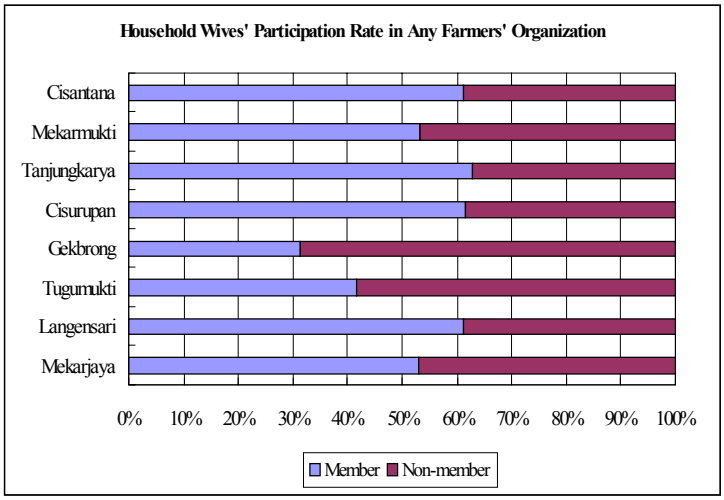
As for WUA and young farmer group, the participation rates are low in all the model areas both for the households heads and their wives.

In addition, the proportion of household heads who do not participate in any farmers' organization is analyzed as shown in the figure on the right.

The proportion of household heads who do not participate in any farmers' organizations is the highest at 47% in Gekbrong followed by Mekarjaya (39%) and Mekarmukti (37%).



In the same manner, the proportion of wives who do not participate in any farmers' organization is analyzed as shown in the figure on the right. The proportion is the highest at 69% in Gekbrong followed by Tugumukti (58%) and Mekarjaya (47%).



It could be concluded that the organizational activities are inactive in these model areas (i.e. Gekbrong, Mekarjaya, Mekarmukti and Tugumukti). It is therefore necessary to consider such conditions in the project planning of the farmers' organizations.

3.1.6 Agro-processing and Marketing System

(1) Marketing System

The production volume of vegetables and the access road condition are significant factors to development of existing marketing system of vegetables in the Study area. Traders in most villages handle vegetables produced in the village. In villages producing a large volume of vegetables, traders from outside come to buy, transport and sell them to the market. While, in villages producing small quantities of vegetables, farmers transport vegetables by themselves to market nearby for selling since no traders come to the village. Farmers in villages served with good access road have an option to select good traders since several traders come to buy vegetables.

Usually, traders build collection centers of vegetables in the village where transaction is carried out between farmer producers and traders. Sometime, the transaction is made on roadside in villages that has no facility for collection and shipping. Grading, sorting and packaging are conducted by farmers as post-harvest handling before selling their product. In case of carrot and potato, farmers carry out cleaning and washing.

The type of packaging is different by commodity. Tomato is packaged by wooden crate box of 40 to 45 kg. Potato is packaged by polyethylene bag with small holes of 35 to 50-kg weight. Welsh onion is bound by bamboo made strips

by 30 to 45 kg. Cabbage is traded without packaging. Locally available raw materials are used for packaging materials in many cases. A wooden crate box for tomato costs Rp.2,000 to 3,000/box. Farmers have to buy them before selling their product, which are not returnable from the market.

The villages of the Study area are categorized into the following three groups with respect to the post harvest system:

Post Harvest System in the Study Area

No.	Post-Harvest System	Village
1.	Sorting and grading with collection center:	Mekarjaya, Gekbrong, Cisurupan, Tanjungkarya, and Cisantana
2.	Sorting and grading without collection center:	Langensari, and Tugumukti
3.	No sorting, grading and collection center:	Mekarmukti

The destination of vegetables varies by distance from the village to urban market and by volume to be delivered. The marketing system in the Study area is classified as three types depending on the distance to market and the trade volume.

Vegetable Marketing System in the Study Area

Urban Marketing System Type-I	:	More than 50 % of shipping to Jakarta and the remaining major part to Bandung
Urban Marketing System Type-II	:	More than 50 % of shipping to Bandung and the remaining major part to Jakarta
Local Marketing System Type	:	Majority of shipping to local markets

The classification of marketing system of the Study area is shown below.

Classification of Marketing System in the Study Area

No	Type and Village	Main Market	Distance	Max. volume
1.	Urban market (1)			
	(1) Gekbrong	Jakarta, Bekasi 95% Local , Remaining	Jakarta, 135 km Bandung, 25 km	20 tons/day
	(2) Langensari	Jakarta, Bekasi 50% Bandung and local, Remaining	Jakarta, 210 km Bandung, 25 km	50 tons/day
	(3) Tugumukti	Jakarta, Bekasi 50% Bandung and local, Remaining	Jakarta, 210 km Bandung, 25 km	50 tons/day
2.	Urban market (2)			
	(1) Cisurupan	Bandung, 75 % Jakarta, 20 % Local, Remaining	Bandung, 80 km Jakarta, 270 km	50 tons/day
	(2) Tanjungkarya	Bandung, 75 % Jakarta, 20 % Local, Remaining	Bandung, 80 km Jakarta, 270 km	50 tons/day

3.	Local market			
	Mekarjaya	Bandung, 60 % Jakarta, 40 %	Bandung, 30 km Banjarang, 9 km	4 tons/day
	Mekarmukti	Local (Hariaig), 100%	Hariaig, 3 km	Very small
	Cisantana	Local, 100 %	Kuningan, 6 km	11 tons/day

The vegetable production and major markets for the model areas are shown in Figure 3.1.13.

The vegetables produced in Lembang Subdistrict, where Langensari is located, have acquired the reputation of their good quality. Traders export some vegetables to Singapore, Malaysia, and Burunei, and send them to Pontianak in West Kalimantan. However, there are some problems such as the delay in payment,limited trading volumes, so numbers of traders are limited.

All products from Cisantana go to Pasar Baru in Kuningan, but that market receives approximately the same volume of vegetables from outside of Kuningan, such as Cirebon, Central Java, and East Java because of the larger demand. In Mekarmukti, the vegetable production in dry season is very limited. They grow chili and peanut but not red onion and Welsh onion mainly due to lack of irrigation water. Farmers in Mekarmukti are required to transport by themselves to a local market in the vicinity for selling.

The payment is made almost always in cash and one-day credit that means traders will pay farmers next day after they carried and sold commodity at the market. Only in Cisantana one-week credit is applied.

Neither farmers' group nor KUD handles vegetable marketing in the Study area. Traders manage all marketing function in the village at present.

The present vegetable marketing systems in eight model areas are shown in Table 3.1.3.

(2) Prices and Marketing Volume

1) Production quantity of vegetables

Total vegetable production in West Java Province amounted to 1.27 million tons in 1997 and this quantity increased to 1.56 million tons in 1998. West Java Province occupies the largest production share of vegetables in Indonesia as shown below.

Production of Vegetables in Indonesia

Unit: Tons

	Cabbage	Potato	Red onion	Chinese cabbage	Welsh onion	Carrot
West Java	344,916	241,877	83,908	149,570	140,724	88,814
North Sumatra	219,314	207,657	144,554	64,496	15,423	38,856
Central Java	313,916	205,172	30,376	53,147	30,866	29,547
Total	1,350,101	848,102	602,998	454,112	272,004	230,013

Source: Statistik Indonesia, 1997

Potato, cabbage, cucumber, Chinese cabbage, chili and tomato are dominant in West Java Province, which is exactly similar to the production pattern in Bandung district. Bandung and Garut districts occupy 93% share of potato production in West Java Province. They also occupy 82% share for cabbage and 61% of tomato.

Among the concerned districts, the vegetable production is the biggest in Bandung district where Langensari, Tugumukti and Mekarjaya villages are located, followed by Garut district where Cisurupan and Tanjungkarya villages are located. The production quantity in Sumedang and Kuningan districts is not so significant at present. The details of vegetable production of the districts related to the Study area are described in Subsection 3.1.4.

2) Marketing Volumes

The incoming volume of vegetables to urban market will represent the demand of vegetables to be purchased by consumers. Since a large amount of vegetables move to Jakarta from West Java Province, the incoming volume at Kramat Jati market in Jakarta is examined. The volume incoming to Caringin market in Bandung, and a typical local market, Pasar Baru in Kuningan was surveyed. The result is summarized below:

The Incoming Volume to Major Markets

	Kramat Jati market, Jakarta	Caringin & Gede Bage markets, Bandung	Pasar Baru, Kuningan
Incoming volume			
Ton/day	1,090	112 (97 + 15)	23
Ton/year	393,600	40,900	8,200
Loss at the market, 10%	39,400	4,100	800
Estimated Consumption	354,200	36,800	7,400

Source: JICA Study Team, October 1999

The origin of vegetables coming to Kramat Jati market was surveyed from 8:00 pm on 24 October 1999 until 8.00 am on 25 October 1999 by counting incoming trucks to the market. The result is summarized below.

The Origin of Incoming Vegetable to Kramat Jati

Unit: Tons

	Cabbage	Chili	Red onion	Potato	Chinese cabbage	Total
West Java	55	30.5	2	43	35	165.5(43.7%)
Cent. Java	30	15	10	-	-	55(14.5%)
East Java	12	61	60	-	-	133(35.1%)
Sumatra	-	5	6	7	-	18(4.8%)
Bali	-	7	-	-	-	7(1.9%)
Total	97	118.5	78	50	35	378.5(100%)

Source: Commercial & Development Sec., Kramat Jati Market, Jakarta

As far as the incoming volume of vegetables to Jakarta market in October 1999 is concerned, cabbage, potato and Chinese cabbage from West Java Province are dominant, and the major origin of chili and red onion is East Java Province. In spite of the long distance to Jakarta, some vegetables come from Sumatra and Bali. There is competition of vegetables produced in each province.

3) Prices

(a) Market Prices

Market Information System (MIS) has been established in the Ministry of Agriculture in Indonesia since 1979. It collects prices from Monday to Friday in nineteen production areas and at twenty wholesale markets in 26 provinces in Indonesia. Usually prices in production areas are collected in the morning, while prices in wholesale markets are recorded in the afternoon when suppliers from the collection areas have arrived. Average prices are then sent to provincial Agriculture Service Offices in every province. It is sent to Jakarta Headquarter and disseminated by local radio. In West Java, Radio Bandung and RRI (National Radio) are used. Some farmers groups were seen in the Study area, that effectively utilized the radio information on prices and conducted the price negotiation with traders and market selection on the basis of those information.. In West Java Province, 9 offices are operating at the following locations:

Market Information System Offices in West Java Province

	District/Municipality	Subdistrict	Location
1.	Bandung	Pangalengan	Pangalengan
2.	Bandung	Cibiday	Ciwiday
3.	Bandung	Lembang	Lembang
4.	Cianjur	Cipanas	Cipanas
5.	Garut	Garut	Cikajan
6.	Majalenka	Majalenka	Maja
7.	Bekasi	Beksi	Pasar Cibitung
8.	Bandung City	-	Pasar Gedebage
9.	Bandung City	-	Pasar Carinjin

The monthly average prices of vegetables in three wholesale markets, i.e., Caringin (Bandung), Cibitung (Bekasi) and Kramat Jati (Jakarta) and six production centers for past three years are collected (see Annex VI). The monthly average market prices of major vegetables in Caringin, Kramat Jati and Garut markets in 1999 are shown in Figure 3.1.14, along with the incoming volumes to Kramat Jati.

Wholesale market prices in Kramat Jati are always higher than those in Bekasi and Bandung because of larger demand than others. The highest and lowest prices occur in the different months for different kinds of vegetables and the fluctuation ratios differ for the kinds of vegetables. In 1999, the price of chili has fallen largely to almost 1/10 of the highest, followed by red onion of approximately 1/6. While French bean, potato and carrot show very stable price.

Based on the data on the monthly average prices and incoming volumes in Kramat Jati, Jakarta, the relationship between incoming volumes and marketing amount (incoming volume x price) in the period of January and September 1999 is analyzed, as shown in Figure 3.1.15. From the result of analysis the vegetables are categorized into the following groups with respect to the price elasticity:

Categorization of the Vegetables

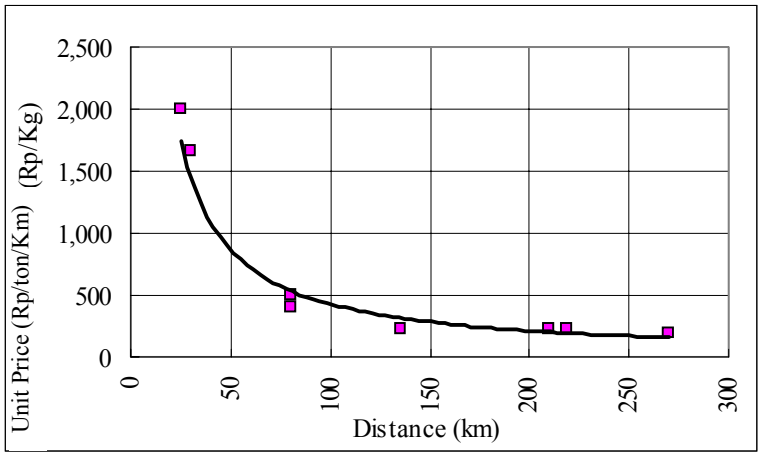
No.	Price characteristics	Vegetables
1	Stable prices for increase of income volume	Potatoes, Carrot, French beans
2	Price fall after certain incoming volume	Tomatoes
3	Large price fall after certain incoming volume	Chili,

The large price fluctuation of vegetables can be attributed to unstable incoming volume to the market. This large seasonal fluctuation of vegetable prices causes unstable supply of vegetables to consumers and reduces consumers' incentive of vegetable consumption. To avoid price fluctuation of vegetable, the constant supply should be ensured by market-oriented cropping system.

(b) Transportation Cost

Transportation cost is another important factor influential to market price of vegetables. Transportation and shipping in the Study area are usually carried out by 5 ton-truck from production areas to urban markets. Some time pick-up trucks of 1.5 ton are used in villages that have narrow and

insufficient access road. The cost of transportation by distance is shown below.



The unit cost per kg per km rapidly decreases with transportation distance to 150 km, and it goes down gradually to 200-km distance, then it is kept nearly constant beyond 200-km distance. This is one of the reasons why vegetables produced in Bandung and Garut are transported to Jakarta.

(3) Marketing and Post-harvest Facilities

1) Marketing and Post-harvest Facilities in the Study Area

Among the model areas, six villages already have collection centers of vegetable in the village that were constructed by traders. The most simple collection center is provided only with the floor paved by concrete and without roof. This floor is also used for washing and cleaning of carrot in Cisantana.

In Tugumukti, a farmer built a collection center by his own fund. The center is made of wood and bamboo having roof with tiles, but without electricity. The size of the center is 6m x 4m, and costed about Rp.5 million to construct.

In Langensari, a trader built his own collection center made of concrete structure. Sorting, grading and weighing are done inside for vegetables.

There is no collection center in Cisurupan and Mekarmukti at present because of narrow road in the village and small production of vegetable. Even there is collection centers in the village, grading and packaging are frequently carried out in the field without any sunshade. This comes from lack of knowledge for post-harvest handling technology of farmers. The first step of better post-harvest handling procedure is required to avoid damages from the heat after harvest particularly for perishable vegetables.

There is no facility for storage of vegetables in any village. High roof cottage without wall is the typical storage of simple structure utilizing natural ventilation in high land area.

2) Market Capacities of Urban Markets

As mentioned in the previous section, there are three major urban markets in West Java Province to which the major production from the Study area is shipped, i.e., Caringin market in Bandung, Kramat Jati market in Jakarta, and Cibitung market in Bekasi. Their capacities are shown below.

The Capacity of the Major market

	Caringin market, Bandung	Kramat Jati market, Jakarta
Organizing body	Market Cooperative	Municipal Government
Space	12 ha	15 ha
Shop number	1,200	3,600
Trader number	719	2,000
Trade volume of vegetable	87 - 140 ton/day = 36,000 ton/year	770 - 1,260 ton/day = 393,000 ton/year
Additional market	Gede Bage :5,400 ton/year	Fruits: 250,000 ton/year

Source: JICA Survey Team, October 1999

Kramat Jati market handles vegetable and fruits, but Caringin market handles meat, fish, egg beside vegetables and processed foods in general. As seen from the table, the market size of Jakarta is 10 times larger than that in Bandung. It is the reason why most traders in production areas prefer to transport vegetables to Jakarta, besides the higher prices than other markets.

The trading system adopted in those markets is a traditional way operating under the principle of common trust. These include:

- The "Consignment system" where the commodities are sent to trader at the market by producer or supplier for subsequent sale. After the products are sold, the proceeds are then paid to the owner.
- The "Commission system" where the trader deducts a certain commission from the product sold.
- The "Stall tenancy system" where product owner rents a stall from a trader at the market, either on daily or monthly term.

There is no auction system adopted at the market in Indonesia.

3) Agro-processing Activities around the Study Area

The Project purpose is to increase the production of vegetables mainly for the consumers in the public markets. In future, the farmer cooperatives to be formed in the villages might make a choice to produce materials for agro-

processing or to commence the agro-processing. To grasp the present conditions of agro-processing industry around the Study area, the reconnaissance survey was conducted to Tafu manufacturing factory.

There are many Tafu manufacturers in Sumedang because the production of soybean was dominant at this area in the past. Tafu manufacturer forms COPTT (Cooperative Tafu Tempe Producers) for joint purchasing of soybean that is provided through BULOG. Since domestic production of soybean is now short for Tafu and Tempe manufacturing, imported soybean being used for processing.

The capacity of Tafu manufacturer in Sumedang is usually 1,000 kg/day soybean treatment. Due to economic crisis, it becomes 500 kg/day treatment because of weak consumers' purchasing activity. For processing, no chemicals are used for preservative purpose. Accordingly, daily production is limited only one day's sold out quantity.

A typical manufacturer has 75 workers for two shift working system. There are about 150 members of COPTT in Sumedang. The number of total workers amounts to 11,250. This is a big job opportunity in the region.

Each factory has its own quality standard and they have specialists for quality control. The factory receives sanitary inspection by officers from Health Section of the municipality. Every processor now worries about contaminant chemicals from imported soybean. They are eagerly expecting to use domestically produced soybean.

Similarly to soybean, there might be lots of opportunity for agro-processing in West Java Province to utilize cabbage, chili, Chinese cabbage, and potatoes. However, it is noted that surplus product is not sufficient for materials of agro-processing business. Raw materials for agro-processing are required to be homogeneous in quality, steady supply in volume and steady prices. The contract farming system with manufacturers is one of the choices to ensure the stable farm income, as well as to contribute to promoting agro-industry.

3.1.7 Agricultural and Rural Infrastructure Development

(1) Irrigation System

Most of the farmers in the model areas are suffering from the water shortage during the dry season, and need for irrigation development is considered quite

high. Reasons of the water shortage which is commonly pointed out, are analyzed to be; i) shortage of the water resource itself, ii) lack or deterioration of irrigation facilities, iii) poor water management, iv) malfunctioning water users' association, etc. Even without irrigation facilities, present water use circumstances, such as water resource availability, conjunctive use, dependence on the proposed water source, also provide indices to know "degree of safety in water use" or "stable water use".

Present conditions on irrigation and water use in the model area are summarized below:

Present Conditions on Irrigation and Water Use in the Model Areas (1/2)

Area	Irrigation Facilities	Water Use				Description on Irrigation and Water Use
		Shortage of source	Conjunctive use	Dependency	Stable water use	
Mekarjaya	no	yes	yes		low	Citiis river, the main source of the area, is being utilized on the downstream by "free intake" and a semi-technical irrigation system by PU for paddy rice cultivation. The water is extracted to the opposite bank to the neighboring village for irrigation. Few irrigation facilities exist in the target area, and "rain-fed" agriculture is being undertaken both during wet and dry season. The Citiis river should accommodate most of the target area.
Langensari	few				high	Though water source itself is sufficient for irrigating the target area, demand for irrigation improvement is high because the water source is located below the farm field and can not provide water by gravity. An existing weir irrigates only eight hectares along the river. Farming technology and motivation of farmers to vegetable cultivation are high enough. Some farmers have already introduced pump irrigation. Once the irrigation systems are facilitated, stable water use is promised.
Tugumukti	yes		yes	yes	low	The area belongs to one of tertiary blocks of Cijanggel irrigation area (80 ha of 740 ha). However, the system does not function well having only single line of tertiary canal through the area. In the dry season, rotational irrigation is practiced during the driest period, and the area is irrigated only for 24 hours a week, extracting all the water in the main canal. It seems quite difficult to pump up the water from the streams located on the north and south of the area, due to required pumping head of nearly 100 m.

Note: "yes" for the column "Irrigation Facilities" means existence of semi-technical irrigation system which covers most of the target area

Present Conditions on Irrigation and Water Use in the Model Areas (2/2)

Area	Irrigation Facilities	Water Use				Description on Irrigation and Water Use
		Shortage of source	Conjunctive use	Dependency	Stable water use	
Gekbrong	no	yes	yes	yes	low	A private owned pipeline (5 inch, GI) provide both irrigation and domestic water in the target area. The village has recently constructed another pipeline (3 inch GI), but does not function well due to poor construction procedure, which causes leakage and choking along the line. The intake facility (box structure) is often filled up with debris conveyed by floods, and the sediment enters to the pipeline. The irrigation area being located on the upstream of the residential area, frequent stoppage of domestic water is one of the most serious problems in the target area.
Cisurupan	yes		yes		moderate	A comparatively stable water source is situated close to the target area, of which most part is used for paddy rice cultivation. Most of the irrigation canals remain unlined with low efficiency. Most of the target area is covered by a World Bank program, so called PIK (Handover of irrigation scheme to water users' association) . The project is being undertaken. Vegetable cropping in the wet season is practiced only for 40 ha which is irrigated by Cihareumas spring.
Tanjungkarya						Water sources are located close to the target area. Discharge is stable as spring. No systematic irrigation system is available, and large part of the water flows to downstream without being used. Farmers who cultivate on the upper elevation and/or far from the water sources strongly request improvement of irrigation system. Once the irrigation system gets improved, stable water use would be secured having good water sources. Scattered water sources (spring) also provide better access for water users.
Mekarmukti		yes	yes	yes	low	The source as a spring provides stable water both in terms of quality and quantity. However, it is utilized by many users including drinking purpose. Only 60% of the water can be extracted to the target area. The target irrigation area is located far downstream from the water source. The proposed conveyance canal would run across the steep slope. PU has prepared preliminary design of paddy rice irrigation system for 282 ha, but budget for implementation or detail design has not been allocated yet.
Cisantana	yes	yes		yes	low	Five intake facilities are being operated on the Cipager river of which water is used conjunctively for irrigation and domestic purposes.. The system which was initially considered to be the target area of the Study is being involved in the World Bank program (PIK). The construction works are being undertaken. PIK's concept is for improvement of paddy rice irrigation system, and the design itself is also made based on the parameters for paddy rice irrigation. On the other hand the area is mostly cultivated with vegetables. Vegetables are cultivated in the Northern part of the area under rainfed condition without any irrigation (120 ha).

Note: "yes" for the column "Irrigation Facilities" means existence of semi-technical irrigation system which covers most of the target area

(2) Rural Marketing Road

Located in the highland area, namely the hilly land between 800 and 1,500 m above the mean sea level, "rural road" is one of the most important infrastructures for securing access to commodities for living and other external services to support their life, under serious natural conditions. The road also plays important roles as "marketing infrastructures", in facilitating conveyance of agricultural inputs and products. Particularly in the highland area, where vegetable cultivation is extensively practiced, conditions of roads directly affect "quality of forwarded products" and "value (price) of product" which is increased by timely forwarding. Thus, need for rural road improvement is quite high as the irrigation improvement.

Road conditions of the model areas in which the need of road improvement is particularly high are described below:

Model Area	Road conditions
Mekarjaya	Access road of 2.3 km to Mekarjaya from District road (Banjaran～Arjasari) has deteriorated up to the road sub-base, and the condition is very poor. Certain stretch of the village road (1 km) has also deteriorated. Vehicles hardly enter the stretch during wet season. These road conditions hamper proper forwarding of products to markets
Lamgensari	Access road to Cikidang village from Ciputri has deteriorated for 200 m, which restrain passage of vehicles during the wet season. The access road to the village center where the village office and the main market exist is also in poor condition for 900 m. Vehicles can not pass the road. A bridge over the Cibogo river has to be replaced because of deterioration and its narrow width of 2.0 m. Forwarding of agricultural products are handled by labor transporters.
Gekbrong	Main stretch of the road is 3 km from the entrance at the Provincial road to Tabrik (village on the upstream of the target area). Upper 1,750 m is seriously damaged to the sub-base, and hardly passable during the wet season. Trucks forward tomatoes almost every day to Jakarta, which is also getting affected by the deterioration of the road. Some part of the road is being improved under a program of the World Bank, but pavement is not included.
Tanjungkarya	Main village road running through the village center is being improved. Density of road network seems low compared to its area. Farmers strongly request improvement or construction of marketing roads for forwarding of agricultural products.
Mukarmukti	Condition of main village road is good. However, access road to the downstream area is insufficient. For development of vegetable production, it is necessary to improve the marketing road network.
Cisantana	Part of access road to Cisantana has deteriorated at Cigugur for about one kilometer, which affects transport with vehicles during the wet season. Two kilometers on the upstream of the target area has also deteriorated and hampers passage of vehicles during wet season. Road network in the northern part of the area, where rain-fed vegetable cultivation is undertaken, is very low. New road construction is considered necessary for collection and forwarding of agricultural products. Farm lands located on the steep slope adjacent to the Cipager river can be accessed by neither vehicles nor motorcycles, which imposes a great burden to the farmers in forwarding their products such as vegetables and milk, through steep and narrow foot paths.

(3) Rural Water Supply

Rural water supply system which supports agricultural production activities and

living in rural areas is considered as “basic need” on infrastructure development.

However, rural domestic water is often in short supply due to conjunctive use or sharing of the limited water source with irrigation. Present conditions on the rural water supply in the model areas are described below:

Model Area	Water Source		Description
	Type	Conjunctive use with irrigation	
Mekarjaya	Spring, small stream	Yes	Existing water supply system constructed by a UNICEF program (1995) has malfunctioned to large extent. The system conveys water from Cibruey spring to pubic water stands (4 locations). On the upstream area, people bring water from small springs, dug wells or rivers.
Langensari	Spring, groundwater	Little	Most of people in the target area get domestic water from dug wells manually. Groundwater table is very low of 20 m from the ground, which seems to coincide with the water level of an adjacent river. Some part of the area receives water from a pipe line system handled by PDAM.
Tugumikti	Spring, River	Little	Hydraulic pumps operated by users’ groups provide certain percentage of domestic water in the target area, while pipe line system (through SPN) covers upper part of the area. In general, domestic water is in short, particularly in the dry season.
Gekbrong	Small stream	Yes	One water source (Cibeleng river) is conjunctively used for irrigation and domestic purposes. Facilities (intake and pipe line) are also for the both purposes. Frequent stoppage of water supply due to shortage of water, deteriorated facilities and poor water management.
Cisurupan	Spring	Some	Most of the people in the target area get drinking water from dug wells which often dry up in the dry season. Some part of the area receives water supply through a pipeline system operated by PDAM.
Tanjungkarya	Spring, small stream	Yes	Conjunctively used for irrigation and domestic purposes, but little water shortage problem having abundant discharge. Contamination by agro-chemicals and fertilizers might occur.
Mekarmukti	Spring	Yes	Water supply pipeline from the upstream village (constructed in 1970’s). Pumping from the Cilian spring which is also used for irrigation with a hammer pump. Domestic water is in short.
Cisantana	Small stream	Yes	Having independent water distribution system, conditions of rural water supply is comparatively good. However, the water is in short during the dry season, due to the conjunctive use with irrigation.

3.1.8 Environmental Condition

(1) Environmental Institution and Legislation

1) Environmental Impact Management Agency (BAPEDAL)

Environmental Impact Management Agency (BAPEDAL) was established in

1990 by transferring the responsibilities of Ministry of Population and Environment. BAPEDAL is a Non Ministerial Government Agency subordinated and directly responsible to the President. The principal mandate of BAPEDAL is to assist the President in management of environmental impacts including prevention of and control over pollution and environmental damage, and rehabilitation of environmental quality. BAPEDAL consists of the regional BAPEDALs and three technical directorates, namely, i) Institutional and Capacity Improvement, ii) Pollution Control, and iii) Environmental Impact Assessment and Technical Development.

2) Environmental Impact Assessment System in Indonesia

Environmental impact assessment system in the country was originally established in the government regulation No. 29 of 1986. This regulation is called the AMDAL (Analisis Mengenal Dampk Lingkungan) in the country. AMDAL, and then, was revoked in 1993 and replaced by the government regulation No.51 of 1993. The regulation stipulates the definition of target projects, the process of EIA (named ANDAL: Analisis Dampak Lingkungan), the documents to be submitted, and the required process for permission and licensing, with the several supporting guidelines. Out of the guidelines, the KEP-11/MENLH/3/1994 defines criteria for the projects to be required to conduct an EIA study. As for the agricultural development project, the criteria are set up as follows:

(a) Activities requiring EIA

Public Work Sector (activities related with irrigation)

- Construction of dams or embankment: Height $\geq$ 15 m or Impound area $\geq$ 100 ha
- Irrigation area development: Irrigated area $\geq$ 2,000ha

Agriculture Sector

- Shrimp/fish culture: Area $\geq$ 50 ha
- Development of rice field in forest area: Area $\geq$ 1,000ha
- Plantations: Area $\geq$ 10,000ha
- Cash crop farms: Area $\geq$ 5,000ha

(b) Protected Areas

- Forest protection areas, Nature conservation areas, Peat areas, Marine and freshwater, Conservation areas, Water catchment areas, Coastal mangrove areas, Coastal edges, National parks, River edges, Recreation

parks, Areas surrounding lakes and reservoirs, Nature parks, Areas surrounding springs, Cultural reserve and scientific, Research areas, Areas susceptible to natural hazards

For projects that fall within this criteria, project proponents must follow the AMDAL system. As the first step, the proponents must prepare a Terms of Reference (TOR) for EIA study (KA-ANDAL), which describes the scope of the study, results of scoping, major possible issues predicted to arise in the project, and methods of the study. After preparation, KA-ANDAL is submitted to the AMDAL commission, which consists of relevant and multi-spectral agencies in order to review the KA-ANDAL technically. The KA-ANDAL is reviewed within 12 working days after submission. After review works, the proponent must then carry out an EIA as defined in the KA-ANDAL, and prepare the impact assessment report in the form of the ANDAL document. In addition to the ANDAL document, the proponent must prepare an Environmental Management Plan (RKL) and an Environmental Monitoring Plan (RPL). The RKL specifies all environmental management techniques, which must be implemented to reduce or eliminate the predicted significant environmental impacts. On the other hand, the RPL specifies the technical details of the monitoring that must be carried out to ensure that the environmental management procedures are indeed implemented and are effective in mitigating the impacts. The ANDAL, RKL and RPL documents must be all submitted at the same time and together to the AMDAL commission.

3) Environmental Management and Monitoring Procedures (UKL and UPL)

In case projects do not fall within the criteria, projects will be evaluated whether the Environmental Management Procedures (UKL) and the Environmental Monitoring Procedures (UPL) are required or not, based on the technical guideline of responsible Ministries. Project proponents must prepare the UKL and UPL and submit to responsible agency and BAPEDAL when they are required. The Ministry of Agriculture has their own technical guideline for the UKL and UPL with the required document form. (Decree of Ministry of Agriculture No. 752: Technical Guideline for the Environmental Management Procedures (UKL) and the Environmental Monitoring Procedures (UPL)). According to the Decree No. 752, the following projects are required to formulate the UKL and UPL in case of the upland agricultural development projects.

1) Development of rice field in forest area: 500 ha ≤ Area < 1,000ha
2) Development of rice field outside forest area: 500 ha ≤ Area
3) Plantation development 5,000 ha ≤ Area < 10,000ha
4) Cash crop farms (horticulture) development 500 ha ≤ Area < 5,000ha
5) Plantation in upland and watershed area: 500 ha ≤ Area < 5,000ha
6) Cash crop farms in upland and watershed area: 25 ha ≤ Area < 5,000ha

(2) Natural Condition in and around the model areas

1) National Forest Land

National forest land is directly managed by the Ministry of Forestry and Estate Crop, and it is clearly distinguished from village land at present. The National Forest Land is classified into four categories, i) Conservation Forest; ii) Protection Forest; iii) Production Forest; and iv) Recreation Forest. Out of the forest areas, the conservation and production forests are located in the vicinity of the model areas and/or also related villages as shown below.

Model Areas	Location of forest land	Category
Mekarjaya	Adjacent to the Study area	Production forest (Conservation forest)
Tugumukti	5 km upper from the village	Production forest (Conservation forest)
Langensari	2 km upper from the village	Production forest (Conservation forest)
Gekbrong	Adjacent to the Study area	Conservation forest
Cisurupan	Adjacent to village	Production, Protection & Conservation forests
Tanjungkarya	Adjacent to village	Production, Protection & Conservation forests
Mekarmukti	3 km upper from the village	Production forest (Conservation forest)
Cisantana	Adjacent to the village	Production forest (Conservation forest)

Source: District Offices of Ministry of Forest and Estate Crops

2) Vegetation (Flora)

Most of the lands of the villages are presently used for agriculture and/or miscellaneous. Some parts of the village leave the woodlands as the secondary forest or tree crops farm. Mahogany (*Swientenia mahogani*), Lamtoro gung (*Leucaena leucocephala*), Petai (*Parkia spesiosa*), Avocado (*Persea sp.*), etc. are found in the secondary forest and tree crops farms. On the other hand, pine tree (*Pinus sp.*) is major tree species in the production forest, and those in the conservation forest are Rasamala (*Altinghia excelsa*), Rattan (*Rattan sp.*), Pasang (*Quercus sp*), Puspa (*Puspa Noronhoe*), etc.

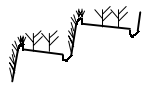
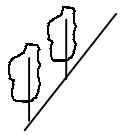
3) Wildlife (Fauna)

Wildlife, particularly mammals, are rarely observed in the model areas due to human intervention. In addition, no endanger species of animals also habit in the model areas. To the contrary, it is reported that several large mammals inhabit in central parts of the conservation forest, such as tigers, antelopes, monkeys, wild pig, etc.

4) Soil Erosion Condition

(a) Present Extension Activities for Soil Conservation in the model areas

Extension works for soil conservation are the charge of the District Forest and Soil Conservation Service Office (Dinas-Perhutanan dan Konservasi Tanah). District extension workers (PKLs) of the Offices have a responsibility for the field extension. Major work items for PKLs are to promote the soil conservation measures in the fields and to assist in implementation of social and agroforestry programs. The following table shows the existing standard of recommended soil conservation measures.

Slope(%)	Recommended measures	Shape of lands
0 - 8	Contour bund 1: This is the initial stage of the bench terrace. The bund is constructed along contour line to prevent soils from flowing down.	
8 - 15	Contour bund 2: Large bunds are constructed at interval of 20 – 30 m, and the small (ordinal) bunds are constructed between the large bunds at shorter interval than the above practice.	
15 - 45	Bench Terrace: This is the most common practice in the area. Level or adverse slope terrace is constructed with ridge on the edge and watercourse on the unslope side.	
over 45	Forest land including Fruit trees: This is the main conservation measure in "Social-agroforestry Program". Perennial crops, including fruit trees (durian, juck fruit, bread trees, etc.) are planted in the slope to cover the surface of lands.	

Source : Interview survey to PKL (Forestry Extension Service) staff, JICA Study Team

(b) Present Land Condition

Based on the interview survey to farmers and field observation, farmers have an intention to prevent soil erosion occurring in their fields. In fact, bench terrace is extensively disseminated over the model areas as a soil conservation measure, especially in existing paddy fields and irrigated vegetable cropping area.

In Mekarjaya, however, sloping lands without conservation measures are observed through the field survey. Furthermore, some of the vegetable

fields in Gekbrong, Langensari, and Tugumukti, are cultivated in denuded sloping lands, although the slope is generally gentle. It is speculated that the fields are rather susceptible to soil erosion since they are exposed to heavy rainfall in the rainy season. In this way, some of the lands still remain as the sloping land without conservation measures since the measures, especially bench terrace, require the significant money and labor force. The research results in Citanduy watershed in West Java indicates that a heavy workload (500-700 man-days/ha) is required for construction of bench terrace.

On the other hand, it is often found that the edge and slope of bench terrace are left denuded. In addition, the farm ridges in the field on terrace land is often formed along the slope. These might also induce a kind of sheet erosion and/or collapse of terrace. There is still some of room for improvement in the farm fields.

(c) Possibility of Soil Erosion

Soil erosion rate is roughly estimated by using USLE (Universal Soil Loss Equation) formula, based on the Indonesian and other country's standard factors of USLE and research data in the country. The assumption for estimation and each factor are explained in Annex VII. The results of rough estimation are presented in Table 3.1.4, and summarized as follows:

Possibility of Soil Erosion

Model Areas	Slope (%)	Crop types	Conservation Type	Annual loss (ton/ha/yr.)
Mekarjaya	10-40	Vegetables	Contour bund and Terrace (level)	32-410
Tugumukti	0 – 15	Vegetables	Strip row, Contour bund and Terrace (level)	8 – 33
Langensari	0 – 8	Vegetables	Strip row, Contour bund and Terrace (level)	8 – 33
Gekbrong	0-8	Vegetables	Strip row and Contour bund	16 – 33
Mekarmukti	3 – 40	Paddy & upland	Contour bund, Terrace (reverse), Agroforestry	0.5 – 59
Cisurupan	0 – 15	Vegetables	Terrace (level)	8 – 39
Tanjungkarya	0 – 15	Vegetable & Paddy	Terrace (level) and (reverse)	2 – 39
Cisantana	10 –15	Vegetables	Terrace (level)	39

Since this is a rough estimation, it does not precisely indicate the amount of soil loss in the fields. This, however, can indicate the tendency of soil erosion in and outside the model areas. Annual soil loss is estimated low to moderate in the model areas, which generally ranges from 0.5 to 39 ton/ha/yr. As for Mekarjaya, the value of annual loss is considered relatively high, since the soil conservation measures are still not adopted well.

To the contrary, the possibility of soil erosion outside the model area, such as upper reaches or marginal area of the villages, is estimated quite high. The values of annual loss range from 22 to 948 ton/ha/yr as shown in Table 3.1.4.

(d) Constraints on the Present Extension Activities

According to the PKLs, the extension works of soil conservation are conducted to same farmer's groups with the agricultural extension works, and they have a periodical meeting with PPL (agricultural extension workers) to exchange the opinions and progress about the target groups. However, the frequency of PKL's visiting is unstable and insufficient. In fact, farmers often complain about the shortage of visiting. The following matters are reported as the constraints on the extension activities by the PKLs.

- Lack of transportation measures
- Shortage of number of staff (by comparison with coverage area)
- Low farmer's educational level
- Low ability of extension workers

  (Shortage of opportunity to get latest information and technology)

In addition to these constraints, it is also assumed that less coordination with agricultural extension services is one of the causes for ineffective extension activities, even PKLs reported they had periodical meetings with PPLs. The soil conservation approach is closely related with agronomic field management. For example, presently farmers form the farm ridge along slope because they think that the farm ridge against slope will cause poor drain and growth of vegetables. Thus, a comprehensive advice, which covers not only agronomic but also soil conservation matters, is required to realize the sustainable and profitable land management.

5) Water Quality of Drinking Water

Results of water quality analyses on existing drinking water sources are presented in Annex V, and they show that most water sources are suitable for drinking purpose. However, the water quality of the dug wells indicates contamination of the colon bacillus and other bacteria. In addition, water quality of dug well indicates the presence of nitrate (NO_3-N) and nitrite (NO_2-N). This might be associated with high application of nitrogen fertilizer (Urea, Ammonium Sulfate) into the farm lands.

6) High Dosage of Agrochemical

(a) Agrochemical Use

The dosage of agrochemical, especially of herbicides, is quite high in the model areas. The following are considered as the reasons for high application of agrochemical.

- High infection of pests and diseases
- No concern for environmental issue
- Insufficient knowledge for plant protection

In fact, high infection of vegetables by pests and diseases compels farmers to apply agrochemical for many times. The continuous and repeated cropping of same crops in a plot is considered as one of the reasons of high infection of diseases and pests.

(b) Highly Toxic Agrochemical

In 1996, the Government reduced the numbers of authorized agrochemical substantially as stipulated in the Ministry Regulation No. 473/kpts/TP. 270/6/96. In this regulation, 28 ingredients and 53 products were banned from being produced or traded in the country. Through the field survey, however, the restricted products, such as Dursban 20 EC, were confirmed in market and farmer's use. Further, farmers in the model areas presently use several toxic chemicals classified "highly hazardous" based on the WHO classification (1992). Table 3.1.5 shows the list of available agro-chemicals in and around the model areas.

(3) Social Condition

1) Health Condition

According to the district health clinics in each subdistrict, no vector-borne diseases such as malaria disease, schistosomiasis, filariasis and encephalitis are found in and around the Study area. In this connection, there is less possibility of an outbreak of vector-borne diseases caused by the implementation of irrigation project, unless the outsiders who have a potential of the diseases migrate to the model areas.

Some of the model areas show a high incidence of diarrhea as presented in Annex VII. It might be associated with the water quality of drinking water or availability of safe water. In fact, the sites without a piped water supply system indicate a relatively high tendency for the diarrhea.

2) Sanitation Condition (Domestic Waste)

At present, there is no domestic waste facility in the Study area. It is often found in the model areas, especially in the Cisantana site, that wastes from villages are dumped in and around the river. This causes degradation of water quality and increase of diarrhea disease in the area and also in downstream reaches. A sort of health education activity is required for proper and sustainable management of water resource.

3) Water Use Condition

Through the interview survey to village chiefs, several existing users of the water resources are confirmed as shown below.

Model Areas	Water resource	Other users (purpose)	village in down reach (purpose)
Mekarjaya	Citiis	Boros & Arjasari (Irrigation)	2 RW in Mekarjaya
	Cikuya spring	- Absent -	- Absent -
	Ciremes	- Absent -	Boros & Mangunjaya (Irrigation)
Tugumukti	Situ Lembang	6 villages (Irrigation)	2 villages (Irrigation)
Langensari	Cilukang	- Absent -	1 RW in Langensari (Irrigation)
Gekbrong	Cibeleng	- Absent -	Songgom (Irrigation, Drinking)
Cisurupan	Ciburial	- Cisero (Irrigation, Drinking)	Tanbakbaya (Irrigation)
	Ciharemas	- P.T. Aqua (Drinking)	Balewangi (Irrigation)
Tanjungkarya	more than 10 springs	- Sukawangi (at Cilembang: Irrigation)	Smarang (Irrigation)
		- Sukakarya (at Bojongsirua: Irrigation)	Sukarasa (Irrigation)
Mekarmukti	Ciliang spring	- Karangbunga (Drinking)	- Absent -
Cisantana	Cipager	- P.T. Aqua (Drinking)	Cipager (Irrigation),
		- P.T. Presti (Drinking)	Cileuleuy (Irrigation)

Source: Interview survey to Village Chiefs

Since the existing use of water source is considered a sort of vested right, significant attention should be paid on the project formulation in order to avoid any social conflicts.

4) Historical and Religious Sites

There is no archeological and/or historical site in the model area. In Tanjungkarya, there is a grave of historical ancestor outside the model area. Further, since cemeteries of villages are generally located at higher elevations than the farm fields, it is not considered there will be any disturbance by the irrigation development, except for Cisantana. In Cisantana, some of graves are located in the individual farm plot. However, the replacement of graves will not occur by the implementation of the project directly, and this matter will basically depend on individual sense of the values.

(4) Present Environmental Problems (including Possible Environmental Problems under Present Condition)

Based on the results of the field survey, the following five environmental issues are identified as the present environmental issues, including possible environmental issues which may occur in the future if the situation is left as it is.

Environmental Issues	MK	TG	LG	GK	MR	TJ	CR	CS
1. Health hazard caused by high dosage	+	+++	+++	+++	+	++	++	++
2. Water pollution into groundwater	-	+ - ++	+ - ++	+ - ++	-	+	+	+ - ++
3. Water pollution into down stream	-	-	+	-	-	++	++	+++
4. Soil erosion in and around model areas	+++	+	+ - ++	++	+ - ++	++	+	++
5. Social conflict among the villagers	-	-	-	-	-	-	++	++

Remarks : +++ : major, ++ : moderate, + : minor, - : none

1) Health Hazard caused by High Dosage of Agrochemical

So far, there have not been any severe health hazard caused by improper agrochemical use. According to farmers, however, they have experienced headache and skin ailment on using. Most of them do not put a mask and glove on when they apply the chemical. In addition, used bottles and packages were often found in the farm lots in the model areas. Therefore, mishandling of agrochemical and improper disposal of used containers may pose health hazards, although farmers have much experience in the usage of agrochemical. In order to minimize the possibilities, the following items should be instructed to the farmers by the extension works.

(a) Promoting proper handling

- Safety agrochemical usage (dilution, spraying, keeping)
- Necessity and methods of proper disposal

(b) Reducing the opportunity of agrochemical use

- Effective agrochemical usage (suitable time in a day and condition)
- Less input crop management (IPM, crop rotation, proper spacing)

2) Water Pollution in Groundwater and Drainage

This issue is not clearly obvious at present. Since the present application level of agro-inputs (fertilizer and agrochemical) is relatively high, agro-inputs may contaminate drainage and groundwater. At present, almost all the farmers pay no attention to prevent water pollution caused by the agro-input use.

(a) Groundwater

Many literatures have reported the possibility of nitrogen (nitrate: NO_3-N

and nitrite: NO_2-N) contamination from farm to groundwater. The water pollution in groundwater is closely related with the overuse of agro-inputs (fertilizer and agrochemical) and leaching through soils. Unless any measures will be taken to reduce agrochemical use, the water quality of groundwater might be deteriorated due to the contamination. It is essential to promote a proper farming management and also to conduct a periodical water quality monitoring of the groundwater in order to avoid any adverse impacts.

(b) Drainage water

Contamination of polluted water into drains mainly occurs in paddy production area, since the drain water will function as the medium for pollutant. It is assumed that the drainage waters in Tanjungkarya, Cisantana, and Cisurupan are presently polluted by agricultural activities, such as fertilizing, spraying, livestock waste, etc. To minimize the adverse effect, the following activities should be considered as the options.

- Extension of environmental friendly farming practice
- Promotion of communication between the related villages of water resource to understand the importance of water quality management
- Health education for improvement of sanitation condition

3) Soil Erosion and Landslide

The potentiality of the soil erosion in the Mekarjaya site is higher than other sites, since it has moderate to steep sloping and the soil conservation measures are not adopted on all the sloping lands. Especially, the area along Ciremas river of Mekarjaya has steep slope of about 30 to 40 %, and the area is presently cultivated only with strip row or contour bund measures. In addition, landslide occurs every year on the slope area along the Ciremas river. According to farmers, the length of slide area is about 50 m.

4) Social Conflict in Water Users in the Area

The Cisantana site has an existing irrigation system, which does not fully function due to the deterioration of system at present. Irrigation water is not distributed to all the villagers. Water users in downstream and middle reaches in the village Cisantana often complain of irrigation water shortage. These discontents in the site might be an obstacle for the development of entire village. Therefore, this should be solved in the earliest stage through the close communication among villagers. However, the water users organization have not functioned sufficiently. It is essential to activate the

organization and to have a consensus of water distribution through discussion among the members of the organization.

On the other hand, a water supply system in Cisurupan is not fully developed in all the households of the village. Some of the households in the model area have water supply system installed by a private mineral water company before. According to farmers, it has also resulted in discontent of the farmers outside the model area.

3.2 Development Needs and Basic Development Concept

3.2.1 Results of Village PCM Workshop

The Project Cycle Management (PCM) method has been applied to the project planning process with a view to formulating the project based on participatory approach. In accordance with the concept of participatory planning of PCM, the village PCM workshop was held at each model area site inviting farmers living there. In the workshop, three steps of analysis, i.e. "participation analysis", "problem analysis" and "objective analysis" were made together with farmers.

All-important information from the village PCM workshop was examined in the next step of "alternative analysis" for identification of project approaches. In the final step, the Project Design Matrix (PDM) was prepared for each model area. The analyses in the latter two steps were carried out in cooperation with the counterpart team.

(1) General Features

(a) Objectives

The objectives of the village PCM workshop were as follows:

a) To confirm farmers' needs and/or potential to the agricultural development,
b) To have common understanding between the project planner (Study Team and counterpart team) and farmer beneficiaries on the present problems/ constraints to the agricultural development, and appropriate approaches for the solution of such problems/constraints, and
c) To prepare PDM based on the results of analyses in the workshop.

(b) Program of PCM Workshop

In each location of model area, three days were spent for the village PCM workshop. The basic program of the workshop was as follows (see Annex III for detailed program):

- First day; participation analysis
- Second day; problem analysis
- Third day; objective analysis

About two hours of time were spent for each analysis. For the problem analysis, however, the time exceeded more than two hours in many model areas. The workshop was held at the village office in most model areas.

(c) Participants

In advance of the village PCM workshop, through the district agricultural service office, each village office was requested to select 15 participants who were the representatives of owner farmers, tenant farmers, owner-cum-tenant farmers, labor farmers, and woman farmers. However, the actual composition of the participants was not always balanced as shown in the table below.

Composition of Participants to Village PCM Workshop

Model Area	Owner Farmer (person)	Tenant Farmer (person)	Owner + Tenant (person)	Labor Farmer (person)	(Female) (person)	Total Participants (person)
1. Mekarjaya	9	4	2	0	(0)	15
2. Langensari	6	4	5	0	(2)	15
3. Tugumukti	8	3	2	2	(0)	15
4. Gekbrong	1	8	4	2	(0)	15
5. Cisurupan	6	3	2	0	(0)	11
6. Tanjungkarya	9	2	5	0	(1)	16
7. Mekarmukti	13	0	2	0	(1)	15
8. Cisantana	8	0	3	0	(0)	11
Total	60	24	25	4	(4)	113

In addition, relevant officers from the village office, district's and subdistrict's agricultural service offices were requested to attend the workshop as observers, expecting their understanding of the PCM method (a list of participants and observers of the workshop is presented in Annex III).

(d) Moderator and Co-moderator

The Rural Society/Farmers' Organization expert of the Study Team was the moderator of the PCM workshop. Both the counterpart of the expert and an assistant (cum-interpreter) who was temporally employed for the operation of workshop took charge of co-moderator.

(2) Participation Analysis

In the participation analysis, people, groups, organizations related to the agricultural production activities were analyzed. Although there were some differences between the model areas, the result can be summarized as follows (details of each model area are presented in Annex III):

Summary of Participation Analysis Result

Related to crop production	Farmers, Farmers Groups, Farm Water Users Association, Labor Farmers
Related to marketing of products:	Village middlemen, Middlemen from Outside, Village Car Owners, Bandung Market, Jakarta Market
Related to farm input supply	Village Mini-shop (KIOS), Subdistrict Level Retailers, Vegetable Seeds Retailers in Bandung and Lembang, Village Seed Growers, KUD, Village Tractor Owners, Village Buffalow Owners, Compost

	Fertilizer Sellers
Agricultural supporting services	PPL, PHP, LSM, KUD, Banks at District and Subdistrict levels, Extension Office (BPP), District Agricultural Service Office, District Livestock Service Office, District Public Works Service Office

(3) Problem Analysis

The core problem and its direct causes analyzed in each model area are presented in the table below (the problem trees from eight model areas are presented in Annex III).

Core Problem and Its Direct Causes Analyzed in Each Model Area

Model Area	Core Problem	Direct Causes			
		1	2	3	4
1. Mekarjaya	Lack of capital	Low agriculture income	Difficulty in loaning		
2. Langensari	Lack of capital	Low agriculture income	Difficulty in loaning		
3. Tugumukti	Low agriculture income	Low price of products	Low crop production	Unemployment of farm labors in dry season	
4. Gekbrong	Lack of capital	Low agriculture income	Difficulty in loaning		
5. Cisurupan	Low agriculture income	Low price of products	High price of farm inputs	Low crop production	No agro-processing activities
6. Tanjungkarya	Lack of capital	Low agriculture income	Difficulty in loaning		
7. Mekarmukti	Lack of capital	Low agriculture income	Difficulty in loaning		
8. Cisantana	Low agriculture income	Low crop production	Low price of products		

Further causes of the direct causes (or causes of the direct causes) in the above table were similar in all the model areas. For easy understanding of problems in the model areas, these causes are classified into (i) production infrastructure, (ii) production technology, (iii) production inputs, (iv) outputs marketing, (v) agricultural supporting services, and (vi) others, and described below (problems derived from corresponding cause are presented in parenthesis).

a) Production infrastructure

- Inadequacy or insufficiency of irrigation facility (difficult dry season cropping, low crop production, difficult control of cropping season, etc.)
- Poor condition of village road (little availability of middlemen, difficult sale of products, etc.)

b) Production technology

- Lack of vegetable production technology (high damage of pest/ disease, low crop production, low quality of products, etc.)
- Lack of soil management technology（high damage of pest/ disease, low crop production, etc.）

c) Production inputs

- Expensive farm inputs（small application/utilization of farm inputs, inappropriate plant management, etc.）
- Expensive and difficult obtaining improved seeds（low crop production, low quality of products, etc.）
- Expensive and difficult obtaining compost fertilizer（small input of compost fertilizer, soil deterioration, etc.）
- Lack of production tools and machinery (inappropriate chemical spraying, difficult pump irrigation, etc.)

d) Outputs marketing

- Low price and large fluctuation of vegetable price (low agriculture income, instability of agriculture income, etc.)
- Low quality of vegetable products (low price for sale, etc.)

e) Agricultural supporting service

- Difficult obtaining loan (insufficient application/ utilization of farm inputs, etc.)
- Insufficient availability of extension service (lack of vegetable production technology, week farmers' organization, etc.)

f) Others

- Shortage of land (high cropping intensity, injury by continuous cropping, increase application of agro-chemical, etc.)
- Many non-certificate land (difficult loaning, etc.)
- Shortage of farm labors (inappropriate crop management, increased production cost, etc.)
- Lack of farmers' organizational capability (difficult loaning, difficult joint purchase of farm inputs, difficult joint sale of products, etc.)

(4) Objective Analysis and Identification of Project Approaches

In the workshop of each model area, the objective tree was prepared. Based on the objective tree, the project approaches were then identified for each model area. The identified project approaches are summarized in the table below (the results of examination made on the project approaches are presented in Annex III).

Project Approaches Identified on Objective Trees

Approach	①	②	③	④	⑤	⑥	⑦	⑧
1. Irrigation facility improvement/ development	YES	YES	YES	YES	YES	YES	YES	YES
2. Village road improvement	YES			YES				YES
3. Vegetable production technology improvement	YES	YES	YES	YES	YES	YES	YES	YES
4. Vegetable products quality improvement	YES	YES	YES	YES	YES	YES	YES	YES
5. Farmers' organization activation	YES	YES	YES	YES	YES	YES	YES	YES
6. Agricultural supporting service improvement	YES	YES	YES	YES	YES	YES	YES	YES
7. Land certification program promotion	YES	YES		YES		YES	YES	
8. Farm road improvement						YES		
9. Agro-processing industry development					YES			

①Mekarjaya ④Gekbrong ⑦Mekarmukti
②Langensari ⑤Cisurupan ⑧Cisantana
③Tugumukti ⑥Tanjungkarya

(5) Selection of Project Approaches

Based on the concept that the agriculture and rural society should be developed in an integrated manner, the selection of the project approaches was carried out. In the selection, issues examined were as follows:

1) As a result of an examination made on project components for each approach, the "irrigation facility improvement/development approach" and the "vegetable production technology improvement approach" were combined into the "vegetable production system improvement approach". This combined approach was then selected.
2) The "marketing road improvement approach", the "vegetable products quality improvement approach" and the "farm road improvement approach" were combined into the "vegetable products marketing system improvement approach". This combined approach was also selected.
3) The "land certification program promotion approach" was not selected considering its probability of achieving objectives and size of target group. In the land certification program, landowners are usually requested to spend a lot of money and time (low probability of achieving objectives). In addition, this approach supports only owner farmers and not tenant farmers (small size of target group).
4) The "agro-processing industry development approach" was not selected considering that this approach would be necessary after the achievement of "farmers' organization activation" (low probability of achieving objectives).
5) The "farmers' organization activation approach" was selected so as to cover the component expected in the "agricultural supporting service improvement

approach". Under this approach, the project itself would assist farmers and farmers' organizations.

The selected three approaches consisting of (i) vegetable production technology improvement, (ii) vegetable products marketing system improvement, and (iii) farmers' organization activation are proposed to be implemented in all the model areas, although the project "inputs" under these approaches would be different between the model areas. The selected approaches in each model area are then summarized as follows.

Approaches Selected for Model Areas

Approach	①	②	③	④	⑤	⑥	⑦	⑧
1. Vegetable production technology improvement	YES	YES	YES	YES	YES	YES	YES	YES
2. Vegetable products marketing system improvement	YES	YES	YES	YES	YES	YES	YES	YES
3. Farmers' organization activation	YES	YES	YES	YES	YES	YES	YES	YES

①Mekarjaya ④Gekbrong ⑦Mekarmukti
②Langensari ⑤Cisurupan ⑧Cisantana
③Tugumukti ⑥Tanjungkarya

3.2.2 Development Necessity and Potentials of Highland Area

(1) Necessity of Highland Area Development

In order to promote the strong support to the successful implementation of the national development plan as well as agricultural sector development plan, the Department of Agriculture has implemented the "Gema Fortina 2003" with the main objectives of :

- Increasing of productivity of horticulture crops,
- Contribution to earning of foreign exchange by export of horticultural products,
- Increase of income of the people,
- Promotion of improvement of national diet condition

on the basis of the strategies of the production increase by means of the superior horticulture crops in the appropriate locations, and organizing and activation of farmers association. However, the horticulture production technology, distribution of qualified seeds, marketing system including collection and packaging technology, agricultural extension services, etc., remain insufficient. Those conditions keep the horticultural productivity low.

The population living in the highland area is inherently positioned in the limited

agricultural land of paddy and upland fields, thus the agricultural land per farmer is low compared with the flat and low elevated paddy areas. The development schemes and government supports to the highland area have been comparatively less than those in the low land areas, so the agricultural productivity of highland area is left behind. Despite the high potential of crop diversification, the farmers income, therefore, are generally low.

As described in Section 3.2.1, the development needs in the Study area are in general similar in all the model areas, being highy attributable to low agricultural income as the core problem, and less job opportunity in the dry season, low productivity and low prices of vegetable crops. The areas are, however, distinguished with different land tenure condition, land holding sizes, productivity, post-harvest handling, and infrastructure condition, among which the most influential factor to the farm household economy is the agricultural production type. On the basis of the agricultural production constraints, the model areas will be grouped into the following four types:

1) Area requiring production increase technology of vegetable cropping

In order to utilize the limited farmland, farmers have introduced the horticulture cropping under intensive agriculture. Due to the lack of farmers' technology of horticulture cropping and government support services, the vegetable productivity remains low.

2) Area requiring sustainable agricultural technology for vegetable cropping

Farmers have long practiced intensive vegetable cropping, using high agricultural inputs, such as agro-chemicals and fertilizers. As sustainable agricultural production technology is required.

3) Area requiring land productivity through introduction of crop diversification

Paddy cropping is predominant because of comparatively sufficient irrigation water. Farmers intend to introduce vegetable cropping for raising the land productivity and income generation.

4) Area requiring agricultural infrastructure improvement

Vegetable cropping in the dry season is limited due to lack or heavy damage of agricultural infrastructure especially of irrigation facilities. To increase the irrigation area in the dry season and stabilize the cropping, urgent improvement of the irrigation facilities is required.

The eight model areas are widely scattered in the highland of West Java from the east to west. The development needs and development constraints, which were revealed through this Study, are likely to be a common subject to be solved in the other highland area in West Java (see Chapter 2). In order to improve the present conditions under the combined development constraints, it is prerequisite to apply the integrated agricultural development approach.

The highland development will contribute much to the rapid improvement of the farmers' income because the project effect on the basis of vegetable production is expected to accrue in a short term. It further plays an important role of the sustainable vegetable production to be managed with active operation of farmers' cooperatives, diversification of diet demands, and environmental conservation in a long term.

(2) Development Potentials of the Study Area

The Study area is located in the highland of West Java Province, that has been acknowledged to be a suitable area for crop diversification and vegetable production in the master plan of the Third Umbrella Cooperation as one of four agro-ecosystems of agriculture in Indonesian. The Study area is blessed with the following development potentials for promotion of vegetable production:

1) Agro-climate suitability

The Study areas, except Mekarmukti, are located in the tropical highland area having the elevation of 900 m to 1200 in which the temperate climate prevails with the annual average minimum temperature of approximately 15°C to 20° C. The highland areas are highly suitable for temperate and sub-tropical vegetable production.

2) Agro-economic suitability

The Study areas are located near large consumption cities, such as Jakarta, Bandung and Cirebon, for which the food demands will further increase and diversify together with the regional economic development. The trunk roads to the urban consumption cities are well developed and the access to the large consumption cities is superior to other major vegetable production areas in Indonesia.

3) Agricultural Condition

Most farmers in the Study area have practiced the superior vegetable production like potatoes, tomatoes, cabbage, etc. which are those with higher economic values and higher market demands, and high price competitiveness.

4) Available irrigation water source

Surface irrigation water resources from the small rivers and springs are available, which will be economically usable. Farmers are currently confronted with drought damages or no cropping is being made in the dry season. With provision/improvement of irrigation facilities, cropping will be stabilized and increased in the dry season.

5) Market Information Network

The Department of Agriculture has established the market information centers in the highland area for collection and dissemination of market prices of the commodities by use of public radio broadcasting system.

6) Vegetable Research and Technology Extension System

The Department of Agriculture and West Java Agricultural Service Office have established a vegetable research institute, extension offices and horticulture crop seed distribution centers in the highland areas.

3.2.3 Basic Concept of Development Plan

(1) Strategies of Integrated Agricultural and Rural Development

On the basis of the development needs of the model areas which were confirmed by the participatory analysis (PCM workshop), and with the principle reference to the national policy to promote the decentralization, and agricultural sector direction to encourage the increase of agricultural productivity and farmers' income, the development strategy of the integrated agricultural and rural development in highland area is determined as shown below.

(Target group)	:	Farmers in the model area
(Super goal)	:	The model development in highland area is extended to other highland potential area.
(Project purpose)	:	The farmers' income and living standard are improved through promotion of vegetable cropping.
(Project output)	:	(1) Vegetable production system is improved. (2) Marketing system of vegetable products is improved. (3) Farmers' organizations are activated in agricultural production.
(Target year)	:	Five years after the commencement of the project work.

In order to realize the project outputs, the following project activities are

implemented:

1) Improvement of vegetable production system
   - Improvement/extension of irrigation facilities
   - Establishment of linkage with the research institutes of vegetables and agricultural extension service offices by set-up and operation of adaptive trial farm
   - Operation of farmers' field schools to demonstrate advanced technology of vegetable growing with farmers' participation
2) Improvement of vegetable marketing system
   - Improvement/construction of collection and packaging center for vegetables
   - Improvement of market road
   - Farmers' guidance for market-oriented cropping system with involvement of private sector
3) Activation of farmers' organizations for active agricultural production
   - Farmers' guidance for organizing farmers' associations including farmers cooperatives, farm water users association and rural water users association.
   - Guidance to farmers' associations for O&M of the facilities constructed, irrigation water management, joint purchase of agricultural inputs, joint selling of agricultural products, post harvest handling, farmers credit, and association management.

Besides, to monitor and evaluate the project works, the following monitoring and evaluation activities are carried out:

- Project benefit monitoring and evaluation
- Environmental impacts monitoring and evaluation

The Project activities to be undertaken by the Project are conceptually shown in Figure 3.2.1

(2) Basic Approach to Project Implementation

The integrated agricultural and rural development project herein formulated includes various project components for development and consolidation of infrastructure facilities as well as for reinforcement and/or activation of farmers associations to be organized. Although it will be required to carry out such wide-ranged project works in collaboration with the concerned government authorities, the Task Team which is responsible for and will manage the project works will be established at each government office level. The field task team will be

organized in the subdistrict agricultural service office which is the actual execution body for rural/agricultural development works in line with the Government's decentralization policy. The project components are shown in Table 3.2.1, together with the responsible offices and collaboration offices.

The project aims at the enhancement of farmers' income and living conditions by means of agricultural infrastructure improvement, formation of farmers organizations and provision of agricultural support services through active operation of farmers organizations. To attain the project objectives effectively, it is desired to adopt the participatory development approach with reference to the farmers opinion and with discussions with them.

With the project works, various supporting services such as institutional set-up and technical guidance to the farmers will be provided after completion of the infrastructure improvement. The participatory development of the model area project will provide the local government officials concerned with the practical knowledge and experience from the planning stage to the operation stage of the Project. The experience and lessons learnt through the Project implementation can be utilized to the development of the other highland areas.

In order to implement the project with various components effectively, and taking into account the model aspect for the highland area development, it will be required first to implement the model areas, which have the high development potentials, and development needs. The successful implementation of high potential area is also the best means to attain the demonstration effect.

As descried in section 3.2.1, although the farmers in highland areas are confronted with various kinds of development, the income and living condition enhancement selected as the project purpose is the common and urgent subjects awaiting solution in 8 model areas. The development of eight (8) model areas, therefore, could be divided into the following two stages:

1) Priority Model Development

The first stage development aims to establish the technical and implementing base as a model area which will have to be the core to demonstrate the effects of the integrated agricultural and rural development. Selection of the priority model areas can be made with due attention to the duties given to the first stage development (see Chapter 4

2) Second Stage Development

The development needs of the remaining model area was confirmed high in this Study. One of the project purposes is to extend the highland project

development in other potential areas. It is desirable to implement the remaining model areas as the second stage development, which have been left behind the development up to the present.

During the first stage development, the feasibility study for the remaining areas will be carried out, referring to the result of the first stage project implementation. Further the project identification of other highland areas will also be desirable in the first stage by applying the planning procedures applied in this study.

3.2.4 Supply and Demand of Targeted Vegetables and Vegetable Price Prospects

(1) Analysis of Supply-Demand Balance of the Target Vegetables

The future balance between supply and demand for the target vegetables has been estimated. The estimations are based on the following process and factors:

(a) Projection of total production
(b) Projection of total supply
(c) Projection of total demand on the basis of the following projection
- Projection of consumption per capita
- Projection of population
- Projection of Total Demand

(d) Balance between Supply and Demand

(Main Sources of Data for the estimations: SUSENAS 1987, 1993, 1996)

The resulting estimates of supply-demand balance are presented in the following table and summarized below.

- The demand for tomatoes is in excess of its domestic supply since the year 2000 until to the year 2010.
- The supply-demand balance of chilies also shows the same trend.
- The supply-demand balance of cabbages exhibits the opposite trend, from the year 2000 to the year 2010. The supply of cabbages is in excess of its demand from the year 2000 until to the year 2010.
- The supply-demand balance of red onion exhibits a mixed trend. From the year 2000 until to the year 2004, the supply is in excess of its demand. In the year 2005, the excess will disappear and supply become balanced with its demand. After the year 2006 until to the year 2010, the demand for red onion becomes higher than its supply.
- A similar trend also occurs in the case of supply-demand balance of garlic. From the year 2000 until the year 2005, the supply of garlic is

in excess of its demand. But, the reversed supply-demand balance condition will occur from the year 2006 until to 2010. During this period of time, it is predicted that the demand for garlic will be higher than its supply.

Estimates of Supply-Demand Balance of Some Major Vegetables

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cabbage	+	+	+	+	+	+	+	+	+	+	+
Tomatoes	-	-	-	-	-	-	-	-	-	-	-
Red onion	+	+	+	+	+	0	-	-	-	-	-
Chili	-	-	-	-	-	-	-	-	-	-	-
Garlic	+	+	+	+	+	+	-	-	-	-	-

Notes: (+) = excess supply, (-) = excess demand, (0) = no excess
Source: JICA Study Team

(2) The Prospects of Vegetable Prices in the Markets

These predictions are relevant only from the viewpoint of the economic theory of a market. According to this theory, when excess osupply occurs in a market, the price of the traded commodity will tend to decline to make its buyers willing to buy more so as to settle the excess. By contrast, the price will tend to increase when excess of demand prevails in the market. In other words, the price will act as an effective means to make an adjustment in the market whenever supply and demand is not at a balanced condition.

By applying this economic theory of market to the context of supply-demand balances explained above, one may foresee the following future price trends for the studied vegetables. The price of cabbage will have a declining trend through out the period of 2000-2010. Conversely, the prices of tomatoes and chillies will have the tendency to increase during this period of time. In the case of red onion, the following mixed price trend will occur. The price of red onion will have the tendency to decrease during the period of 2000-2004, and then become stable in the year 2005. After this time, during the period of 2006-2010, the price of red onion will have the tendency to increase. A very similar trend of price will be applied to the case of garlic. At the early part of the studied period (i.e. 2000-2005), the price of garlic will have the tendency to decline. After this time, the price of garlic will have the tendency to increase.

This discussion is concerned only about future trends of annual average prices of these major vegetables. It gives no information regarding the extent of their monthly price fluctuations. Such information is also important for production management decision. So the extent of monthly price fluctuations in four local

vegetable markets and wholesale vegetable markets was investigated.

1) Local market
   (a) Lembang and Ciwidey vegetable markets, both located in the District of Bandung,
   (b) Cipanas vegetable market, located in the District of Cianjur and
   (c) Cikajang vegetable market located in the District of Garut,
2) Whole sales market
   (a) Caringin vegetable market, located in the City of Bandung and
   (b) Kramat Jati vegetable market, located in the City of Jakarta.

All these markets have potential for selling of vegetables, which are produced in the proposed model areas.

The investigation results are presented in Annex VIII. The following conclusions may be drawn from those results. First, all the vegetables exhibit high monthly price fluctuation at all levels of market. Second, the magnitudes of monthly price fluctuation are, however, much more pronounced for chilies and red onion than for cabbage and tomatoes. Third, there is a tendency that magnitude of monthly price fluctuation increases when annual average price increases, and vice versa.

Such phenomena of monthly price fluctuation of vegetables are attributable to their production and product characteristics such as high seasonality of production and high perishability of product. Theoretically, these characteristics are improveable. In the context of upland vegetables, a major factor behind the high seasonality of production is insufficiency and insecurity of irrigation water, especially in the dry season. This could be overcome by developing irrigation system. Meanwhile, the development of transportation system and post harvest technology and processing facilities including grading and standardization system, as well as packaging system could effectively improve the perishability of vegetable products. All these would not only have the effect on improving the extent of monthly price fluctuations of vegetables, but also lead to the improvement of future trends of annual average prices of vegetables.

3.2.5 Basic Concept of Agricultural and Horticultural Development Plan

Attainment of project purpose of PDM, “To increase farmers income through stabilization of vegetable production” should require i) expansion of planted area of vegetables to be profitable; ii) stable production of vegetable; iii) producing of

competitive vegetables in the market with high quality; and iv) vegetable production to meet needs of consumers and market channels.

General strategies and approaches of horticulture development in the model areas are:

a) To increase production of temperate vegetables using favorite natural conditions of the tropical highland for large consumers markets of Jakarta and Bandung,
b) To improve quality of vegetable products to get them competitive in the market,
c) To realize constant/steady vegetable production through the year in order to reduce influence from market price fluctuation,
d) To introduce ecological/sustainable farming system for environment/soil conservation and safety of products to consumers health,
e) To extend improved farming technology through farmers group,
f) To activate supply of inputs (seeds, fertilizer and agro-chemicals) and marketing of products through farmers organization by collaboration with private sector, and
g) To create employment opportunities through intensive vegetable production.

3.2.6 Basic Concept of Rural Infrastructure Development

(1) Irrigation and Drainage Development

The basic concept and development approach in the model areas are as follows:

a) Improvement of irrigation efficiency
b) Introduction of the irrigation system suitable for vegetable cultivation
c) Introduction of the irrigation system, which requires “easy and low cost” O&M
d) Technical transfer to the water users at the implementation stage so that the users themselves could manage O&M works after the completion of the project.
e) The irrigation area will be determined primarily aiming at even distribution of limited water sources.

(2) Rural Road Improvement

The basic concept and development approach in the model areas are as follows:

a) As the marketing facilities, the roads should connect the market and the model area. Extent of road improvement should be determined in accordance with to this concept.

b) Taking into consideration the small land holding size, O&M roads of the proposed irrigation system will take a part of the roles of the marketing road

(3) Rural Water Supply Development

Considering common conditions on rural water supply in the model areas, namely "unstable water sources", "concurrence with irrigation", the rural water supply will be developed with the following concept.

a) Water supply development for the areas of which present water sources for drinking are proposed as the water sources of the irrigation development plan of the Study,
b) Water supply development for the areas of which drinking water source is "dug-well" which often dries up.
c) O&M by water users

(4) Marketing facilities

a) Development of marketing facilities primarily aims at reduction of losses in the course of handling processes.
b) Collection centers will be installed at every farmers' groups (Kelompok Tani) and the O&M works will be done by the groups themselves.
c) The center will have a capacity of storing and processing harvests of two days.

3.2.7 Basic Concept of Extension Service for Vegetable Production

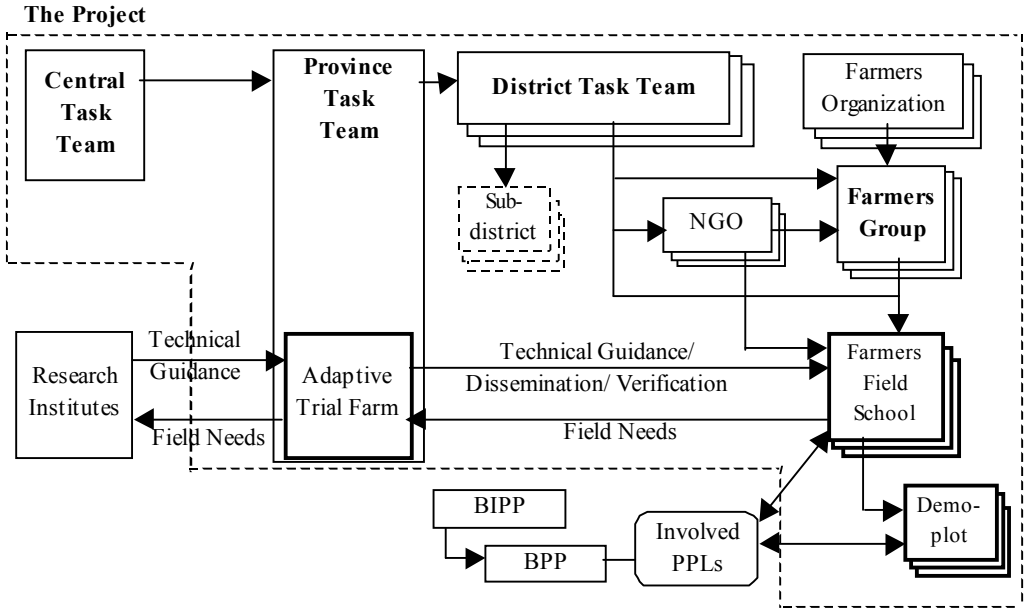
Strategies and approaches of improvement of vegetable farming technology are:

a) To disseminate improved farming technology through Farmers Field School (FFS) to farmers,
b) To train farmers by verification and demonstration of improved farming technology at Demonstration Plots (Demo-plots) in farmers' field,
c) To provide FFS for dissemination of improved farming system and voluntary activities of farmers groups,
d) To establish Adaptive Trial Farm (ATF) at existing Margahayu BBU at Lembang, which will be a technical core of vegetable cultivation in the Project. Activities of the ATF are: i) to experiment newly-introduced vegetables and varieties, ii) to collect information/data of vegetable farming from research institutes and private sector, and to provide them to the model areas, iii) to provide technical guidance for FFS and Demo-Plot, and iv) to train and demonstrate improved farming technology of vegetables to the Task

Team and leader farmers, and

e) To train PPL on vegetable farming through involvement in FFS and Demo-plot activities.

Framework of Improvement of Vegetable Farming Technology is shown below:



3.2.8 Basic Concept of Marketing System Improvement

(1) Framework of Improvement Plan

1) Shipping with standard quality

Most farmers in the production area are sorting and grading vegetables before delivery. But traders in urban market have to conduct re-grading of the products after arrival from the production area. This means sorting and grading done by producer farmers do not reflect market or consumer requirements. In Kramat Jati market on October 25, 1999, potatoes from Garut were sold at Rp.3,500/kg, Rp.3,200/kg and Rp.3,000/kg for class A, B, and C, respectively. Shop owner in the market had done this grading. Vegetable shipping (sorting and grading) is required on the basis of the information of what consumers want or need, in order to attain that the quality is improved, and the total sales amount of production is increased, and finally the farmers' income is increased.

2) Careful handling during post harvest treatment

The present post-harvest treatment procedure deteriorates the quality of vegetables. In most cases, the sorting, grading, and packaging are carried

out in the field without any sunshade, and the packaged product before delivery remains at the roadside without sunshade. Direct sun or heat attack affects taste and shelf life of the products because vegetables are perishable commodities. It is first required to avoid damages by heat with better post-harvest treatment. Transportation of vegetables to urban market during cool time in a day, namely evening or early morning, is also required.

3) Planning of cropping pattern

With implementation of the Project, the cropping season will be adjusted with irrigation water supply so as to ensure the strategic production in the areas, since the price fluctuation of vegetables comes from unstable supply to the market. Farmers should be aware of the past tendency of vegetable prices in the urban markets and the market demand by introduction of contract-base cropping, visiting wholesales markets, etc., and then they have to decide crop variety and most preferable planting time. For adopting appropriate cropping, favorable agro-ecosystem in the area can be fully utilized.

Implementing all the above mentioned training scheme should be done in collaboration with PPL and PIP in the district. Upgrading the capability of PPL is essential prior to the implementation of farmers' training.

(2) Improvement of Collection Center

As mentioned in the previous section, six villages already have collection and distribution centers of vegetables, although they are simple. Two villages have no collection centers as yet due to small production or narrow road in the villages. Even in the villages that have already installed the collection center, sorting and grading are carried out in the field or roadside without any sunshade and on bare ground. One of the reasons for this is that the number of collection center is not enough. Sub-centers of simple structure but with roof in a small area in every village are required. The use of the collection center will help farmers to obtain the knowledge of joint work for sorting, grading and joint delivery of their product. The bargaining power of the farmers can also be made available by the joint work. This provides a good opportunity for farmers forming farmers' cooperative in the village.

The general plan of shipping and packing facility (collection center) is as follows:

In order to attain the quality improvement of vegetables after harvest, the existing collection and distribution centers must be improved, and additional centers must be provided.

A simple structure is desirable, but concrete floor and roof are the minimum requirement. When farmers utilize a standard grading table, consequently the size of grading can be uniformed. Where there is land space available in the village, it is also recommended to have a simple storage structure with a high roof and shelf but no wall. This type of storage structure can be used for short term storage of the products before delivery such as for tomato, red onion, carrot and potato but not for leafy vegetables.

Taking into account the limited land, limited market road condition in the Study area, and O&M and management method of the centers, the following general plan is proposed:

(a) O&M body	:	Farmers' group (Kelompok Tani) consisting of about 25 farmers having fields of approximately 10 ha
(b)) Location	:	Beside rural market road or other available land
(c) Handling capacity	:	Equivalence to production volume of one farmers' group approximately of 5-10 tons

The definite locations and designs of the collection centers will be determined for the selected priority model areas and detailed site inspection through the farmers participation.

(3) Operation and Maintenance Plan

Farmers' cooperatives will be organized in model area. It will be responsible for O&M of the center and administration of collecting, shipping and accounting matters of vegetable marketing. The farmers' cooperative will be established before commencement of the improvement/construction works or at least before the completion of village collection and distribution center.

The expenses for O&M of the collection center in village have to be borne by beneficiaries. To sustain the O&M of the center, a fund deposit system is conceived, as the advanced farmers' groups in West Java Province have applied for the similar cases. At every shipment, the certain percentage of sale amount, namely 5 to 10%, will be collected from users of the collection center.

The O&M method to be applied is the sole matter of the farmers, but before commencement of the Project, the beneficiary's O&M method must be confirmed, not only for the beneficiary responsibility of O&M of facilities but also for the sound operation and management.

3.2.9 Basic Concept of Activation of Farmers' Organizations

The farmers' organizations are activated according to the basic approaches below.

a) The organizational supporting plan is to be formulated aiming at creation of self-reliant farmers' organizations focussing on the farmer beneficiaries in the proposed irrigation development area in each model area. Within this frame, the Project will provide support to the "Farm Water Users Association" and "Farmers' Cooperative".

b) Farm Water Users Association is expected to be responsible for the operation and maintenance of the proposed irrigation facilities. This organization is essentially necessary for sustainable utilization and operation of the irrigation facility. The Farmers' Cooperative is expected to support the production activities of the member farmers in joint purchase of farm inputs, joint collection and delivery of vegetable products and supply of agricultural credit.

c) In addition to these two organizations, the Project will provide the support to the "Rural Water Supply Users Association" in the model areas where rural water supply for domestic use is programmed under the Project.

d) Although the proposed farmers' organizations have basically to be established and operated by the farmers themselves, the Project will not directly support the farmers and farmers' organizations in their establishment and operation. The Project supports to the farmers' organizations are to be planned focussing on their motivation and organizational management capacity improvement by providing training.

e) In the light of the unstable farmers' economy in the model areas, however, the project supporting activities should be practical ones that provide a certain incentive to the farmer beneficiaries or member farmers. For instance, the member farmers can possibly be hired as labors in the irrigation construction works, and thus a certain proportion of their wages can be paid for membership fee when they join the farmers' organizations.

f) The training program has to be provided based on the area specific needs of model area and/or individual farmers which will be identified through discussions with the farmers. Direct use of existing manuals from the previous training program should be avoided.

The discussion meetings will be held with the farmers for the establishment of new organizations in collaboration with the relevant agencies in charge of the farmers' organizations, i.e. District Cooperative Office for the farmers'

cooperatives and Public Works Office for the water users associations and rural water supply users associations. Once they are established, the new organizations will be registered both at Subdistrict administration office and the relevant agencies, expecting their ordinary supports.

After formation of the cooperatives, their own efforts for strengthening the operation fund of the cooperative, such as the membership deposit, compulsory saving, etc. are required. However, at the initial stage of the operation, the lack of the operation fund of the cooperative is foreseen, that will hinder the brisk activities and growth of the cooperative. Both the task team and the cooperative should study the special credit program to support the farmers' economic activities and look for the government facilities available for this purpose.

The Project will continue its support to the established organizations in their daily activities. Such support will be provided within the organizational frame of the project implementation office. The District Task Team will directly be responsible for the model area(s) in accordance with the guidance from the Provincial Task Team. In addition, the village coordinators to be hired by the Project will take responsibility for the supporting activities in each model area. The supporting activities of the village coordinators will be carried out in accordance with guidance provided by the District Task Team.

In addition, the special farmer-training program will be provided to the leaders of the respective organizations as follows.

a) Initial leader training will be provided in Bandung for two leaders of the respective organizations from all the model areas. This training will focus on the expected role and objectives of the newly established organizations. It is also expected that the leaders from different model areas will understand each other and the conditions of other model areas.
b) Overseas training will be provided for two leaders of the Farmers' Cooperative in each model area. In this training, the leaders will visit advanced farmer cooperatives in vegetable production areas in abroad and learn the development needs of their cooperatives.
c) Periodical training will be provided for the leaders of farmer groups (estimated to be 61 persons) twice a year in Bandung. The objective of this training is to identify the problems in their model areas and the solution for such problems through the discussions among the leaders.

The project supporting activities for the farmers' organization should be carried out taking the following issues into account.

a) Among the eight model areas, the participation rate to the farmers'

organizations is comparatively high in Langensari, Tanjungkarya, and Cisantana, and all these model areas are classified as better-income area. Accordingly, particularly for the Farmers' Cooperatives, it is necessary to increase member farmers gradually, from rich farmers at the initial stage to poor farmers at the next stage.

b) Powerful farmer leaders are already available in Tugumukti and Gekbrong, and they support small farmers in supply of farm inputs and crop marketing, etc. In the organization establishment, therefore, how to co-exist with these powerful leaders have to be examined involving the village authorities.

c) Mekarjaya is categorized as the area having many poor farmers. The participation rate to the farmers' organizations is also low. It is therefore expected that the Project will face a lot of difficulties in its organizational development in this model area. The project support is thus necessary to be provided intensively to this model area.

d) KOPTAN has been established in Mekarjaya. It is therefore necessary to have discussion with this KOPTAN and related organizations for re-organization of KOPTAN into the irrigation command area.

e) The farmers should be informed sufficiently of the importance for selection of the chairman, accountant, other office bearers on the basis of the sound operation and management of the farmers' organization.