

3.4 Future Environmental Impacts and Mitigation Measures

3.4.1 Result of Screening and Initial Scoping

Environmental screening and scoping were carried out to identify and assess the potential adverse impacts on the environment by using environmental checklist as shown in Annex VII. As results of the screening and scoping, the following six matters are considered as potential environmental issues and/or effects.

(1) Forest Disturbance in the forestland

The intake sites of Gekbrong, Mekarjaya, and Cisantana are located in the conservation forest or production forest of the national forestlands. On the implementation of the projects, the disturbance in the present forestland may be caused by cutting tree and inundation of the forestland by the construction of intake facilities.

Since the development activities at the sites will center on the rehabilitation and/or improvement works of existing facilities, it is assumed that the disturbance size into and effects to the forest will be small. This will be a reasonable trade-off between decrease of forest area and reduction of further encroachment through stabilization of farm economy, if the proper management activities will be conducted on the construction stage against cutting, improper disposal, etc. However, a detailed survey like as an EIA study might be required depending on the development size. Therefore, the requirement of an EIA study should be decided through close discussions with BAPEDAL, when the rehabilitation plan will be changed drastically.

(2) Health hazard and water pollution by high application of agro-inputs

This problem is one of the potential problems in most of the sites, if the present condition is left as it is. In Mekarjaya and Mekarmukti, especially, the dosage level of agrochemical is relatively lower due to the limitation of farm capital and irrigation water. Therefore, it is possible to say that both areas have a potential to increase the agrochemical dosage drastically from the present level. The potential for misusing and mishandling is assumed higher in Mekarmukti, since the site will change the cropping system from paddy cultivation to vegetable cultivation (horticulture cropping). Hence, it is essential to promote the environment-friendly agriculture through strengthening the agricultural extension service.

(3) Water pollution into drainage water and groundwater

Water pollution into drainage water and groundwater is also a present

environmental problem for most of the sites. For the same reason given previously, the water pollution is accelerated by high application of agro-inputs through introduction of intensive horticulture farming. Since Mekarjaya, Tanjungkarya, Cisurupan, Cisantana and Mekarmukti have paddy fields in the downstream areas, the polluted water might be distributed to other villages and cause adverse effects in the villages, such as increase of incidence of diarrhea disease. Therefore, the promotion of environment-friendly agriculture is also important for mitigating the water pollution.

(4) Social conflict in village

Most of the model areas just cover parts of the village. Especially in Langensari, Tugumukti and Cisurupan, the direct beneficiary is limited since the project activities are limited into the parts of the villages. On the other hand, the proposed project in Mekarmukti and Cisantana covers almost all the area of village. Limiting beneficiaries among the villages may induce a social conflict between villagers. As for Cisurupan, villagers outside the model area presently complain about those of the model area because of the unequal support. In this connection, the discontent might be accelerated by the implementation of the project, unless attention is paid to the villagers outside the model area in village Cisurupan.

(5) Improvement of living condition of rural life

Farm income will directly increase through stabilization of farm product and improvement of marketing system. In addition, the accessibility to domestic water will directly contribute to improvement of living conditions in the model areas. The purpose of the project is set up as “To improve living standards through increase of farmer’s income”, as clearly defined in the PDMs attached in Main report.

(6) Improvement of regional economic situation

The project works will generate incremental employment of casual labor at the construction stage, though not permanently. In addition, the increase in agricultural production will induce economic activities in other sectors through linkage effect. The secondary or tertiary benefits will accrue in any sectors related to agriculture, such as traders and wholesalers.

The prospective impacts without mitigation measures are assessed as shown below.

Environmental Issues	MK	TG	LG	GK	MR	TJ	CR	CS
1. Forest disturbance	+	-	-	++	-	-	-	+
2. Health hazard	++	+	+	+	++	+	+	+
3. Water pollution into drain and groundwater	++	+	+	+	++	+	+	+
4. Social conflict	-	+	+	+	-	+	++	-
5. Improvement of living condition	+++	++	++	++	+++	+++	++	++
6. Improvement of economic situation	+++	+++	+++	+++	+++	+++	+++	+++

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

MK: Mekarjaya

TG: Tanjungkarya

LG: Langensari

GK: Gekbrong

MR: Mekarmukti

TJ: Tanjungkarya

CR: Cisurupan

CS: Cisantana

3.4.2 Environmental Conservation Plan (Environmental Mitigation Measures)

The objectives of the environmental conservation plan are to mitigate any environmental adverse impacts caused by the implementation of the project and to ensure the sustainability of the project. Therefore, the plan is formulated based on the present and future environmental issues. Consequently, the following are recommended as the basic concepts for environmental conservation plan for each development stage (Details : see Annex VII):

(1) Construction Stage

1) Application of proper construction works

The construction activities for rehabilitation/improvement of irrigation system and rural road in rainy season may cause soil erosion and finally deterioration of water quality due to the inflow of eroded soil. Improper construction methods which leave soil exposed unnecessarily might also cause soil erosion. The mitigation measures to be taken for avoiding any soil erosion are that:

- i) construction would be undertaken by employing proper construction methods; and
- ii) disposal of cut and fill materials would be made in a right way.

2) Slope protection of road and canal embankments

In Mekarjaya, Mekarmukti, and Cisurupan, soil erosion from embankment of canal is one of the causes for inefficiency of the irrigation system. In addition, as for the rural road improvement activities, the slope protection works should also be taken to avoid soil erosion and to ensure sustainability of the roads. Considering the cost effectiveness, the re-vegetation by seeding on slope and utilization of surface soil for fill material are recommended as the protection measures to be applied for slope protection.

(2) Operating Stage

1) Promotion of Environment-friendly Agriculture in the sites

Promotion and implementation of environment-friendly agriculture are essential to ensure the sustainable land management through reduction of dosage of chemical inputs. It can be expected not only to improve the environmental condition but also to achieve stabilization of farm economy through reduction of production costs. The following are recommended for the techniques of environment-friendly agriculture.

- i) Introduction of Integrated Pest Management (IPM) system
- ii) Utilization of slow-acting fertilizer (e.g. coating fertilizer)
- iii) Introduction of crop rotation and mix cropping
- iv) Utilization of bio-chemical and organic fertilizer
- v) Improvement of farming practices (e.g. spacing, fertilizing, grafting, etc.)

2) Distribution of project benefit

Through the project implementation, the outsiders (non-beneficiaries) can be expected to directly benefit by i) increase of employment opportunity for casual labor on construction stage and ii) increase of employment opportunity for farm labor in dry season. In addition, rural development activities will contribute to mitigating the discontent of the outside area. In this connection, if the water supply systems in model villages of Langensari, Tugumukti, and Tanjungkarya are incorporated into the development components, the social conflicts in these areas are considered minor or neglected. In order to prevent and improve the situation, especially in Cisurupan, it is recommended to establish a stock fund to secure the capital for future development, since it is difficult to cover whole of village by rural development components.

3) Promotion of Soil Conservation

The following matters are considered as future issues in the model areas regarding soil erosion.

- i) Erosion in farmlands due to improper soil conservation
- ii) Erosion in riverbank and embankment of canals

Although these issues will not be induced directly by the project, they will affect the sustainability of the project. Therefore, they have to be dealt with and mitigated in the project activities. The conservation measures for them are considered as follows:

- 1) Promotion of soil conservation with proper farm management

To promote soil conservation measures for the area, it is recommended that the following steps be taken depending on the present conservation level.

Recommendable Soil Conservation Method

Present level	Measures	Model areas
No conservation / Primitive methods on slope land	Contour bund and strip row are recommended for the soil conservation measures at initial stage for farmers to easily introduce the measures. One of the constraints for introduction of strip row is that farmers think the strip row cause the poor growth of crops by the crop competition. Therefore, useful crops for soil management and farmers economy should be selected and presented for them. Recommended crops and trees are presented in Annex VII.	Mekarjaya Tanjungkarya
No conservation / Primitive methods on gentle slope land	Contour bund or strip row is recommended as the soil conservation measures for sustainable management. Recommended crops and trees are presented in Annex VII.	Gekbrong
Terrace land (but insufficient)	Most of the terrace land cannot completely protect the soil erosion, since the present bench terrace adopted in the sites is incomplete. Completing land terrace is closely connected with agronomic technology. Therefore, it is essential to present them another means to drain water from the fields sustainable way. In addition, it is also important to promote introduction of cover crops on the edge of terrace for ensuring sustainable management of terrace.	All sites
Others	Mulching measure is rarely found in the model areas. It is considered that the situation is related with availability of mulching material. In stead of mulching, the introduction of cover crops is more utilizable and realistic in the model areas.	All sites

It is recommended to build up the collaborative relationship between agricultural and forestry services in order to attain the comprehensive supporting service. Reinforcement of the rural extension center's function in each Kecamatan is one of the options for the improvement.

2) Re-vegetation and/or tree cropping in canal bank and intake site

At present, the soil erosion from canal bank is observed in the Cisurupan and Mekarmukti sites. Farmers in both sites have also recognized it adversely affect to the canal systems because they are compelled to clean canal every year. The soil erosion on the bank is caused for the following reasons.

- i) poor vegetation or denudation on the slope of bank
- ii) land slide of bank caused by farming activities (such as poor drain system, over cultivation, etc.) on the top of bank

As for the Mekarjaya site, the sloping area around the proposed intake site of Cikuya spring and river course of Cremes river are not covered by

vegetation. Unless some erosion protection measures are adapted on these areas, sedimentation into irrigation systems (canals, intake, ponds, etc.) may occur in future. In this connection, the following measures should be taken on these areas to improve present situation.

- i) Re-vegetation and plantation of tree crops (such as fruit trees)
- ii) Restriction of utilization in top of bank and establish tree crop area
- iii) Establishment of drainage system on the top of bank

The environmental conservation measures required for each model area are summarized below.

Environmental Conservation Measures for Each Model Area

Item	Site
1. Construction Stage	
i) Application of proper construction works	All sites
ii) Slope protection of road and canal embankment	All sites
2. Operation Stage	
i) Promotion of environment-friendly agriculture	All sites
ii) Distribution of project benefit to non-beneficiary	Cisurupan
iii) Soil conservation (by on-farm management)	All sites
iv) Soil conservation (by land management)	Tanjungkarya, Cisurupan, Mekarjaya

3.4.3 Environmental Monitoring Plan

From environmental viewpoints, the following are to be monitored in the project.

- (1) Water pollution in drainage and groundwater by agro-inputs
- (2) Other effects induced by the agrochemical application

The outlines of monitoring plans for both issues are noted below. However, since it describes only the outlines in this report because of the shortage of study periods, a further study needs to be conducted to formulate a realistic environmental monitoring plan. The further study will clarify the items to be monitored, the baseline of indicators, and institutional framework for monitoring activities.

- (1) Water Quality of Drainage and Groundwater
 - a) Sampling sites (Related model areas)
 - Drainage water: Cisantana, Gekbrong, Tanjungkarya, and Mekarjaya
 - Groundwater: Cisurupan, Langensari, Tugumukti, and Tanjungkarya
 - b) Sampling methods

Water Sampling from:

- Drainage (river water): surface water in down reaches of the model areas
- Dugwell: groundwater in downstream area of village and in the model areas

Frequency of Sampling: at least once a crop season (2 to 3 times per year)

Survey items

- Physio-chemical substances (pH, EC, SS, DO)
- Organo-chemical substances (COD, NH₄-N, NO₂-N, NO₃-N, T-N, T-P)
- Agro-chemicals

Implementing agency of monitoring

The sampling will be carried out by district agricultural service office, generally. However, the analysis will be entrusted to other institutions, such as BALITSA (Balei Punelithian Sayuran).

(2) Other Effects induced by the Agrochemical Application

Other than the water pollution, several adverse effects might be induced by the high application of agrochemical. To prevent any adverse effects beforehand, it is recommended to take the following monitoring works.

- 1) Sampling sites (Related model areas): All sites
- 2) Monitoring items
 - i) Residual level of agrochemical in vegetables
 - ii) Accumulation level of agrochemical in the soil
 - iii) Farmers intention and agrochemical application level
 - iv) Cases of health hazard caused by agrochemical use
- 3) Sampling activities

To grasp the relationship between farming practice and affected levels, an interview survey has to be conducted in the fields of sampled area of items i) and ii).

The activities are:

- i) Sampling of several kinds of vegetables;
- ii) Sampling of surface soils in the same area with sampled area of vegetable;
- iii) Interview survey to farm household (the cultivators on the sampled area)

to grasp the application level and intention of agrochemical usage; and
iv) Interview to health clinic and chief of villages.

4) Monitoring period and frequency

Periodic monitoring should be conducted as least twice a year

5) Implementing agency of monitoring

These activities will also be carried out by district or provincial agricultural service office, mainly. However, the analysis works for agrochemical accumulation level in soils and vegetables will be entrusted to the BALITSA (Balai Punelithian Sayuran).

3.5 Basic Plan of Project Implementation

3.5.1 Implementation Agency

With reference to the implementation arrangement of existing foreign aid projects in West Java Province, the preliminary plan of project implementation is prepared as described below.

The Project implementation agency will be the Directorate General of Agricultural Infrastructure and Facilities (DGAIF) at the central level responsible for implementation of the Project with respect to the overall project monitoring and evaluation of the project implementation. It is recommended to establish the “Project Management Office (PMO)” under the control of DGAIF. The decision-making matters of PMO will be entrusted to the Directors of the Directorate of Rehabilitation and Land Development (DRLD) and Directorate of Irrigation Water Management (DIWM), who will act as the supervisor of PMO on behalf of the Director General of DGAIF.

The Provincial Agricultural Service Office will be the executing agency of the implementation of the Project. For the effective execution of the project works locating in several Districts, it is recommended to establish the Project Implementation Unit (PIU) in the Provincial Agricultural Service Office, which will be responsible for planning of budget, implementation, and technical guidance to the sub-district Task Teams to be mentioned below.

For coordinating the Project works, the Provincial Coordination Committee (PCC) will be established which will be composed of the representatives from the following provincial government offices and agencies: BAPPEDA, Public Work Service Office, Cooperative Service Office, Counseling Team of Improvement of Family Welfare, and Agricultural Service Office. The major duties and responsibilities of each member office will be as follows:

- BAPPEDA : Overall planning and budgeting
- Agricultural Service Office : Project implementation plan and budget schedule
- Public Work Service Office : Rehabilitation and construction of irrigation facilities, market road, rural water supply facilities and collection and distribution center, and
- Cooperative Service Office : Formation of farmers cooperative
- Counseling Team of Improvement: Improvement of family welfare especially for WID
Family Welfare

The District Agricultural Service Offices will be responsible for the field operation of the project. For this purpose field Task Teams are appointed, which will carry out the supervision of rural facilities improvement, guidance to farmers of formation of farmers organization, introduction of appropriate production technology, improvement of post harvest handling, management of farmers organization in collaboration with the supporting offices.

At the district level, a District Coordination Committee (DCC) will be established under the control of Bupati, which will comprise the agencies same as the Provincial Coordination Committee at the District level. DCC will be responsible for coordination at the District level relating to infrastructure improvement works, guidance of farmers organization, which will be made in collaboration with the supporting office.

The organization chart of the project implementation is shown in Figure 3.5.1.

3.5.2 Participatory Approach to the Project Implementation

The target group of the project is the farmers in the model area. The active operation of the farmers' organizations to be formed with the project will enable the sustainable operation. In implementing the project it is prerequisite to apply the participatory approaches to ensure the successful implementation. Throughout the planning to the O&M stages, it is required to reflect the farmers opinions through the discussions with the farmers, thereby active participation of the farmers and organizational self-reliance will be expected.

With reference to the existing ongoing projects in the around the project area, the participatory approaches to be considered in project implementation will be as follows:

(1) Planning stage

In this Study stage, the farmers needs were confirmed by means of the PCM workshops, which are the basis of the project formulation. The feasibility study is scheduled to extend this approach.

(2) Implementation of infrastructure improvement

There exist two types in the participatory implementation in on-going agricultural and rural development projects with foreign aids in West Java Province, e.g., beneficiary participation and non-beneficiary participation. Some projects on the basis of local budget are executed by means of bottom-up system with beneficiary

sharing of the cost. Participation of the beneficiaries for the project will be examined in the next study stage.

(3) Guidance to the farmers organizations and O&M

The guidance to the farmers organization is in principle executed with the farmers participation . The farmers field schools will be conducted in the farmers' fields, which will provide the basis of the joint works of the farmers groups.

O&M of the rural facilities will be conducted by the beneficiary organizations to be formed with the Project.

3.5.3 Implementation Plan

The overall goal of the Project is that the model development is expanded over the highland area of the West Java as well as the other highland areas. As mentioned in Section 3.2.3, it is proposed to implement the development of the highland areas with the following three development stages:

- First Stage Development: Development for the priority model areas to be selected through the second stage on the Study
- Second Stage Development: Development of the remaining model areas for which the general development plan is formulated in this Study
- Third Stage Development: Development of the potential highland areas in North Sumatra, East Java, Central Java and West Java

The time span of the project implementation is set to be three years. During the three years, the rural infrastructure improvement, formation of farmers' organizations and guidance to them will be carried out. The general plan of the project implementation will be as follows:

(1) First Year

- Overall implementation schedule including budget schedule,
- Set-up of implementation organization at respective levels,
- Improvement of existing building and facilities for adaptive trial farm,
- Preparation of technical guide books, manuals,
- Training of the staff of technical task teams,
- Preparation for the rural infrastructure improvement such as survey, design

(2) Second Year

- Improvement/construction of rural infrastructures
- Operation of adaptive trial farm and farmers field school.
- Guidance of formation of farmers organizations
- Preparation of the development plan (feasibility study) for remaining model areas for the Second Stage Development
- Monitoring and evaluation of project benefits and environmental impacts

(3) Third Year

- Operation of adaptive trial farm and farmers field school.
- Guidance of the farmers organizations
- Monitoring and evaluation of the project effects

The scope of the project works covers not only the agricultural infrastructures but also software portion such as guidance to farmers in horticulture production technology improvement, formation of farmers' associations, and management of farmers' associations. The project will be implemented with the initiative of the district task team at the field level in accordance with the Government policy of local autonomy as proposed in Chapter 3.5.1. Those works will be a new challenge for district task teams. With the limited numbers of the staff to be assigned and their limited experience to the similar types of the project works in mind, the support to the task team from the external technical group will be required.

It is proposed that during the First Stage Development Period, the external expert group will provide the technical transfer to the district task team, that will gain a wide range of such knowledge and experience as project formulation, formation of farmers' association, guidance to them, etc. Through the First Stage Development Project works, the experienced task teams can provide the important and effective role for encouraging the Second Stage and Third Stage Development.

The development sequence of the First to Third Development and task team as well as external experts groups is shown below.

General Implementation Schedule

	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year
Priority Model Mreas	← First Development →						
Preparation of Project Work							
Agricultural Infrastructure							
Formation of Framers Association							
Training of Farmer Associations							
Monitoring and Eevaluation	●	●	●	●	●	●	●
Preparation of F/S of 2nd Stage Development							
Remaining Model Areas			← Second Development →				
Preparation of Project Work							
Agricultural Infrastructure							
Formation of Framers Association							
Training of Farmer Associations							
Monitoring and Eevaluation			●	●	●	●	●
Preparation of F/S of 3rd Stage Development							
Other Highland Areas				← Third Development →			
Preparation of Project Work							
Agricultural Infrastructure							
Formation of Framers Association							
Training of Farmer Associations							
Monitoring and Eevaluation				●	●	●	
Task Team and External Expert							
• Task Team 1st Stage Development							
2nd Stage Development							
3rd Stage Development							
• External Expert							

3.6 Project Impacts and Preliminary Evaluation

3.6.1 Economic Impacts

The economic impacts of the Project will consist of the following four items:

(1) Improvement of vegetable production system

1) Increase in irrigation area

With improvement of irrigation system, cropping area of vegetables in the dry season will increase. The areas with provision of irrigation system will reach 679 ha in all eight model areas, and annual cropping areas will increase to 1,585 ha (cropping intensity of 233 %).

2) Increase in unit yields and improvement of quality

Stable supply of irrigation water and improvement of vegetable production technology, unit yields of vegetables in the dry season will increase and be stabilized. Further extension of improved vegetable production technology the unit yield increase and quality improvement can be expected.

3) Introduction of high benefitable vegetables

With introduction of crop diversification and improved technology of cropping, high valued vegetables can be introduced and thereby the economic aspect of farming will be much improved.

Through establishing of the stable vegetable production system, the production of vegetables in the dry season will be increased, which will enable selling the vegetables in the vegetable off-season when the in-coming volumes to the market are limited. The production system is much ecumenically superior to the other vegetable producing areas, resulting in enhancement of farmers' income and living standards, and contributing to the stable supply of the vegetables to the people in the rural people in the adjacent.

(2) Improvement of marketing system of vegetable products

1) Reduction of production loss before shipping

With improvement of post-harvest handling process and rural market roads, damages and quality degradation on the vegetables will decrease, minimizing the production loss and ensuring high sales values.

2) Acquiring high prices by standardized products.

Attaining of Standardized commodities and improved packages will gain the high values of commodities shipped to the markets.

3) Reduction of O&M cost of transportation vehicles

Traffic condition will be improved by the road improvement, so O&M cost of vehicles will be saved.

4) Reduction of O&M cost of rural market roads.

Besides, O&M cost of road will be saved.

(3) Improvement of rural infrastructure (rural water supply system)

Together with improvement of irrigation system, rural water supply system will be improved where the villagers have been using the same water sources for domestic purpose. Through this rural water supply system, stable water supply is ensured. The improvement of water supply system will contribute much to the enhancement of living conditions in rural areas.

(4) Model demonstration effect

The modern farming technology and value-adding marketing system in the model area will generate the incentives of agribusiness activities to the farmers in and around the model area. The experience on the government staff and farmers concerned in the project implementation will provide the basis for further development in the other highland areas. Besides the farmers in the vicinity of the model areas, government officers concerned in the horticultural development will have the chance to visit the model development area.

3.6.2 Socioeconomic Impacts

(1) Increase of Farmer's Income

Farmers are confronted with unstable agricultural outputs depending on endowed rainfall. With the Project, the farmers' incomes will be increase through stable cropping system and improved marketing system. It leads to the enhancement of living conditions and rural economic development. In addition, improvement of farmers' purchasing power will activate the cash flow in the markets and market activities.

(2) Increase in Employment Opportunities

Employment opportunities for unskilled laborers will be generated during the construction period. The increase in the cropping intensity generates more work for farmers. Post-harvest handling including standardizing process of shipping commodities, manufacturing package materials will generate employment opportunities.

(3) Promotion of joint works and activation of rural organizations

Through the guidance to the farmers' organizations, rural society organization and joint works will be activated.

(4) Market road serving for the rural areas

Improvement of rural market road contributes to improvement of transportation of agricultural production farm inputs and other daily consumption in the rural area as well as communication with other remote areas.

(5) Expansion of Women's Activity

To promote the active operation of farmers' organizations, various guidance inclusive of household welfare will be provided to the farmers/farmers' organizations. Through those guidance and training, the women works will be improved and activity will be expanded. Increase of the farmers' income will also contribute to improve women's activity in not only farm families of the Study area but also other families.

(6) Expansion of Business Chance

With an increase of the farmers' income, the farmer's purchasing power would rise in the rural markets. Particularly, markets of farm inputs and equipment/tools will be more active and this impacts in rural economy would make other markets more active subsequently, which will expand business chances to local non-farmers indirectly.

3.6.3 Environmental Impacts

(1) Sustainable Agriculture

With a view to utilizing and managing limited and valuable land and water resources, proper farming and effective land use systems are required. The development procedure and system by the model development will facilitate efficient and sustainable use of land and water resources, which may be expected to produce sustainable benefit definitely.

(2) Improvement of Living Environment

Under the present intensive agriculture in the model area, excess application of agro-chemicals and fertilizers has occurred. Pollution of the drainage water and groundwater will be accelerated if conditions continue without mitigation measures. The implementation of the project farming technology will contribute to mitigate the living environmental issues.

3.6.4 Preliminary Economic Evaluation

The project formulated here is the model development project, for which the project cost consists of the model area-specific and overall costs. The model development requires the guidance and training for the project execution staff and farmers' organizations. In evaluating the economic viability of the project, the specific cost to the model area will be applied since the economic effect of the model demonstration is large but difficult to evaluate in financial terms. The direct cost and the preliminary estimated benefit accruing from improvement of vegetable production system are as shown below.

(1) Direct cost (see Chapter 3.3 PDM)	
• Specific cost for eight model areas	
Direct cost of infrastructure improvement	7,237 Rp. million
Transfer of technology and technical guidance	5,710 Rp. million
• Overall cost for eight model areas	29,156 Rp. million
Total	42,103 Rp. million
(2) Incremental benefit	
- Project irrigation area	679 ha
- Annual cropping area (cropping intensity %)	1,585 ha (233%)
Vegetables	1,388 ha
Paddy	179 ha
- Annual incremental benefits (preliminary)	6,100 Rp. million

As seen in the above, the annual vegetable cropping areas increases much, and incremental benefit (preliminary estimate) is large. While the direct cost, according to the unit area cost, is within the normal range of these types of work. Therefore a large project effect is expected.

CHAPTER 4 SELECTION OF PRIORITY MODEL AREAS

4.1 Basic Concept of Selection of Priority Model Areas

As mentioned in the previous chapter, present conditions of the Study area regarding socio-economy, agriculture and farming, agricultural supporting services, marketing system, agricultural and rural infrastructures, and environment were clarified. Furthermore, development needs in the Study area were confirmed by means of PCM workshop. According to those results, development stages of agricultural production activities differ to a large extent by model area, and the development needs and potential do as well. Therefore, appropriate countermeasures which meet the actual situations of the model areas should be planned in the course of programming of project implementation. For this, it is necessary to categorize the model areas and select the priority model areas of which development needs, potential, and urgency are high. Considering these conditions, the priority model areas are selected through the following procedure:

- (1) Categorization of the model areas according to relevant indices,
- (2) Evaluation indices are set up on the basis of selection criteria which are described below, and overall priority will be determined by a method that evaluates scores of each evaluation index,
- (3) Model areas where irrigation development programs are being implemented or planned will be excluded from the priority areas by applying a screening method, because certain coordination will be required in the future on O&M of infrastructures, water management and water users' associations within the areas, and
- (4) The priority model area will be selected from each category, according to the overall priority.

4.2 Categorization for Selection of Priority Model Areas

The model areas are categorized according to the following indices:

- Agricultural and Farming Conditions
- Socioeconomic Conditions

4.2.1 Agricultural and Farming Conditions

Agricultural and farming conditions are evaluated according to the following indices which represent the characteristics of eight model areas:

(1) Stage of Introduction of Horticultural Crops

Cultivated crops differ to a large extent depending on natural conditions such as water resources, soils, ground elevation, and agricultural supporting services. Farmers in some areas get equal incomes from paddy rice and vegetables, while others get mainly from the vegetables. It is necessary to diversify the crops from the paddy rice to horticultural crops so that farmers' income and living standard will be improved. Categories of this index are set according to the "percentage of income from paddy rice cultivation to the total agricultural income", on which the model areas are categorized into; i) "Low" (the income from the paddy rice occupies more than 40 % of the total), ii) "Medium" (less than 40 %), and iii) "High" (no income from the paddy rice).

(2) Vegetable Cultivation Technology Level

Due to difference in irrigation water availability, stages of extension of cultivation technology and soil productivity, present vegetable cultivation technology and productivity vary by model area. Accordingly, level of the vegetable cultivation technology is evaluated by model area to be "Low" or "Medium", or "High".

(3) Needs for Urgent Improvement of Agricultural Infrastructures

Improvement of irrigation facilities is required for every model area in order to stabilize or enable vegetable cultivation during the dry season. In particular, the model areas, where only vegetables are planted, requires urgent improvement of the agricultural infrastructures because the vegetable production is much limited by deterioration or absence of the irrigation facilities. The model areas are categorized into "Very urgent", and "Urgent" by this index.

(4) Needs for Sustainable Cultivation Technology

In model areas where intensive farming practices are undertaken with high application of agricultural inputs and labor force, the production level and environmental impact may be beyond the sustainable agriculture due to high dosage of fertilizer and agro-chemicals. For such areas, introducing of technology for sustainable agriculture is necessary. The model areas are categorized into "High", "Medium" or "Low" according to the needs for the sustainable cultivation technology.

4.2.2 Socioeconomic Conditions

According to the socio-economic conditions, the model areas are categorized using the following indices:

(1) Operation Size

The average operation size of farmers varies from 0.87ha to 0.21 ha, which largely affects agricultural income of farm households. The model areas are categorized according to percentage of small operators (less than 0.2 ha) into; “High” (30 % or more small operators), “Medium” (20 to 30 %), and “Low” (less than 20 %).

(2) Income of Farm Household

The model areas are categorized according to amount of farmers’ income, which consists of farm income and non-farm income. The categories are “High” (more than 10 million Rp./household), “Medium” (7 to 10 million Rp./household), and “Low” (less than 7 million Rp./household).

(3) Land Holding Type

The land holding type in the model areas is divided into “owner operator”, “tenant operator”, “owner cum tenant operator” and “non-operational land owner”. The model areas are categorized by percentage of the owner operator, who should be the main constituent of the agricultural production activities, into “High” (the owner operators occupy more than 80 % of the households), “Medium” (40 to 80 %), and “Low” (less than 40 %).

The categorization results are given below:

Result of Categorization

Categorization Index	Model Area							
	1	2	3	4	5	6	7	8
Agriculture and Farming Conditions								
• Stage of Introducing of Horticultural Crops	△	●	●	●	●	○	△	○
• Vegetable Cultivation Technology Level	△	●	●	○	○	△	△	○
• Needs for Urgent Improvement of Agricultural Infrastructures	●	○	○	●	○	○	○	●
• Needs for Introduction of Sustainable Production Technology	△	●	●	△	△	△	△	○
Socio-economic Conditions								
• Percentage of Small Operators	●	●	△	△	●	○	○	○
• Income of Farm Households	△	●	●	○	●	●	△	●
• Land Holding Type	○	△	○	△	○	○	●	○

Model Area			
1:Mekarjaya	2:Langensari	3:Tugumukti	4:Gekbrong
5:Cisurupan	6:Tanjungkarya	7:Mukarmukti	8:Cisantana
Evaluation			
● : High or big ○ : Medium △ : Low or small			

Consequently, the model areas are categorized as follows:

Category 1: Model areas which require crop diversification from the paddy rice to the horticulture crops. The income level of farm households is the lowest among eight model areas. The farm households in the model area which is included in this category belong to the poor.

- **Mekarjaya** and **Mekarmukti** model areas

Category 2: Model areas which require improvement of productivity of the horticultural crops cultivation by extension of improved production technology. Farmers' income level, which differs by operation size, belongs to "Low" or "Medium".

- **Cisurupan** and **Tanjungkarya** model areas

Category 3: Model areas which require urgent improvement of agricultural infrastructures in order to improve the productivity of vegetable cultivation. Farmers' income level belongs to "Medium" or "High".

- **Gekbrong** and **Cisantana** model areas

Category 4: Model areas which require introduction and extension of sustainable agricultural technology. Farmers' income level belongs to "Medium" or "High".

- **Langensari** and **Tugumukti** model areas

4.3 Selection of Priority Model Area

4.3.1 Selection Criteria

The selected priority model areas are supposed to be the models of agricultural development of the highland area. It is necessary that the outcome of the various project activities would be effectively demonstrated. In this context, the following factors are set as the selection criteria:

- (1) High development needs,
- (2) High potential of active operation of farmers organization to be formed,

- (3) High potential of agricultural development for upland crops,
- (4) Urgent needs of agricultural infrastructure improvement/construction, and
- (5) High demonstration effect

4.3.2 Evaluation and Selection of Priority Areas

(1) Evaluation of Overall Priority

To evaluate the five factors, the evaluation indicators, which will sufficiently show the characteristic of the evaluation factors, are selected with judgement standards. The total score is 100 points which are evenly distributed to each evaluation factor (20 points for each factor). The score of evaluation factor is further distributed also evenly to evaluation indicators. The judgement standards are (i) very high (⊙), (ii) high (○), (iii) medium (△) having the relative scores of 100%, 60% and 30%, respectively.

The evaluation factors and indicators with their scores are shown below.

No.	Evaluation Factors and Indicators	Score	
(1)	High Development Needs (a) Contribution to income generation of the poor groups (b) Employment generation effect (c) Necessity of introduction of advanced technology for increasing productivity	20	(7) (7) (6)
(2)	High Potential of Active Operation of Farmers' Organization (a) Potential of active operation of farmers' cooperatives (b) Potential of participatory O&M of infrastructures (c) Contribution of improvement of gender issues	20	(7) (7) (6)
(3)	High Potential of Agricultural Development for Upland Crops <u>Natural Conditions</u> (a) Agro-climate (b) Physiography (c) Soils <u>Agro-economic condition</u> (a) Farmers' intention to promote vegetable growing (b) Familiarity of farmers with vegetable growing (c) Availability of agricultural extension services <u>Marketability</u> (a) Accessibility to urban market (b) Demand size of present vegetable shipping (c) Potential of active operation of post harvest handling	20	7 (3) (2) (2) 7 (3) (2) (2) 6 (2) (2) (2)
(4)	Urgent Needs of Improvement/Construction of Agricultural Infrastructures (a) Present condition of irrigation facilities (b) Effect of improvement of irrigation facilities (c) Easiness of O&M of proposed irrigation facilities	20	(7) (7) (6)
(5)	High Demonstration Effect	20	
	(a) Replicability to other highland areas (b) Representing surrounding potential development areas		10 10

The result of priority evaluation is shown in Table 4.3.1.

(2) Screening of Model Areas Which Have Ongoing Irrigation Development Plan

Cisantana and Cisurupan model areas which have ongoing irrigation development plans in the related villages, are screened out from the priority model areas. The priority model areas which are included in each category are supposed to get passed through the screening criterion.

(3) Selection of the Representative Model Area among Each Category

According to the overall evaluation scores, four representative model areas are selected.

4.4 Priority Model Areas

Through the selection processes the following four model areas were selected as the priority model areas:

- Model area which requires crop diversification from paddy rice to horticulture crops:
Model Area : Mekarjaya
District : Bandung
Sub district : Arjasari
- Model area which requires improvement of productivity of horticulture crops through extension of improved production technology:
Model Area : Tanjungkarya
District : Garut
Sub district : Samarang
- Model area which requires urgent improvement of agricultural infrastructures for the improvement of productivity of horticulture:
Model Area : Gekbrong
District : Cianjur
Sub district : Warungkondang
- Model area which requires introduction and extension of sustainable agricultural technology:
Model Area : Langensari
District : Bandung
Sub district : Lembang

These Category 1 to 4 correspond to the development stage of horticulture crop production. Accordingly, the horticulture crop production areas in the highland

area can be classified into these categories. The areas classified in Category 1, which require the crop diversification by introduction of horticulture crops, are situated at the initial stage of development of horticulture crop cultivation, while the ones in Category 4 which require the technology for sustainable agriculture are situated at the high development stage. The income level of the farm households in the areas of Category 1 remains low, and these areas belong to the poor areas. The income level of those of Category 2 also remains at low or medium level, which should be improved to a large extent. The areas classified into Category 3 or 4 have largely contributed to the horticulture crop production, whereas they have a lot of problems on the vegetable production. The improvement of agricultural infrastructures and/or the introduction of technology for sustainable agriculture for these areas will realize the improvement of the productivity of horticulture cultivation which is required to the horticultural subsector along with the stabilization and enhancement of farmers' income, and will contribute to keep up with diversified food demands of the people of Indonesia.