

JAPAN INTERNATIONAL
COOPERATION AGENCY

DIRECTORATE GENERAL OF
FOOD CROPS AND HORTICULTURE,
THE REPUBLIC OF INDONESIA

THE FEASIBILITY STUDY
ON
INTEGRATED AGRICULTURAL AND RURAL DEVELOPMENT
IN
HIGHLAND AREA IN THE REPUBLIC OF INDONESIA

FINAL REPORT

VOLUME - I

MAIN REPORT

MAY 2000

NIPPON KOEI CO., LTD.

HOKKAIDO ENGINEERING CONSULTANTS CO., LTD.

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PREFACE

In response to the request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct The Feasibility Study on The Integrated Agricultural and Rural Development in Highland Area and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to the Republic of Indonesia a study team headed by Mr.Hiroshi Kuronuma, Nippon Koei CO.,LTD. three times between September, 1999 and March, 2000.

The team held discussions with the officials concerned of the Government of the Republic of Indonesia, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

May, 2000



Kimio Fujita
President
Japan International Cooperation Agency

Mr. Kimio Fujita
The President for
Japan International Cooperation Agency
Tokyo, Japan

May 2000

Dear Sir,

LETTER OF TRANSMITTAL


We are pleased to submit to you the report on the Feasibility Study on the Integrated Agricultural and Rural Development in Highland Area in the Republic of Indonesia. This report presents the results of all works performed in both Indonesia and Japan during a total period of 9 months from September 1999 to May 2000.

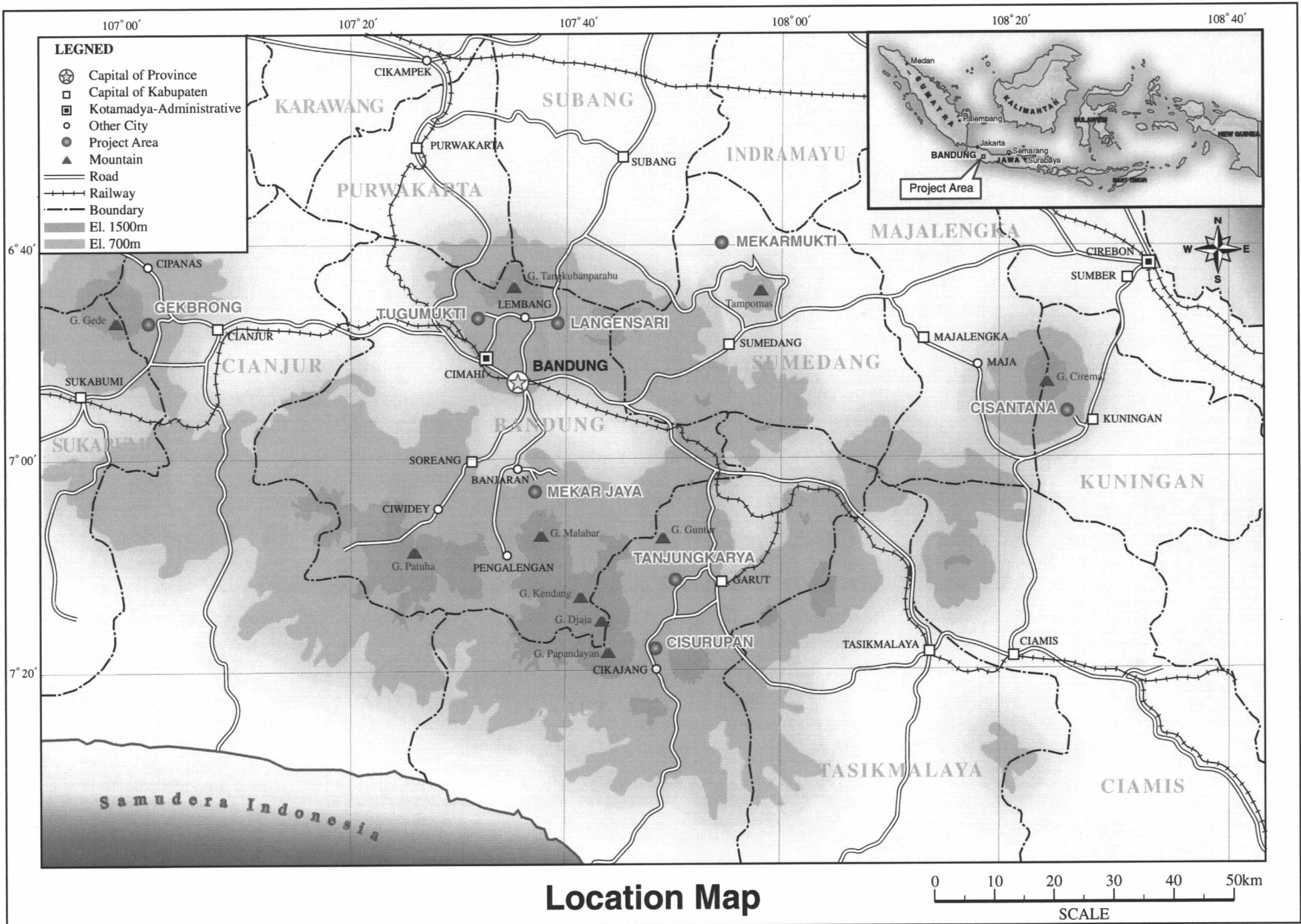
This is a model development project for highland areas, with the project purpose to increase the farmers' income and improve their living standards through stabilization of vegetable production. The Project includes plans to improve the vegetable production system and marketing system of vegetable products, and activate the farmers' organizations in agricultural development.

We are confident that the Project will greatly help increase the farmers' income and improve the living standards of the farmers in and around the Project area and also encourage the agribusiness activities of farmers groups now being demanded by the agriculture sector.

We wish to express our deep appreciation and sincere gratitude to the officials concerned of your agency, the Ministry of Foreign Affairs, the Ministry of Agriculture, Forestry and Fisheries of the Government of Japan for the courtesies and cooperation kindly extended to our team. We also wish to express our hearty appreciation and gratitude to the officials concerned of the Indonesia Office of your Agency, the Embassy of Japan in Indonesia, the Ministry of Agriculture of the Government of Indonesia, Agriculture Service Office of West Java Province, and District Agricultural Service Offices of concerned model areas and other authorities concerned for their close cooperation and assistance extended to our team during the field investigation and studies in Indonesia.

Very truly yours,


Hiroshi Kuronuma
The Leader of the Study



SUMMARY

SECTION I BACKGROUND OF THE PROJECT

Introduction

1. The objectives of the Study are: 1) to conduct the Feasibility Study for selected model areas on the integrated agricultural and rural development in highland areas as a model for further upland agricultural development including maintenance of small scale upland irrigation facilities and farming plan to develop upland agriculture by promoting upland field cropping, and 2) to carry out, in the course of the Study, technology transfer to the Indonesian counterpart personnel concerned.

2. The Study area consists of eight model areas (1,069ha) located in five districts of West Java Province. The model areas consist of: Mekarjaya, Langensari, Tugumukti, Gekbrong, Cisurupan, Tanjungkarya, Mekarmukti and Cisantana. This report is the Final Report, describing the result of the Study conducted in the First Stage and Second Stage Works for a period of 5.5 months from September 19, 1999 to February 29, 2000.

Background of the Project

3. The newly elected government has decided to continue the implementation of the existing agricultural development plan, i.e. the 'Gerakan Mandiri' (abbreviated as 'Gema'). The plan consisted of four subprograms.
 - (1) 'Gema Palagung 2001' program: This program is designed for increasing the production of rice, soybean, and corn with the target of achieving self-sufficiency by the year 2001.
 - (2) 'Gema Proteina 2001' program: This program is set to increase the production of animal products until the year 2001.
 - (3) 'Gema Hortina 2003' program: The program deals with the acceleration of production of tropical horticultural products including vegetables. The program targets to achieve a national production equivalent to US\$ 10 billion and export of horticultural products equivalent to US\$ 600 million by the year 2003.
 - (4) 'Protekan 2003' program: The program is set to increase foreign currency revenues from the exportation of fishery products with a total revenue target of US\$ 10 billion in 2003.

4. The 'Gema Hortina 2003' program is a five-year program, extending from the year 1999 to the year 2003. The program includes four groups of horticulture: (a) vegetables, (b) fruits, (c) flowers, and (d) medicine crops. The vegetable group consists of potatoes, cabbages, chilies, red onion, tomatoes, and mushrooms. The program aims also to promote the consumption of vegetables and fruits by the people to achieve the FAO recommended level of 65 kgs per capita per annum. This would contribute to raising the national demand for vegetables and fruits significantly. The promotion of intensive agriculture by vegetable cropping will contribute to generation of the job opportunities in the rural area, which is prerequisite for rural economic development.

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

The Study Area

Socioeconomic Conditions

5. The main cash income source of households in all model areas is agricultural production. Even in Mekarmukti having the smallest proportion of agriculture income, this proportion is 81% of the average annual cash income of household. Based on the characteristics of farm income sources, the model areas can be classified into the following groups.
- (1) 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.
 - (2) The model area in which paddy production is the major cash income source: Mekarmukti
 - (3) The model area in which both vegetables and paddy production are the major cash income sources: Mekarjaya
 - (4) The model area in which both vegetables and livestock productions are the major cash income sources: Cisantana.

Land Holding and Land Tenure

6. The average sizes of land operated per household are small, ranging from 0.21 ha in Mekarjaya (0.21 ha) to 0.42 in Gekbrong.

Present Condition of Agriculture

7. Vegetable production in five districts relevant with the Study area, which consist of Bandung, Cianjur, Garut, Sumedang, and Kuningan districts, occupies a range between 65% and 70% of the total in West Java province in recent three years. Major vegetables 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), bean vegetables, and carrot.
- (1) In Mekarjaya area, vegetables and palawija^{1/} are grown in both dry and wet seasons, and partly paddy rice in the wet season. The farming technology level of vegetables is relatively low.
 - (2) Langensari area 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 limited land resources and continuous cropping of same crops, the farming system became intensive in terms of farm inputs and labor requirement.
 - (3) Tugumukti area is also one of the most progressive areas of vegetable production. The farming practices are similar with Langensari area. However, due to the shortage of irrigation water in the dry season, the cropping intensity is lower comparing with Langensari.
 - (4) In Gekbrong model area, vegetables and palawija (mainly maize) are planted. Farming technology and productivity are medium to relatively high level.
 - (5) In Cisurupan model area, about 20% of farmers cultivate paddy, and remaining 80% of farmers cultivate mainly vegetables. Farming technology and productivity are relatively high to medium.
 - (6) In Tanjungkarya model area, about 70% of farmers plant paddy in the wet season, and 15% of farmers cultivated only paddy both dry and wet seasons. Farming technology and productivity of vegetables are on medium to low level.
 - (7) Mekarmukti area is occupied mostly by rainfed paddy land. The cropping intensity is low even including palawija, which is mainly soybean planted after paddy using residual soil water. Vegetable cultivation is not being undertaken much in the model area, even in the village.
 - (8) Cisantana model area has a special vegetable, “welsh onion” with high

^{1/} Palawija: Food crops other than paddy (corn, tuber crops and beans)

farming technology and high productivity. The planted area of welsh onion occupies about 70% of the total planted area.

8. 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”. Causes of these problems are arisen from six reasons: ”undeveloped/broken irrigation facilities”, “lack of guidance on vegetable farming technology”, “undeveloped rural marketing system”, “not available crop credit”, “Not available good seeds in village”, and “shortage of compost”.
9. On-farm works are practiced under conditions of extremely intensive labor input. These conditions provide employment opportunities for farm labors and small-holder-farmers. Labor shortage incidentally occurs in the busy season, land preparation and harvest seasons, otherwise, less employment opportunities in off-season for farm labors. Farmers spray agro-chemicals more than once per week in the wet season, and once per two weeks in the dry season for pest/disease control. Farmers require technology on effective fertilizer application, proper control of pest/disease, and credit for input purchase. Shortage of compost is a serious problem in vegetable cultivation. Vegetable seeds of good varieties generally are not available except in big cities such as Bandung and Lembang; therefore, farmers in isolated or distant area from large city, have to use local varieties or recessive seeds. 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.
10. 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. 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 model areas. In Mekarmukti, Gekbrong, Cisurupan, Tanjungkarya Mekarmukti model area, goat and sheep are major animals. Due to the shortage of forage in dry season, increase of animals is limited.
11. Net profits per ha are high in the model areas in which vegetables are mainly planted, and low in the model areas in which food crops are mainly planted.

Present Agricultural Support Services

12. Research Institute for Vegetables (RIV), which is one of the regional research institutes under the Agency of Agricultural Research and Development (AARD) of MOA, is located at Lembang, near Langensari model area. PRAS has units on agricultural technology, Implementation Unit of Technology (UPTD). UPTD for horticulture is located at Sumedang. BBU Marhagayu, which is a branch station of UPTD for horticulture, is located at Lembang adjoining with RIV.
13. Agricultural extension service in Indonesia is a task of district and subdistrict governments under coordination/guidance of KANWIL, PRAS and District Agriculture Service (DIAS). Field extension workers (PPLs) provide extension services at the field level. PPL provides guidance on farming technology through contact farmers to farmers groups. In some villages, PPLs set demonstration plot in farmer's land mainly for technical guidance of food crops. PPLs formulate farmers groups by themselves for technical guidance and credit supply to groups.
14. 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, they generally have little knowledge on vegetable farming.

Marketing System

15. 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 with good access road have an option to select good traders since several traders come to buy vegetables. The villages of the Study area are categorized into the following three groups with respect to the post harvest system:
 - (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
16. 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 into three types depending on the distance to market and the trade volume.
 - (1) Urban Marketing System Type-1:
More than 50% of shipping to Jakarta and the remaining major part to Bandung: Langensari, Tugumukti and Gekbrong
 - (2) Urban Marketing System Type-II:
More than 50% of shipping to Bandung and the remaining major part to Jakarta: Cisurupan and Tanjungkarya
 - (3) Local Marketing System Type:
Majority of shipping to local markets: Mekarjaya, Mekarmukti and Cisurupan
17. The incoming volume of Kramat Jati (Jakarta) market was surveyed on October 24, 1999. The result shows cabbage, potato and Chinese cabbage from West Java Province are dominant, and the major origin of chili and red onion is East Java Province. Nevertheless long distance to Jakarta, some vegetables come from Sumatra and Bali. There is competition of vegetables produced in each province.
18. 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 fluctuate largely almost 10 times, followed by red onion of approximately 6 times. While French bean, potato and carrot show very stable price. In 1998, the price fluctuation of chili, cabbage and French bean ranged between almost 5 to 6 times, while carrot, welsh onion, and potato show rather stable price.
19. From the result of analysis on the incoming volumes and prices of Kramat Jati for the period from January to September 1999, the vegetables are categorized into the following groups with respect to the price elasticity:
 - (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,
20. The market size of Jakarta is 10 times as large as 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:
- (1) 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.
 - (2) The "Commission system" where the trader deducts a certain commission from the product sold.
 - (3) The "Stall tenancy system" where product owner rents a stall from a trader at the market, either on daily or monthly term.

Environment

21. Environmental impact assessment system in the country was originally established in so-called AMDAL (Analisis Mengenai Dampak Lingkungan) in 1986. 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 which require EIA studies. The EIA for this model area development is not required due to small size of development.
22. In case projects are not required to prepare EIA, the 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.
23. Related to vegetation (flora), most of the lands of villages related to the model areas are presently used for agriculture and/or miscellaneous. Some parts of the villages leave the woodlands as the secondary forest or tree crops farm. Wildlife

(fauna) 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.

24. The sloping lands without conservation measures are observed in Mekarjaya. Some of the vegetable fields in Gekbrong, Langensari, and Tugumukti, are cultivated in denuded sloping lands. It is speculated that the fields are rather susceptible to soil erosion since the fields are exposed to heavy rainfall in rainy season. It is often found that the edge and slope of bench terrace are left denuded. In addition, hollows (the farm ridges) in the field on terrace land is often formed vertical way (along the slope). These might also induce a kind of sheet erosion and/or collapse of terrace. It is judged that there is need of improvement of soil conservation measures.
25. Forest and soil conservation extension worker (PKL) is presently providing the extension services for soil conservation since the soil conservation technology is closely related to agronomic field management. To attain the efficient and sustainable land management, agricultural extension worker (PPL) is required to execute the extension services of soil management in collaboration with PKL.
26. Results of water quality analyses on existing drinking water sources show that most water sources are suitable for drinking; 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 (NO₃-N) and nitrite (NO₂-N). This might be associated with high application of nitrogen fertilizer (Urea, Ammonium Sulfate) into the farmlands. High infection of pests and diseases with vegetables compels farmers to apply agrochemicals many times. The continuous and repeated cropping of same crops in a plot is considered as one of reasons for high infection of diseases and pests.
27. Some of the model areas show a high incidence of diarrhea. It might be associated with the poor quality of drinking water or lack of availability of safe water. In fact, the areas without a piped water supply system indicate a relatively high tendency for the diarrhea. It is often found that wastes from villages are dumped in and around the river in Cisantana area. This causes degradation of water quality and may associate with the 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.

28. Based on the results of the field survey, the following are identified as the present environmental issues, and possible environmental issues that may occur in future if the situation is left as it is.
- (1) Health Hazard caused by High Dosage of Agrochemical
 - (2) Water Pollution in Groundwater and Drainage
 - (3) Soil Erosion and Landslide
 - (4) Social Conflict in Water Users in the Area

Development Needs and Basic Development Concept

Development Needs

29. The Department of Agriculture has implemented the “Gema Fortina 2003” for 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. This keeps horticultural productivity low.
30. The Study area is blessed with the following development potentials for promotion of the vegetable production:
- (1) Agro-climate suitability
 - (2) Agro-economic suitability
 - (3) Agricultural Condition
 - (4) Available irrigation water source
 - (5) Market Information Network
 - (6) Vegetable Research and Technology Extension System

Development Strategy

31. On the basis of the development needs of the model areas which were confirmed by the participatory analysis (PCM workshop), and with the principal 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.

32. 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, farmer 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 production, 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

33. The integrated agricultural and rural development project herein formulated includes various projects, which require collaborative work with the concerned government authorities. To manage the project works effectively, a Task Team, which is responsible for and 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 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 discussions with them. The implementation of the model area will provide the local government officials concerned 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 for the development of the other highland areas.
34. In order to implement the project effectively, the model areas must be implemented first, which have high development potentials, and development needs. The successful implementation of high potential area is also the best means to attain the demonstration effect.

Basic Development Plan

35. **Basic Concept of Agricultural and Horticultural Development Plan**
To increase farmers income through stabilization of vegetable production requires: i) expansion of planted area of vegetables, ii) stable production of vegetables; iii) production of competitive vegetables in the market with high quality; and iv) vegetable production to meet needs of consumers and market channels. Strategies and approaches of horticulture development in the model areas are:
- (1) To increase production of temperate vegetables using favorite natural conditions of the tropical highland for large consumers' markets of Jakarta

and Bandung,

- (2) To improve quality of vegetable products for more competitiveness in the market,
- (3) To realize constant/steady vegetable production through the year in order to relieve influence from market price fluctuation,
- (4) To introduce ecological/sustainable farming system for environment/soil conservation and safety of products for consumers' health,
- (5) To extend improved farming technology through farmers' group,
- (6) To activate supply of inputs and marketing of products through farmers' organization by collaboration with private sector, and
- (7) To create employment opportunities through intensive vegetable production.

36 Basic Concept of Vegetable Farming Technology Improvement

Strategies and approaches of improvement of vegetable farming technology are:

- (1) To disseminate improved farming technology to farmers through farmers field school (FFS),
- (2) To train farmers by verification and demonstration of improved farming technology at demonstration plots in farmers' field, which is selected on the proposal of the farmers' cooperative,
- (3) To establish Adaptive Trial Farm (AFT) attached to existing Margahayu BBU at Lembang, which will be a technical core of vegetable cultivation in the Project, in order 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, and iii) to provide technical guidance for FFS and Demo-Plot,
- (4) To train PPL on vegetable farming through involved FFS and Demo-plot activities.

Basic Concept of Agricultural and Rural Infrastructure Development

37 Basic Concept of Irrigation and Drainage Development

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

- (1) Improvement of irrigation efficiency

- (2) Introduction of the irrigation system suitable for vegetable cultivation
- (3) Introduction of the irrigation system, which requires “easy and low cost” O&M
- (4) 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.
- (5) The irrigation area will be determined primarily aiming at even distribution of limited water sources.

38 Basic Concept of Rural Road Improvement

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

- (1) As the marketing facilities, the roads should connect the market and the model area. Extent of road improvement should be determined conformed to this concept
- (2) 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

39 Basic Concept of 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.

- (1) 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,
- (2) Water supply development for the areas of which drinking water source is “dug-well” which often dries up.
- (3) O&M by water users

40. Basic Concept of Marketing Facilities Improvement

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

41. Agricultural and Rural Infrastructure Development Plan (1/2)

Model Area	Development Plan		Cost (mil.Rp.)
Mekarjaya (selected)	Irrigation	<ul style="list-style-type: none"> • Three system: Citiis A-block (intake and pipeline distribution), • Citiis B-block (conveyance and distribution pipeline, farm pond) • Ciremes block (intake and pipeline distribution) 	658.5
Study area 100ha	Road	<ul style="list-style-type: none"> • Access road from the District road be improved (2.3 km) • Village road in the area be improved (1.0 km) 	511.5
Irrigation 100ha	Rural water	<ul style="list-style-type: none"> • Cikuya will be used as “drinking water source” 	-
Langensari (selected)	Irrigation	<ul style="list-style-type: none"> • Portable pump irrigation system along Cikukang river, and streams from Cikareo spring. • Improvement of the existing gravity irrigation at Cipogo river. 	513.1
Study area 72ha	Road	<ul style="list-style-type: none"> • Access road from the village center and/or market will be improved (0.9 km) • Village road in the area be improved (0.3 km) 	211.0
Irrigation 72ha	Rural water	<ul style="list-style-type: none"> • Development of tubewells with hand pumps with public watering spaces. 	240.0
Tugumukti	Irrigation	<ul style="list-style-type: none"> • Improvement of existing irrigation system (DI Cijanggal) • Improvement of intake facilities, • Conveyance and distribution pipelines, • Farm pond 	362.0
Study area 80ha	Road	<ul style="list-style-type: none"> • Operation roads of the irrigation system will be utilized. 	-
Irrigation 50ha	Rural water	<ul style="list-style-type: none"> • Provision of water supply system from the Kali Cimahi river (5 km of conveyance pipeline) for permanent measures, but not included in the Study. 	-
Gekbrong (Selected)	Irrigation	<ul style="list-style-type: none"> • Construction of intake facilities • Conveyance and distribution pipelines, • Farm pond 	401.2
Study area 80ha	Road	<ul style="list-style-type: none"> • Operation roads of the irrigation system will be utilized. 	271.3
Irrigation 50ha	Rural water	<ul style="list-style-type: none"> • Construction of an independent water supply system. • Intake and pipelines to resident areas. 	120.0
Cisurupan	Irrigation	<ul style="list-style-type: none"> • Two irrigation blocks • Construction of intake facilities at Cihareumas spring • Distribution pipelines, 	178.5
Study area 190ha	Road	<ul style="list-style-type: none"> • Operation roads of the irrigation system will be utilized. 	-
Irrigation 40ha	Rural water	<ul style="list-style-type: none"> • Development of tubewells with hand pumps with public watering spaces • Extension of PDAM pipelines 	245.0

Agricultural and Rural Infrastructure Development Plan (2/2)

Model Area	Development Plan		Cost (mil.Rp.)
Tanjungkarya (selected) Study area 130ha Irrigation 80ha	Irri- gation	<ul style="list-style-type: none"> • Cidalalilegak & Tanjungpura block (intake and pipeline distribution), • Cisaat block (two intakes, three main systems and distribution pipelines) • Cilembang block (intake at an existing pond, open main channel, distribution pipelines) 	425.5
	Road	<ul style="list-style-type: none"> • Operation roads of the irrigation system will be utilized. 	-
	Rural water	<ul style="list-style-type: none"> • Direct intake at the springs are recommended. 	-
Mekarmukti Study area 167ha Irrigation 80ha	Irri- gation	<ul style="list-style-type: none"> • Intake at Ciliang spring • Two irrigation blocks (upper 40ha, lower 40ha) • Open canal as conveyance cum main canal • Rotational irrigation • Farm pond for lower clock, • Distribution pipelines 	872.4
	Road	<ul style="list-style-type: none"> • Operation roads of the irrigation system will be utilized. 	-
	Rural water	<ul style="list-style-type: none"> • Existing water supply system (water from Citaleus, Cikurubuk) should be upgraded (not included in the plan) 	-
Cisantana Study area 250ha Irrigation 120ha	Irri- gation	<ul style="list-style-type: none"> • New construction for north-east rainfed vegetable area (2 parallel systems). • Improvement of existing intake • Conveyance and distribution pipelines (2 lines) • Farm pond (x 2) 	937.3
	Road	<ul style="list-style-type: none"> • Operation roads of the irrigation system will be utilized for the new area. • Access road to the village be improved • Village road be improved in the area. (3.0 km in total) 	450.0
	Rural water	<ul style="list-style-type: none"> • Intake and a conveyance pipeline from the No.1 intake. • Improvement of the existing distribution system 	250.0
Common for all the Areas	Collection Center	<ul style="list-style-type: none"> • Construction of building with scales, furniture, sanitation facilities, • One center per Farmers' Group (Kelompok Tani). 	590.0 (for 8 areas)
Total Cost	Eight Model Areas		7,237.3
	Four Priority Areas (Mekarjaya, Langensari, Gekbrong, Tanjungkarya)		3,652.1

Future Environmental Impacts and Mitigation Measures

42. Environmental screening and scoping were carried out to identify and assess the potential adverse impacts. 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
 - (2) Health hazard and water pollution by high application of agro-inputs
 - (3) Water pollution into drainage water and groundwater
 - (4) Social conflict in DESA
 - (5) Improvement of living condition of rural life
 - (6) Improvement of regional economic situation
43. 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. The following are recommended as the basic concepts for environmental conservation plan for each development stage:
- (1) Construction Stage
 - (a) Application of proper construction works
 - (b) Slope protection of road and canal embankments
 - (2) Operation Stage
 - (a) Promotion of environment-friendly agriculture
 - (b) Distribution of project benefit to non-beneficiary
 - (c) Soil conservation (by on-farm management)
 - (d) Soil conservation (by land management)
44. 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 detailed monitoring plan will be prepared in the beginning of the implementation stage. Items to be monitored are water quality of drain and groundwater and effects by agro-chemical use, and other related items.

Basic Plan of Project Implementation

45. 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 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 project work of the model area in that district. 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.

46. 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.

47. The target year of the project is set to be five years after commencement of the project. The first stage development will be executed over three years. During the three years, the rural infrastructure improvement, formation of farmers' organizations and guidance to them will be carried out. Besides the first stage work, preparatory works for implementation of the second stage (implementation program) will be made.

Project Impacts and Preliminary Evaluation

48. The economic impacts of the project will consist of the following four items:
 - (1) Improvement of vegetable production system
 - (a) Increase in irrigation area
 - (b) Increase in unit yields and improvement of quality
 - (c) Introduction of high benefitable vegetables

Through establishing the stable vegetable production system, the production of vegetables in the dry season will be increased, which will enable to sell vegetables to be sold in the offseason when the incoming

volumes to the market are limited. The production system is much economically 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 adjacent rural areas.

- (2) Improvement of marketing system of vegetable products
 - (a) Reduction of production loss before shipping
 - (b) Acquiring high prices by standardized products.
 - (c) Reduction of O&M cost of transportation vehicles
 - (d) Reduction of O&M cost of rural market roads.
- (3) Improvement of rural infrastructure (rural water supply system)
- (4) Model demonstration effect

49. Socioeconomic impacts will include the following:

- (1) Increase of Farmer's Income
- (2) Increase in Employment Opportunities
- (3) Promotion of joint works and activation of rural organizations
- (4) Market roar serving for the rural areas
- (5) Expansion of Women's Activity
- (6) Expansion of Business Chance

50. The project will contribute much to the following environmental conservation:

- (1) Sustainable Agriculture
- (2) Improvement of Living Environment

51. The project formulated here is the model development project, for which the project cost consists of the model area-specific and overall costs. 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 term. The direct cost is estimated to be Rp. 12.9 billion for specific cost and 29.2 for overall cost, totaling Rp. 42.1 billion. The vegetable cropping areas increase much, and large incremental benefit is expected. While, the unit cost per irrigation area is within the economically viable range. The project benefit is judged to be large.

52. The integrated agricultural and rural development plan herein formulated has identified the development plan for eight model areas, and on the basis of the result of the study, four priority model areas were selected for the first implementation. The priority model area is justified, because the priority model area development will significantly contribute to the economic development of the model area as well as the model demonstration effect.

Selection of Priority Areas

53. The priority model areas are selected through the following procedure:
- (1) Categorization of the model areas according to relevant indices for the categorization,
 - (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.
54. 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".

Langsari and Tugumukti model areas

55. 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
56. Through the selection processes, the following four model areas were selected as the priority model areas:
- Category -1 Model area : Crop diversification for the poor
Mekarjaya model area
 - Category-2 Model area: Improved production increase technology:
Tanjungkarya model area
 - Category-3 Model area: Urgent improvement of agricultural infrastructures
Gekbrong model area
 - Category-4 Model area: Sustainable agricultural technology:
Langensari model area

SECTION III INTEGRATED AGRICULTURAL AND RURAL DEVELOPMENT PLAN OF FOUR PRIORITY MODEL AREAS

Basic Approach to Development Plan

Stage-wise Development with Participatory Approach

57. The project formulated here is based on the following basic development approach:

- (1) The selected four model areas remain at the different development stages with respects to the degree of diversification to horticulture crops and farmers' intention and production technique towards horticulture production such as cultivation practices, marketing system, farmers' association, etc. The development of the priority areas, therefore, should be implemented with the stage-wise development approach, with special attention to farmers' different absorptive capacities and willingness.
- (2) To promote self-reliant activities of the farmers' associations and to ensure a sustainable production system after project implementation, a project approach that would lead to farmers dependence on government support should be avoided. Therefore, a participatory approach is required.
- (3) With a view to proceeding with stage-wise development with participatory approach, it will be effective if the less advanced can observe the necessary production and organizational activities of the advanced farmers. It is advantageous to implement the areas jointly with different development stages since the farmers could be aware of the samples of solutions and that would induce multiplier effects among the farmers in the less developed areas. With the project implementation, the advanced area to some extent will be brought about to the more advanced areas within the relatively short term, which will function as a leading areas for development of the model area as well as the other highland area and thereby provide the efficient demonstration effect.

58. Development Plan is formulated according to following development approach.

- (1) Improvement of farming technology and strengthening of extension system
 - Improved farming technology is disseminated systematically through farmers' groups with holding of farmers field school and installation of demonstration plots.
- (2) Improvement of rural marketing system

- Collection centers are installed in each model area, at the same time, required roads for marketing are improved for easy access to market and/or collection centers.
 - Post-harvest handling technology is improved through the training of farmers in farmers field school.
- (3) Improvement of irrigation facilities
- Irrigation facilities are improved to effectively use the limited water sources.
 - Water users' association is organized to enable operation and maintenance by farmers themselves.
 - Rural drinking water supply is improved, in case of the same water source as irrigation facility.
- (4) Empowerment and strengthening of farmers organizations
- Farmers' cooperative (Koperasi Tani) and farmers' group (Kelompok Tani) are organized/ activated for empowerment of farmers. The farmers' group is an activity unit in the farmers' cooperative
 - Major activities of farmers' cooperative consist of joint purchase of farm inputs, joint shipping of products, and application of credit (KUT). In middle-long term, the farmers' cooperative will establish a credit system itself.
- (5) Training of implementation organization and supporting system
- In order to implement the project smoothly, staff of the implementation organization are trained. At the same time the adaptive trial farm is installed for supporting vegetable farming technology as well as accelerating agribusiness activities with participation of middlemen and traders.

Public Hearing Meetings

59. In accordance with the participatory approach upon which the project planning is based, public hearings were conducted in each model area. The efforts were spent to ensure the attendance of local potential beneficiaries, representatives of local government administrations, collaborating offices from district and sub-district levels, and district, provincial, and department counterpart personnel. The attendants counted for 45 to 70 inclusive of counterparts. NGO participated from the preparation of the public hearing. From the discussions at all model areas, it was concluded that topics of presentation were fully understood by all participants including the intended beneficiary farmers. Their full support for the plan and its implementation were granted. Based on the results of the

confirmation and opinions obtained in the public hearings, the proposed development plan is formulated.

Participation of NGO in the Study

60. The participation of NGO is required to hear the opinions and demands of the beneficiary farmers effectively in the Study and project implementation and to ensure the beneficiary's participation. In the Second Stage Works, NGO conducted (a) the preparatory works of public hearings, participation in public hearings, and beneficiaries intentions on the proposed project plans, (b) additional socioeconomic survey inclusive of rural society activities. The project implementation plan is prepared with involvement of NGO according to the result of the experience of hiring NGO in the Study.

Present Condition of Farm Economy

61. The results of the farm economy survey conducted during the second stage clarified the difference in living standards between the model areas, that the living standard is higher in the vegetable oriented areas, and lower in the paddy rice areas.

(Unit:Rp.1000)

	Agricultural Income	Production Cost	Net Agricultural Income	Other Income	Total Net Income	Living Expenditure
Mekarjaya	5,250	2,020	3,230	1,220	4,450	5,240
Tanjungkarya	11,390	5,220	6,170	1,260	7,430	8,170
Gekbrong	9,080	3,990	5,090	390	5,480	5,660
Langensari	15,890	8,060	7,830	1,770	9,600	10,390

Model Areas and Beneficiaries

62. Proposed irrigation area based on the 1:2,000 scale topographic map that was made by the JICA Team, number of beneficiaries in the list prepared by the village, average operating size, number of farmers' group, and estimated farm labors are given in the following table. In Gekbrong, the average land holding size is big, but percentage of tenant farmers and the farm labors is high. The farmers groups have been organized in each model area, but the percentage of farmers that are organized into groups is low at 40%, and they are not very active.

	Proposed irrigation area (ha)	Estimated beneficiaries (nos)	Average land holding size (ha)	Member of farmers group in the village (nos)	Estimated percentage of farm labors (%)
Mekarjaya	83	400	0.21	300	20
Tanjungkarya	77	280	0.28	440	5
Gekbrong	50	120	0.42	180	40
Langensari	58	260	0.22	540	20

Agriculture and Horticulture Development Plan

Improvement of Production Technology

63. The following production technologies will be improved as basic technologies of the vegetable cultivation:

- Crop diversification or rotational cropping technology of paddy rice and vegetables,
- Production and farming technology required for improving of quality of products,
- Introduction of cropping schedule giving priority to marketability and avoiding of continuous cropping injury,
- Erosion control,
- Compost production technology by utilizing rice straws available in the Area, and
- Technology to improve the quality of the products, control of production cost by introducing of ecological farming technology including IPM, consideration on environmental conservation, production technologies of safe vegetables for consumers' health.

Selection of Cropping Schedule and Crop Varieties

64. The cropping schedule is determined as “general cropping schedule of the area” through discussions in the farmers’ group, taking into consideration avoidance of continuous cropping injury and official market information. Proposed crops will be selected mainly from temperate vegetables, which are suitable and advantageous for the cultivation in the Highland Area and marketable, considering levels of farmers’ production technique, marketability, and particular condition of each location. The following crops are proposed:

Vegetables of *Solanum* sp. (tomato, chili, bell pepper, potato), *Cole* sp. (cabbage, chinese cabbage, cauliflower, broccoli), bean vegetables (french bean, long bean, green pea), *Allium* sp. (welsh onion, red onion, garlic, onion), *Oenanthe* sp. (carrot, celery, parsley), *Cucumis* sp. (cucumber,

melon), Gramineae sp. (sweet corn, baby corn), and *Lectuca* sp.(lettuce).

Production of Compost

65. Farmers are purchasing compost from distant producers at present, but they also have the intention to produce by themselves because the cost for purchasing the compost occupies a large part of their production cost. Paddy rice production areas are situated adjacent to the model areas, and production of the compost from rice straw is proposed. Production cost for the compost of 1 kg is estimated approximately at Rp. 50. Four to five months are required for processing, but the production cost will be 50% of purchasing one.

Erosion Control

66. Particularly in Mekarjaya and Gekbrong Model Areas, terrace formation has not been applied for farming, which causes serious soil erosion due to steep topography. Farmers should form terrace steps by themselves. Farming technologies to control the erosion are also proposed coupled with civil works as the terracing, as follows:

- (1) Terrace formation on the steep farm fields
- (2) Control of surface erosion with bunds on the existing terraces such as paddy fields,
- (3) Erosion control works on the long slopes (anti-erosion facilities, afforestation),
- (4) Contour-wise cropping,
- (5) Mulching of soil surface, and
- (6) Covering of soil surface by mixed cropping and/or relay cultivation.

Achievement of the Project Target

67. The target production and benefit will be attained gradually according to the infrastructure improvement such as irrigation facilities, extension of production technologies and through improvement of farmers' economic capability for the vegetable cultivation. The target year of the project is set at five years after completion of the infrastructure improvement. Proposed production in terms of volume and value at the target year is given below. The vegetable production will be 10,830 ton (2.3 times), which is equivalent to 14,500 million Rupiah (1.9 times). Consequently, incremental benefit is estimated at 4,060 million Rupiah.

	Planted area (ha)	Production (ton)	Production (million Rp.)	Production cost (million Rp.)	Incremental Benefit (million Rp.)
Proposed					
vegetables	662	10,831	14,181	7,246	6,935
paddy rice	54	243	340	187	153
total	716	-	14,521	7,433	7,088
Present					
vegetables	331	4,738	6,528	3,867	2,661
paddy rice	159	603	844	544	300
palawija	54	55	199	130	69
total	544	-	7,571	4,541	3,030

Extension Service Plan for Horticulture Crop Production Technology

Extension of Technology

68. It is difficult to implement extension of farming technology of horticulture crops with existing extension system, considering insufficient capability of PPL, shortage of manpower, and lack of compilation of information on vegetable production technology in the field. Extension of technology by the existing institutions consisting of three levels, namely, province, district, and field is proposed for the project implementation in order to overcome these difficulties.

Adaptive Trial Farm by Provincial Task Team

- Collection of technical information on the vegetable cultivation, and provision to the District Task Team with technical guidance
- Preparation of guidelines on extension activities, such as Farmers' Field School, demonstration farm, etc.
- Arrangement for request and inquiry from the field level

Role of District Task Team on Extension of Production Technology

- Preparation of action plans on the field extension
- Operation of Farmers Field School and the demonstration plot
- Training of PPL and NGO

Field Extension Activities at Model Areas

- Execution of the Farmers Field School and establishment of the demonstration plot
- Support and assistance by PPL and NGO for the Farmers Field School and the demonstration plot
- To feed back needs and inquiry from farmers to the Task Team

Farmers Field School

69. Farmers Field School will be carried out getting guidance from the District Task

Team, but the operation itself will be taken over by the farmers themselves, which is also a purpose of the school, that is to improve capability of self-reliant operation by farmers themselves. NGO and PPL will support and assist their operation and activities on the field. Subjects held at the school will be determined covering various fields on the basis of farmers' needs, consisting of market information, demand and need in the market, post harvest treatment, production technology of compost, improvement of living and dietary conditions with women's participation, etc. Seminars and workshops will be held from time to time, selecting issues and procedures in which farmers would get interested, such as study tour to the progressive production areas and/or market places, lectures by the Task Team or external resources.

Demonstration Plot

70. Demonstration plots are proposed aiming at extending improved farming technology by demonstration of new vegetable production technology and varieties. The demonstration plot will be one of the places where the Farmers Field School is held. A demonstration plot will be allocated in each farmers' group. The demonstration plot should be one which is being cultivated and is located at a place of easy access and of high demonstration effect. Location of the demonstration plot will be selected by the farmers' group considering these conditions. The demonstration plot will basically be shifted year by year. Area of a demonstration plot will be 400 m² to 600 m². Management of production and farming will be carried out by the operator of the farm himself, getting instruction and a farming manual made by the District Task Team.

71. Improvement of Post Harvest Handling Technology

	Mekarjaya	Tanjungkarya	Gekbrong	Langensari
Collection center - Place - Capacity - Facility	2 places 3 tons/day Platform, Office, Storage, Fence, Gate, Parking space,	5 places 2 tons/day Platform, Office, Storage, Fence, Gate, Parking space,	3 Places 2 tons/day Platform, Office, Storage, Fence, Gate, Parking space,	2 places 5 tons/day Platform, Office, Storage, Fence, Gate, Parking space,
Improvement of Post Harvest Technology - Collection of Market Information and Dissemination	Caringin Market in Bandung, Local market in Banjaran, Kab. Bandung	Caringin Market in Bandung, Local market in Cikajang, Kab. Garut	Kramat Jati Market in Jakarta, Local market in Cipanas, Kab. Cianjur.	Kramat Jati Market in Jakarta, Caringin Market in Bandung, Local market in Lembang.
- Works at Collection Center	Preliminary Sorting, Grading by Quality and Size.	Preliminary Sorting, Grading by Quality and Size.	Preliminary Sorting, Grading by Quality and Size.	Preliminary Sorting, Grading by Quality and Size. (Packaging)

Management of Collection Center Manager of Center	Farmers Cooperative Staff of Cooperative	Farmers Cooperative Staff of Cooperative	Farmers Cooperative Staff of Cooperative	Farmers Cooperative Staff of Cooperative
Tasks assigned to Manager of Collection Center	Estimation of collection volume, Procurement of packaging materials, Preparation of bills and related accounting works, Preparation of bills for commission fee and money collection, Education and supervision of workers.	Estimation of collection volume, Procurement of packaging materials, Preparation of bills and related accounting works, Preparation of bills for commission fee and money collection, Education and supervision of workers.	Estimation of collection volume, Procurement of packaging materials, Preparation of bills and related accounting works, Preparation of bills for commission fee and money collection, Education and supervision of workers.	Estimation of collection volume, Procurement of packaging materials, Preparation of bills and related accounting works, Preparation of bills for commission fee and money collection, Education and supervision of workers.
Target of Joint Shipping: 3 years after irrigation facility completed.	60% of total production	65% of total production.	70% of total production.	70% of total production.

Activation Plan of Farmers Organizations

Farmers Cooperative

72. In order to attain the target by implementing the proposed plans steadily and smoothly, it will be necessary to activate the farmers' organization by self-reliant operation. Organizing and training of farmers' group (Kelompok Tani) and establishment of farmers' cooperative (Koperasi Tani) which would provide members with supporting services for their production and economic activities, will be performed in the course of the project implementation. The farmers' group will be one of the units of activities of the farmers' cooperative. NGO and PPL will work together for enhancing rate of participation to the organizations getting guidance from the District Task Team. The target participation rate for long term (6 years) is set at 80 to 90% taking into account regional characteristics.
73. The cooperative which also includes paddy rice farmers will be divided into two production groups, i.e., vegetable production group and paddy rice production group. Each group will be provided with services on farming activities, marketing, supply of inputs, credit and saving arrangement, etc. The proposed plan aims at self-reliant operation of the organizations by; i) strengthening of functions of the service sector, ii) strengthening of financial basis of the cooperative, and iii) improvement of capability of operation.

Water Users' Association

74. Water Users' Associations for the irrigation systems which will be constructed by

the project will be established at an early stage of the implementation before commencement of construction works. All the necessary procedures for the establishment will be completed at least by the starting of operation of the facilities. Target participation rate is set at 100 %. It should be clearly explained that only the members are entitled to use the water distributed by the facilities, and O&M works would be managed by the members themselves by providing water charges or labor contribution, whose amount will be determined for individual member according to planted areas.

Training and Guidance for Farmers' Organization

75. Training and guidance for the farmers' organization will be carried out aiming at the self-reliant operation through enlightening, for ordinary and leader farmers. The training and guidance for the ordinary farmers will be conducted at the Farmers' Field School by means of the workshop and/or distribution of leaflets, while those for the leaders will be held by calling them up at one location.

Irrigation and Drainage Improvement Plan

76. Characteristics and conditions, development approach, special consideration, and outlines of the proposed plans of four priority areas as "model of agricultural and rural infrastructure development in Highland Area" are summarized below:

Summary of Irrigation Improvement Plan (1/2)

Item	Mekarjaya	Tanjungkarya	Gekbrong	Langensari
Characteristics and Conditions of the Area	<ul style="list-style-type: none"> • Poor water sources, • Steep and undulating farm land, • Farmers are less proficient at vegetable cultivation 	<ul style="list-style-type: none"> • Abundant water sources, • Comparatively moderate to gentle slope with less undulation. • Farmers are moderately proficient at vegetable cultivation 	<ul style="list-style-type: none"> • Poor water sources, • Moderate to steep topography with little undulation • Farmers are less proficient at vegetable cultivation • Conjunctive use with drinking water. • High percentage of tenant farmers. 	<ul style="list-style-type: none"> • Abundant water sources, but must be pumped up. • Steep and undulating farm land, • Farmers are very proficient at vegetable cultivation

Summary of Irrigation Improvement Plan (2/2)

Development Concept		<ul style="list-style-type: none"> • New development. • Farm pond and pipe line be applied due to water limitation and topographic conditions. 	<ul style="list-style-type: none"> • Rehabilitation • Open channels without storages due to good water source and moderate topography. • Enhancement of canal density by new construction. 	<ul style="list-style-type: none"> • New development. • Farm pond and pipe line be applied due to water limitation and topographic conditions. 	<ul style="list-style-type: none"> • New development and rehabilitation. • Pump is proposed considering farmers' proficiency at vegetable cultivation. • Pipe line be applied due to water limitation and topographic conditions.
Special Consideration in Planning		<ul style="list-style-type: none"> • Sustainable operation of the new system • Guidance to the newly organized WUA (P3A) 	<ul style="list-style-type: none"> • Restructuring of WUA and strengthening of the activities by training and guidance. 	<ul style="list-style-type: none"> • Formation of independent WUA from land ownership. • Guidance to the newly organized WUA (P3A) 	<ul style="list-style-type: none"> • Formation of WUA and guidance • Stock fund by WUA for O&M cost.
Improvement Plan	Irrigation Area	83 ha	77 ha	50 ha	58 ha
	Water source	River/stream	Spring, river/stream	River/stream	Spring, river/stream
	Intake facilities	Weir	Diversion at existing channels/streams, intake box	Weir	Pump (portable, electric), weir, intake box
	Storage facilities	Farm pond (3)	none	Farm pond (1)	Farm pond (2)
	Conveyance & distribution system	PVC pipeline (open type and semi-closed type)	Open channel	PVC pipeline (open type and semi-closed type)	PVC pipeline (closed type), open channel
	Field application	Bucket, hose (manual application)	furrow	Bucket, hose (manual application)	Bucket, hose (manual application), furrow

Rural Market Road Improvement Plan

77. Rural roads also play a significant role as “marketing facility” for agri-business of vegetables in the Highland Area, where geographical conditions are main constraints for regional development. The following road improvement is proposed for the Priority Model Areas as a part of “marketing system development”.

Summary of Rural Market Road Development

Item	Mekarjaya	Tanjungkarya	Gekbrong	Langensari
Present conditions and characteristics	<ul style="list-style-type: none"> • Poor condition of access road from the village to the market, • Poor condition of main market road in the village. 	<ul style="list-style-type: none"> • Low density of road network • Long distance from the production area to the main market road 	<ul style="list-style-type: none"> • Poor condition of main market road in the village 	<ul style="list-style-type: none"> • Poor condition of main market road in the village

Concept of improvement	<ul style="list-style-type: none"> • Improvement of access to the outside market. • Improvement of access to inside the village 	<ul style="list-style-type: none"> • Improvement of market access within inside the village 	<ul style="list-style-type: none"> • Improvement of market access to inside the village 	<ul style="list-style-type: none"> • Improvement of market access to inside the village
Improvement plan	<ul style="list-style-type: none"> • Improvement of 2300 m from the village to the District road. • Improvement of 1,400 m of main village road. 	<ul style="list-style-type: none"> • Improvement of 400 m from the village center. • New construction of 800 m to a collection center. 	<ul style="list-style-type: none"> • Improvement of 1000 m of main village road. 	<ul style="list-style-type: none"> • Improvement of 1100 m of main village road.

Collection Center Improvement Plan

78. As a component of marketing system improvement plan, collection centers are proposed in each priority model area as follows:

Collection Center Development

Item	Mekarjaya	Tanjungkarya	Gekbrong	Langensari
Number of Centers	2	5	3	2
Capacity (area) of Platform	40 m ²	34 m ²	34 m ²	56 m ²
Proposed Facilities (common)	<ul style="list-style-type: none"> • Platform (for sorting, packing, storage) • Washing place (9 m²) • Bathroom • Office cum equipment stock (9 m²) • Indoor storage (9 m²) • Furniture • Scale • Telephone • Facsimile • Electricity • Water supply • Parking space • Space for keeping deposit 			

With respect to the cold storage facilities for vegetables in collection center, the following plan is proposed. Traders in Jakarta Kramatjati market and Bandung Caringin market who import fruits are currently using refrigerators only for imported fruits, but not for preservation of vegetables. This is because the vegetables to be stored in the refrigerators are limited to potatoes and onions and the maintenance cost (electric charge) is large. The maintenance cost of the refrigerator is a heavy burden on the farmers. So the proposed collection center will be provided with night storage having a high roof, without partition walls and without cold storage facilities.

Rural Water Supply Improvement Plan

79. According to the following basic concept, development of rural water supply is proposed for Gekbrong and Langensari Model Area.
- Area of which proposed water source for irrigation is also used for “drinking purpose” (Gekbrong), and
 - Area where the drinking water source is often dried up and the agricultural activities are seriously affected (Langensari).

Rural Water Supply Development

Item	Gekbrong	Langensari
Characteristics and conditions	Water from the Cibelong river, the only water source of the area, is used conjunctively for irrigation and domestic purposes. Existing system is owned by a private land owner. The irrigation area located upstream of the residential area, villagers are suffering from chronic water shortage.	Residential areas are located at higher elevation on ridges. People take water from dug wells (about 30 m deep)
Planning Parameters	<ul style="list-style-type: none"> • Target population 1,700 (Year 2,010) • Unit water demand 90 lit/person/day • Water charge 5000~7000 Rp /month/ household is assumed. • Conveyance system will be conjunctively used with irrigation. • Filter tanks and distribution facilities are proposed independently from the irrigation facilities. • Priority on water use is given to domestic purpose by the structure design. 	<ul style="list-style-type: none"> • Target population 2,000 (Year 2,010) • Unit water demand 90 lit/person/day • Water charge 7000~10000 Rp /month/ household is assumed. • Water is pumped up and distributed via pressure tank and pipe lines.
Proposed Plan	<ul style="list-style-type: none"> • Intake facilities: conjunctive use with irrigation • Conveyance facilities: conjunctive use with irrigation (PVC pipe line) • Filter tank: 2-stage filter tank • Storage tank: capacity for one day demand • Distribution system : PVC pipe line • End facility: Distribution stand (1 for 10 households on the average) 	<ul style="list-style-type: none"> • Intake facilities: electric submersible pump • Conveyance facilities: pressure tank, PVC pipe line • Distribution system: PVC pipe line • End facility: Distribution stand (1 for 10 households on the average)

Supporting Plan of Implementation of Priority Model Areas

Establishment and Operation Plans of Adaptive Trial Farm

80. Aiming at extension and demonstration of vegetable cultivation technology, an adaptive trial farm (ATF) with advanced technology on cultivation and supporting facilities is proposed at Margahayu BBU in Lembang Subdistrict, a mecca of vegetable production in the Highland Area. Proposed facilities to be improved or constructed are as follows:

- Farm size: 0.7 ha (six farm plots, 20 m×50 m each, operation road)
- Irrigation system: drip irrigation with polyethylene pipe
- Water source: Existing deep tube well (90 m), The electric submersible pump is to be replaced (upgraded)
- Related facilities: Lecture house and storage cum workshop
- Equipment & machines:
 - Training equipment (OHP, copy machine, television, Video player, Video camera, etc.)
 - Hand tractor (8.5HP)
 - Light farming tools

81. Operation of the adaptive trial farm will be carried out by Margahayu BBU under the guidance of the province task team. The acceleration of the agribusiness activities will be focussed in the operation of this adaptive trial farm. The major items of adaptive trial activities are as shown below.

- (1) Adaptive trial test on IPM methods informed from the research institutes and agricultural extension service offices,
- (2) Adaptive trial test on upland irrigation and water saving irrigation practices,
- (3) Adaptive trials tests on appropriate dosage of fertilizer and pesticides with the certified seeds,
- (4) Demonstration and training of advanced farming technology to the participating farmers to demonstration plots.

The result of the adaptive trial farm will be demonstrated in the farmers' field school.

Training Program of Task Teams

82. Training program of the task team will consist of the following:

- (1) The technical guidebook such as the operation guideline and manual required for project implementation will be prepared. by the external experts in cooperation with the provincial task team. During the preparation the transfer of technology will be made to the provincial task team through on-job-training.
- (2) The external expert group and provincial task team will train the district task team in the middle of the first year. The training program will include the overall technical matters required for the project implementation, as well as the engineering matters for the improvement works of the agricultural infrastructures.

- (3) In advance of commencement of operation of adaptive trail farm, farmers' field school, and formation of farmers association, technical training will be provided to the district task teams as well as the village coordinators.
- (4) The regular training to leaders of the farmer groups will be carried out by the district task team twice a year in the form of workshop to report the activities of farmers' groups, schedule of the forthcoming cropping season, etc. Through the operation of this program, the district task team will gain the good experience for guiding the farmers groups to solve the problems in the project implementation.

Project Implementation Plan and Cost Estimate

Study on Project Implementation Budget and Technical Guidance

83. The project will be implemented with the initiative of the district task team at the field level. However, 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. Those works will be a new challenge for district task teams. Since numbers of the staff to be assigned is limited and they have limited experience to the similar types of the project works, support to the task team from an external technical group will be required.
84. To realize the early implementation, it is practical to utilize the financial source of the existing financial assistance project. However, AF-SPL can not be appropriated to the Project due to the limited time constraint. The Ministry of Agriculture is currently executing Integrated Horticulture Development for Upland Area (IHDUA) with Project Type Sector Loan (PTSL). Since IHDUA aims to establish tropical fruit production center, which differs from the highland project purpose, i.e., improvement of farmers' income/living standards through improvement of vegetable production system, some procedures for appropriation will be required. In view of the early commencement, however, the effective utilization of the funds of IHDUA will be one of the possibilities for arrangement of the Project fund. Further, there exist agricultural development projects under the bilateral cooperation programs, which will also be one of the possible plans.
85. The existing projects will be classified as the following three groups:
 - (1) Bilateral government grant aid for infrastructure improvement and technical

support

- (2) Bilateral government technical cooperation program for infrastructure improvement and technical support with beneficiary participation.
- (3) Loan project for infrastructure improvement with monitoring by the external expert groups

These plans have the advantages and disadvantages in terms of the Government financial burden, easy beneficiary participation, acceleration of active project works of local government staff, etc. The plans of the above-mentioned groups (1) and (2) have an advantage of reducing of Government financial burden, but a disadvantage in less possibility of future expansion for the other highland development. Whereas, the plan of group (3) can be expected for future expansion for the Second and Third Stage Development. To this end, the project implementation plan is based on the loan.

86. The time span of the project work of the priority model areas is set to be three years. The construction time schedule will be as shown below.

First year

- Establishment of the project implementation organization consisting of PMO, PIU, and PWU with the assignment of task team members at the national, province, and district levels,
- Preparation of the overall implementation plan including the budget plan,
- Selection of the external expert group,
- Preparation of the technical guide books and manuals required for the further project,
- Training of the district task teams on the basis of technical guidebooks and manuals,
- Improvement of the existing “Unit of Implementation of Technology (UPTD)” at Margahayu Lembang for the adaptive trial farm,
- Survey and design of irrigation system, rural market road, collection center and rural water supply system and tendering in accordance with the government regulation,

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

Third year

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

Project Cost Estimate

87. The Project cost consists of the following components:

- Development cost for the Priority Model Areas (infrastructure development, training and extension, etc.) amounting to Rp. 13,492 million.
- Common cost for the Highland Area Development (Cost for the Adaptive Farm, Training and extension, etc.), amounting to Rp. 13,034 million.

The total required cost for the first stage development is, therefore, Rp. 26,526 million.

The project cost is estimated by use of unit prices and costs proposed for the fiscal year of 2000. Commencement of the project is assumed in the year of 2001.

Project Cost

Unit: million Rupiah

Item		Mekarjaya	Tanjungkarya	Gekbrong	Langensari	Total
Cost for Priority Model Area	Infrastructure	3,119	2,106	2,039	1,696	8,960
	Training & Extension	431	312	223	319	1,285
	Related cost	710	549	457	405	2,121
	Price contingency	336	368	238	184	1,126
	Total	4,596	3,335	2,957	2,604	13,492
Common Cost for Highland	External experts	10,197				
	Adaptive Trial Farm	404				
	Machine & Equipment	389				
	Training & Extension	246				
	Related cost	1,798				
	Total	13,034				
Total Project Cost		26,526				

Note: Price contingency for the "Common Cost" is included in each item.

Organization and O&M

Organization for Project Implementation Organization

88. The following committees and offices will be established under the project implementation organization:

- (1) Project Coordination Committees
 - (a) National Coordination Committee in the Department of Agriculture (NCC): Coordination of scopes of both project implementation works and technical guidance among the related Directorates General under the control of the Director General of the Directorate General of Agricultural Infrastructure and Facilities (DGAIF).
 - (b) Provincial Coordination Committee (PCC): Coordination of scope of collaboration works for collaboration offices at the provincial level under the control of the Governor.
 - (c) District Coordination Committee (DCC): Coordination of scope of collaboration works for collaboration offices at the district level under the control of Bupati.
- (2) Project Execution Team
 - (a) Project Management Office (PMO) and Task Team in Department of Agriculture
 - (b) Project Implementation Unit (PIU) and Task Team in Dinas Pertanian Tanaman Pangan TK-I
 - (c) Project Working Unit (PWU) and Task Team in Dinas Pertanian Tanaman Pangan TK-II

Operation and Maintenance of Facilities

89. O&M works and activities will be taken over by users, not only “sharing of operation cost” but also responsibility of repair and improvement works. Proposed O&M procedures by facility are described below:

Facility	O&M procedures		
	O&M body	Source of O&M cost	Description
Irrigation	WUA (P3A)	Water charge based on irrigated area	Operation of the facilities will be done by appointed staffs of WUA. O&M works will be done by the WUA members.

Rural market road	Village (LKMD)	Tax, Participation for maintenance work	Routine O&M works are organized by the village (LKMD) with villagers participation. Improvement works with machine will be done by revenue budget.
Collection center	Farmers' Cooperative	Handling charge	An the O&M works will be done by the farmers' cooperative. A manager will be appointed at the cooperative.
Rural water supply	Rural Water Users' Association	Water charge	Rural water users' association will collect the water charges and allocate for O&M works.

Establishment and strengthening of O&M organizations (cooperative and/or association) will be one of the most important components of the proposed plan. Intensive training and guidance will be carried out in the course of implementation for organizing and activating of the association.

Project Impacts and Project Evaluation

Economic Evaluation

90. The agricultural benefits are defined as the incremental net income from agricultural production between under without and with project conditions. Initial investment cost consists of specific cost to the priority model areas (cost of construction of rural facilities) and overall cost consisting of training cost for local government staff and village coordinator, and other supporting cost. On condition that the overall cost will be effectively utilized to the development of the other highland areas, the cost allocation is made to the project economic cost to the priority areas on the basis of the extent of the irrigation area.
91. Based on the estimated economic benefit structure and the estimated economic cost structure explained above, EIRR for the model areas is estimated. The sensitivity analysis is also carried out for the cases of price fall and delay of target yields. As shown in the table below, the Project is economically viable.

Result of Sensitivity Analysis (EIRR :%)

Model Area	EIRR (%)	Sensitivity Analysis		
		Case-1	Case-2	Case-3
1. Mekarjaya	23.3	19.8	16.1	21.1
2. Tanjungkarya	16.2	13.6	10.8	14.8
3. Gekbrong	17.2	14.4	11.4	15.7
4. Langensari	17.2	14.1	12.3	15.5
Total Area	19.1	16.2	13.1	17.3

- Case- 1: Output prices decline 10 %, ceteris paribus.

- Case- 2: Output prices decline 20 %, ceteris paribus.
- Case- 3: Delays in the realization of benefit so that the benefit built-up process to become as follows (ceteris paribus)

Financial Evaluation

92. The capacity to pay the project investment cost is analysed by means of the cash flow. The analysis is made on the following conditions:

- (1) Sources of the project fund: the loan and the government budget.
- (2) The training cost for task team and external expert cost which will be effective for other area development are excluded in this cash flow analysis.
- (3) Loan condition: Interest rate: 2.4%/annum
Repayment: Grace period of 10 years and repayment to be completed by 30 years
- (4) Micro credit: initial operation fund of the cooperatives on the basis of Rp. 1 million per ha

The result shows that the entire loan is repaid within the repayment period with the anticipation of the living expenditure increase of 1.59 times (at the 10th year) from the present. In case that the O&M and Replacement cost is paid by the beneficiaries, the beneficiaries burden is Rp. 1,920 x 10 per ha or 7.3 % of net income. The Government is required to determine amortisation rate in consideration of the model development on the basis of this result.

93. Financial evaluation of typical farm household economy was made. The net annual income of typical farm will be increased to 6.2, 2.1, 1.9, and 1.8 times the present in Mekarjaya, Tanjungkarya, Gekbrong and Langensari, respectively.

94. This agricultural and rural highland development plan is a multidimensional program so that its social economic impacts can be seen from various perspectives.

- (1) Increase of farmers' income
- (2) Increase in employment opportunities
- (3) Promotion of joint works and activation of rural organizations
- (4) Market road serving for the rural areas
- (5) Expansion of women's role
- (6) Expansion of non-farming business opportunity

95. The Project contributes much to the environmental preservation mentioned below.
- (1) Sustainable agriculture: The development procedure and system by the model development will facilitate efficient and sustainable use of land and water resources. This may be expected to produce sustainable benefit definitely.
 - (2) Improvement of living environment: Excess application of agro-chemical and fertilizers has occurred under the present intensive cultivation. The implementation of the project farming technology will contribute to mitigation measure. The implementation of the project farming technology will contribute to mitigate the living environmental issue.
 - (3) Enhancement of motivation of farmers' farmland preservation: The farmers would be strongly motivated to operate their farming properly from the view point of conservation through the guidance of agro-soil conservation techniques.
 - (4) Water Resources Preservation: The improvement of irrigation system will increase in the water holding capacity at the filed level, and decrease in the soil erosion, thus contribute to soil, water resources and environmental conservation.

Project Evaluation

96. As previously explained, it is concluded that the Project is justified economically and financially with many socioeconomic impacts. As a conclusion, the Project will contribute to the large extent to the improvement of income and living standards of the local people in the model areas as well as in the highland area, therefore, the early implementation of the Project is expected.

Recommendations

97. Based on the result of the Study, the following are recommended:
- (1) It is recommended to implement the project urgently to establish the model development in the highland area since the following are confirmed:
 - (a) The Project will much contribute to jobs and income generation in the rural area, and promoting the horticulture development projects.
 - (b) The project is formulated on the basis of the beneficiary's development needs, therefore the beneficiaries are very anxious for implementation of the Project.

- (c) The Project is verified to be technically sound and economically feasible. The financial evaluation also shows that the beneficiaries could share the repayment of the project cost.
- (2) It is recommended to provide the sufficient technical supports to the district task from the national and provincial task teams at the respective levels throughout the Project implementation period.
 - (3) In collaboration with other offices such as Public Work Service Office, Cooperative Service Office, and Counseling Team of Improvement of Family Welfare, Subdistrict, and Village Offices, the project work will be implemented. In order to ensure close coordination among them and to provide technical guidance to task teams at their respective levels, it is recommended that National, Provincial and District Coordination Committees should be established.
 - (4) It is required that prior to implementation of the Project the responsibility of the beneficiary in implementation and O&M should be definitely confirmed to encourage the farmers initiative of the project operation,.
 - (5) It is recommended that the Government should provide the assistance for the initial operation fund of the farmers' cooperative that will be used for a revolving fund of the cooperative.
 - (6) It is required to strengthen the market information system of the provincial agricultural service, which should be easily accessible by the farmers'
 - (7) It is recommended that the Project benefits and environmental impacts should be monitored and evaluated during the project implementation and onward.

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ABBREVIATIONS

AAET	Badan dan Pendidikan Latihan Pertanian	Agency for Agricultural Extension and Training
AARD	Badan Penelitian dan Pengembangan Pertanian	Agency for Agricultural Research and Development
ADB	Bank Pembangunan Asia	Asian Development Bank
AFTA		ASEAN Free Trade Area
AMDAL	Analisa Mengenai Dampak Lingkungan	Environmental Impact Assessment
ANDAL/EIA	Analisis Dampak Lingkungan	Initial Environmental Examination
ATF		Adaptive Trial Farm
BALATKOP	Balai Latihan Koperasi	Provincial Cooperative Training Center
BAPEDAL	Badan Pengendali Dampak Lingkungan	Environmental Impact Management Agency
BAPPEDA	Badan Perencanaan Pembangunan Daerah	Provincial Development Planning Board
BAPPENAS	Badan Perencanaan Pembangunan Nasional	National Development Planning Board
BBI	Balai Benih Induk	Seed Production Center
BBP	Balai Benih Pembantu	Local Seed Production Farm
BBU	Balai Benih Umum	Main Seed Production Farm
BIMAS	Bimbingan Massal	Mass Guidance Program
Bina Marga		Directorate General of Road Development, PU
BIPP	Balai Informasi dan Penyuluhan Pertanian	Rural Agriculture Information and Extension Center
BPD	Bank Pembangunan Daerah	Regional Development Bank
BPP	Balai Penyuluhan Pertanian	Rural Agricultural Extension Center
BPR	Bank Perkreditan Rakyat	Rural Bank
BPSB	Balai Pengawasan dan Sertifikasi Benih	Seed Certification and Control Service
BPTP/AIAT	Balai Pengkajian Teknologi Pertanian	Assessment Institute for Agriculture Technology
BRI	Bank Rakyat Indonesia	People's Bank of Indonesia
Bupati	Kepala Daerah Tingkat II	District Chief
CAE		Center for Agricultural Extension (MOA)
Camat	Kepala Kecamatan	Sub-district Chief

CAQ		Center for Agricultural Quarantine (MOA)
CASER		Center for Agriculture Socio-Economic Research
CBS (BPS)	Biro Pusat Statistik	Central Bureau of Statistics
CIF		Cost, Insurance and Freight
Cipta Karya		Directorate General of Housing, Planning and Urban Development of PU
CRIH	Balai Penelitian Sayuran	Central Research Institute for Horticulture
DAS	Daerah Aliran Sungai	Catchment Area
DATI I	Daerah Tingkat I	Provincial Level Government
DATI II	Daerah Tingkat II	District Level Government
DCC		District Coordination Committee
Desa		Village
DGFCH	Direktorat Jenderal Tanaman Pangan dan Hortikultura	Directorate General of Food Crops and Horticulture (MOA)
DI	Daerah Istimewa	Special Territory
DI	Daerah Irigasi	Irrigation Area
DIAS		District Agricultural Service
DINAS		Government Office
DIPERTA	Dinas Pertanian	Agricultural Service Office
DKI	Daerah Khusus Ibukota	Special Capital District
Dusun		Cluster of Village/Kampung
EIA		Environmental Impact Assessment
FFS		Farmers Field School
F/S	Studi Kelayakan	Feasibility Study
FOB		Free on Board
GATT		General Agreement on Tariffs and Trade
GDP	Pendapatan Nasional Bruto	Gross Domestic Product
GNP	Pendapatan Nasional Netto	Gross National Product
GOI	Pemerintah Indonesia	Government of Indonesia
GPS		Global Positioning System
GRDP	Produk Domestik Regional Bruto	Gross Regional Domestic Product
HGU	Hak Guna Usaha	Land Use Right
HRD	Pengembangan Sumber Daya Manusia	Human Resources Development
HYV	Varietas Unggul (Bibit Unggul)	High Yielding Variety

IBRD	Bank Rekonstruksi dan Pembangunan Internasional	International Bank for Reconstruction and Development (World Bank)
IEE		Initial Environmental Examination
IHDUA		Integrated Horticulture Development in Upland Areas
IKK	Ibu Kota Kecamatan	Sub-district Capital
IPEDA	Iuran Pembangunan Daerah	Land Tax
IPM		Integrated Pest Management
JBIC		Japan Bank for International Cooperation
JICA		Japan International Cooperation Agency
Kabupaten		District (Level II Local Government)
KANWIL	Kantor Wilayah	Provincial Office of Central Line Agency
KCD	Kantor Cabang Dinas	Sub-district Agricultural Office
KCI		Potassium Chloride
Kecamatan		Sub-district (administrative division of Province)
Kelompok Tani		Farmers Group
Kepala		Head of Organization
Kios		Village Mini Shop (KIOSK)
KMKP	Kredit Modal Kerja Permanen	Credit for Permanent Working Capital
KOPTANI	Koperasi Pertanian	Farmer's Cooperative
Kotamadya		Municipality (Level II Local Government)
KUD	Koperasi Unit Desa	Village Unit Cooperative
KUT	Kredit Usaha Tani	Credit for Farmer
LAIAT		Institute for Agricultural Technology
LKMD	Lembaga Ketahanan Masyarakat Desa	Village Resilience Body
LSM	Lembaga Swadaya Masyarakat	Public Self-supporting Organization
M/P	Rencana Induk	Master Plan
MOA	Departemen Pertanian	Ministry of Agriculture
MOCSED	Departemen Koperasi dan Pengusaha Kecil dan Menengah	Ministry of Cooperatives and Small and Middle Enterprises Development

MPW	Departemen Perkerjaan Umum	Ministry of Public Works
NGO	Lembaga Swadaya Masyarakat	Non-Governmental Organization
O&M	Operasi dan Pemeliharaan	Operation and Maintenance
ODP(s)		Orchard Development Project
OECF		Over seas Economic Cooperation Fund
P3A	Perkumpulan Petani Pemakai Air	Water Users Association
P3DT	Proyek Peningkatan Pelaksanaan Daerah Tertinggal	Infrastructure Improvement Project for Developing Villages
Palawija		Secondary crop
PCC		Provincial Coordination Committee
PCM		Project Cycle Management
PCV		Polyvinyl Chloride
PDAM	Perusahaan Daerah Air Minum	Regional Drinking Water Company
PDM		Project Design Matrix
PHPT	Pengamat Hama dan Penyakit Tanaman	Plant Pest and Disease Observer
PIK	Penyerahan Irigasi Kecil	Handed over-Small Irrigation Scheme
PIU		Project Implementation Unit
PJP-II	Pembangunan Jangka Panjang Tahap Kedua	Second Long-Term (25 Year) Development Plan
PKK	Pembinaan Kesejahteraan Keluarga	Women's Association for Family Welfare Improvement
PKL*	Penyuluh Koperasi Lapangan	Cooperative Field Extension Officer
PKL**	Penyuluh Kebutuhan Lapangan	Forestry and Soil Field Conservation Extension Worker
PKT	Proyek Konservasi Tanah	Soil Conservation Project
PMO	Kantor Manajemen Proyek	Project Management Office
PMU	Unit Manajemen Proyek	Project Management Unit
PPL	Penyuluh Pertanian Lapangan	Agricultural Field Extension Officer
PPM	Penyuluh Pertanian Madya	Mid-level Agriculture Extension Officer
PPS	Penyuluh Pertanian Spesialis	Agricultural Extension Specialist
PRAS	Dinas Pertanian Tingkat I	Provincial Agricultural Service
PTP	Perseroan Terbatas Perkebunan	State Owned Estate Company
PU	Pekerjaan Umum	Ministry of Public Works

RAD	Pembangunan Pertanian Daerah	Regional Agricultural Development
Repelita	Rencana Pembangunan Lima Tahun	Five-Year Development Plan
RIV/Balitsa	Balai Penelitian Tanaman Sayuran	Research Institute for Vegetables
RKL		Environmental Management Plan
RPL		Environmental Monitoring Plan
RW	Rukun Warga	Village Society
SUSENAS	Survei Sosial Ekonomi Nasional	National Socio-Economic Survey
TOR		Terms of Reference
TSP		Triple Super Phosphate
UKL		Environmental Management Procedures
UNICEF		United Nations International Emergency Fund
UPL		Environmental Monitoring Procedures
UPTD		Implementation Unit of Technology
USLE		Universal Soil Loss Equation
UTM		Universal Transverse Mercator
VAT	Pajak Pertambahan Nilai	Value Added Tax
WTO	Badan Perdagangan Dunia	World Trade Organization
WUA		Water Users Association

Note: Since the counterpart agency was under the reorganization at the time of preparation of the Final Report, the “Directorate General of Food Crops and Horticulture” which issued the comments on the Draft Final Report was indicated as the counterpart agency in the cover of this report.

MEASUREMENT UNITS

Extent	Volume
cm ² = Square-centimeters (1.0 cm x 1.0 cm) m ² = Square-meters (1.0 m x 1.0 m) km ² = Square-kilometers (1.0 km x 1.0 km) a = Are or Ares (100 m ² or 0.1 ha.) ha = Hectares (10,000 m ²) ac = Acres (4,046.8 m ² or 0.40468 ha)	cm ³ = Cubic-centimeters (1.0 cm x 1.0 cm x 1.0 cm or 1.0 m-lit.) m ³ = Cubic-meters (1.0 m x 1.0 m x 1.0 m or 1.0 k-lit.) l = Liter (1,000 cm ³)
Length	Weight
mm = Millimeters cm = Centimeters (cm = 10 mm) m = Meters (m = 100 cm) km = Kilometers (km = 1,000 m)	g = Grams kg = Kilograms (1,000 g) ton = Metric tonne (1,000 kg)
Currency	Time
US\$ = United State Dollars US\$1.0 = ¥104 = Rp.7,300 ¥ = Japanese Yen Rp. = Indonesian Rupiah	sec = Seconds min = Minutes (60 sec) hr = Hours (60 min)
Derived Measures	Other Measures
m ³ /s = Cubic Meter per Second kWh = Kilowatt Hour MWh = Megawatt Hour	° = Degree °C = Degree(s) Celsius 10 ³ = Thousand 10 ⁶ = Million 10 ⁹ = Billion

EXCHANGE RATE

The exchange rates used in this Study are:
 Rp. 7,300 = US\$ 1.00 = ¥104.0
 As of February 2000