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IMPACTS OF IRRIGATION ON FARM FAMILY WORK PATTERNS IN WEST JAVA:

A case study of three villages in the Jatiluhur Irrigation Area

by

Sudardja Adiwikarta

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ABSTRACT

IMPACTS OF IRRIGATION ON FARM FAMILY WORK PATTERNS

IN WEST JAVA:

A case study of three villages in the Jatiluhur

Irrigation Area

by

Sudardja Adiwikarta

The Jatiluhur Irrigation Project began functioning in West Java in 1967. It aimed at: increasing the production of rice; improving the quality of life of rural villagers; controlling floods; generating electricity; providing Jakarta with a reliable source of water; developing land fisheries; and creating employment opportunities.

This study focusses on three villages in the Jatiluhur irrigation area. Before Jatiluhur, Betok village had to rely on natural rainfall; Kalencabang had the advantages and disadvantages of being flooded every rainy season; and Kamalsari, drawing upon local water sources, enjoyed a localized system of irrigation.

The research here, explores the pattern disturbances and adaptation of farm households due to the introduction of a modern irrigation system (which can be hypothesized as having different impacts depending upon the initial circumstances and socio-economic status of the families.)

Data were derived from direct interviews with 162 heads of households; from a series of focussed interviews with village informants; and from official documents. A complete rice farming cycle was observed in the three villages.

The study reveals that Jatiluhur brought about changes in work patterns that varied by village and socio-economic status of the households. In Betok and Kalencabang the work of upper class women in the ricefields decreased whereas middle and lower class women spend more time in the fields. In Kamalsari, changes were minimal and the direct participation of women in farm work declined. Upper and middle class households experienced greater change than lower class households. The landless, even today, constitute an undifferentiated work force with similar patterns in the three villages.

These differential disturbances suggest that integrated regional planning and programs of development should consider the variabilities of village and social class circumstances when potential impacts are assessed.

TO:

My wife, Nunung,

my daughters,

my mother and grandmother

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kahutangan budi nu teu aya hinggana. To them this dissertation is dedicated. Allah SWT. Maha Uninga sareng Maha Adil.

East Lansing, Michigan

U.S.A.

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CHAPTER I

INTRODUCTION

This is the report of a study carried out in three village communities in the Subang regency of the Jatiluhur irrigation area on the northern coastal plain of West Java, Indonesia, during the first half of 1981. The study focuses on farm family work patterns, especially their modifications following a change in the hydrological environment due to the introduction of a modern irrigation system in 1967.

Chapter One, here, outlines the general problem and the study goals. It provides an overview, too, of the study site, and a brief introduction to the northern coastal plain of West Java and the Jatiluhur Irrigation Project.

1. General Problem

Since proclaiming independence in 1945, Indonesia, with an annual birth rate of 2.34% during the last decade, and a population of 146 million in 1980, has had a consistent policy of trying to enhance the quality of life of its people. Being an agricultural country, where 70% of the population makes its living by farming, the government focused on agriculture as the first priority of its development programs. Food production and more specicifically rice farming were emphasized and self sufficiency in food was proclaimed one of the main goals. Huge irrigation systems have been financed and constructed, new varieties of rice are being introduced, chemical fertilizers and

insecticides/pesticides have been made available and have been widely applied. In general, modern farming techniques have been adopted by most farmers throughout the country.

The creation of new ricefield ("sawah"), known as "extensification" programs, and improvement in the productivity of existing ricefields (known as "intensification" programs) have been major themes of the agricultural development policies. Due to high population density, efforts to increase rice production in Java are mainly through intensification efforts, while in the less densely populated islands it has been possible to expand through extensification.

These programs of agricultural modernization, that have been set up in five year development plans ("Pelita") have brought about a significant increase in national farm production, and have encouraged policy makers to devise similar schemes for the future. But experiences in other parts of the world show that along with the many positive results of such induced and programmed agricultural changes, some new problems have emerged. The old established equilibrium in the villages, for instance, and the lives of farmers and their families have been disturbed. Some traditions have been abandoned, and new elements of living are being introduced. Many of these similar disturbances, no doubt, could have been anticipated and been avoided through more careful planning and greater attention to the inevitable social and cultural ramifications of such programs on environmental modification. Planning should be holistic in its concerns and scope and, insofar as possible, should anticipate chain effects that may lead to ever greater economic costs and social disturbances.

Preliminary site surveys and social impact studies are not only a helpful basis for overall and integrated planning, but they become conditio sine qua non. Numerous sociological questions have been formulated and researched to assess the consequences of such large scale area development projects in many parts of the world, but there are several important issues of particular relevance to West Java that have not been fully addressed by researchers. These questions include: 1) Do farmers in impacted areas experience any difficulty in their adaptation to programmed changes and to the new environmental conditions? 2) Do all segments of the farming community gain an equal advantage? 3) Do the systems of social relationships among farmers in villages affected by programs of agricultural modernization become more complex and competitive? 4) Do the members of farm families in such area increase their economic contributions to the farm family households? These and similar questions are among those that need to be answered in order to better understand the consequences (positive or negative) of such development projects. Knowledge of this kind is very important and timely because the government of Indonesia has decided that more irrigation projects will be organized elsewhere in the country.

2. Study Goals

This study aims to explore the problems and processes of adaptation of farm families in three selected villages to the new hydrological environment following the introduction of the Jatiluhur irrigation system. It focuses on farm family work patterns and changes in farming systems as a consequence of accomodations to the modern

irrigation system. In particular we want to determine whether or not these changes vary in relation to earlier variabilities in the history of hydrological conditions in the villages and in terms of the socio-economic levels of the farmers. Although sharing a common culture and comparable in social organizational character, the three villages prior to 1968 were quite different in agricultural structure and in economic aspects: Betok village had to rely on natural rainfall for crops; Kalencabang had the advantages as well as disadvantages of being flooded every rainy season; but Kamalsari drawing upon local water sources, enjoyed a system of irrigation long before the establishment of the Jatiluhur irrigation system. (The Jatiluhur irrigation system was inaugurated by President Suharto on August 27, 1967).

Because basic information about the earlier (1967) work patterns in these villages and of these farm families is not available and a longitudinal design is therefore not possible, a research strategy was devised to explore these changes retrospectively. Methodological procedures will be described further and in more detail in Chapter II.

In addition to the aforementioned goal, it is hoped that this study will contribute to sociology in an applied sense, so that policy makers may use the findings to formulate recommendation for agricultural modernization and societal development. More specifically, the findings should contribute to building a sound rural development policy in the Republic of Indonesia. Indeed, the research is especially timely for the government of Indonesia is planning similar large scale irrigation projects elsewhere in the country.

3. The Site

In order to set the stage for this research, it is necessary to describe in somewhat greater detail the nature of the study site and the situation being explored. First, an overview of the geographical setting of the region will be presented, including its location, general climatic and hydrological conditions, its people and their farming practices and a brief consideration of the "older" irrigation systems in the area. Then the discussion will focus on the history, general aims, organization and observed impacts of the Jatiluhur Irrigation Project.

a. The Northern Coastal Plain of West Java

Geomorphologically known as the "coastal plain of Jakarta" or the "Northern Zone", the northern coastal plain of West Java roughly includes the whole northern coast of West Java from Banten in the west to the administrative border between West and Central Java in the east. About 200 miles long and about 25 miles wide, it stretches from the sea coast in the north to the foot of the mountain system in the south. The latter is known as the "Bogor Zone" or northern part of the "Central Zone".

The region is a flat plain through which large rivers, such as the Ciujung and Cisadane, Ciliwung and Kali Bekasi, Cikarang and Citarum, Cilamaya and Ciasem, Cipunagara, Cimanuk and Cisanggarung, run and meander before discharging into the Java Sea. Originating from springs in the highly volcanic area, the rivers since the beginning of their history have been fertilizing the region with sediment of volcanic materials, especially during rainy seasons when they carry a lot of

materials and deposit them when the streams flood the area.

Climatically this region has a monsoon climate, characterized by a dry season (east monsoon) from April through September and a rainy season (wet monsoon) from October through March. The northern coastal plain is the driest part of the province, with four to six consecutive dry months a year, when the average monthly precipitation is less than 60 milimeter (2.4 inches). There are six to eight wet months a year, when the monthly precipitation is above 60 milimeter (2.4 inches). Total yearly precipitation varies between 60 and 80 inches. Temperature-wise, this area has a tropical character, with monthly averages above 64°F (18°C) and the coldest month never lower than 50°F (10°C).

Farther inland the climate changes from tropical to warm temperate at the higher altitudes where the total moist months increases to 12 a year and the average monthly temperature drops to between 26.6°F and 64°F (or -3°C and 18°C).

The monsoon climate is a main factor responsible for the pest hydrological condition of the region, that is, before irrigation. During the west monsoon, the region had too much water. In addition to local rains the large rivers brought huge amounts of water from the more humid hinterland, so that some of the region suffered from flooding. During east monsoon, on the other hand, the whole region was extremely dry so that almost no farming activities could be carried on. Paradoxically, at the same time in the large river valleys valuable water flowed uninterruptably toward the Java Sea. Thus, prior to the introduction of irrigation, access to water resources varied from season to season and from place to place within the region.

Since the end of 1967, a part of the northern coastal plain has been irrigated by the Jatiluhur irrigation system. Stretching from Jakarta in the west to the Cilalanang river in the east, and from the Java Sea coastline in the north to the main (irrigation) channels of Tarum Barat and Tarum Timur (West and East Tarum) in the south, the "Jatiluhur Irrigation Area" is about 100 miles long and between 8 to 15 miles wide. Administratively, the area belongs to five of the 20 regencies of West Java: Bekasi, Karawang, Purwakarta, Subang and Indramayu. However, only a part of each regency is included in the Jatiluhur irrigation area.

Currently there are around 2.5 million people living in the area, or roughly 10% of the population of West Java. Although the land area itself is only 5% of this province, the irrigated ricefields (250,000 hectares) are about 15% of the province total. Thus, the ratio of ricefields to population is greater in this region than in general in West Java. Most people in the region are dependent upon agriculture, they call themselves "petani" (farmers), although a large proportion of them do not own even a small piece of land for farming. The "landless farmers" are generally farm laborers, farm tenants or sharecroppers. There are hundreds of villages (locally called "lembur" or "kampung") and many small towns scattered throughout the area. The villages (lembur) typically are groups of houses, ranging from very small hamlets up to settlements of five thousand or more inhabitants. People in a village invariably know each other very well. Ethnically most of villagers are Sundanese, but in some villages there is a mixture of Sundanese, Javanese and Jakartanese (Melayu). And there are some "Javanese"

villages in the eastern part and "Jakartanese" villages in the western part of the region. However, culturally there is not a big difference among the various ethnic groups, except in language.

Farmers prepare their irrigated land very carefully; they grow new varieties of rice, plant the young plants in straight lines separated by a certain distance to facilitate weeding; they apply chemical fertilizers and insecticides and pesticides; and they take care of their ricefield very carefully. Their basic farming techniques were inherited from their ancestors who chose to grow rice in wet ricefields; the techniques are different from those followed by their brothers and sisters in the mountainous land who grow rice on dry lands. But, in addition to the traditional practices, the farmers in lowland area also created new techniques or "borrowed" from their neighbors as far as new technology relevant to the changing environments. Recently, the government agencies, especially agricultural extension workers, have taught them new and scientific farming techniques.

Since the colonial period, the northern coastal plain, including the present Jatiluhur Irrigation Area, has been well-known as one of the most important rice warehouse of the province and of the country. Bekasi and Tambun, Lemahabang and Karawang, Cikampek and Sukamandi, are just some of the towns in the area decorated with rice mills of small and medium size, owned by individual entrepreneurs, cooperatives and government agencies. It has been from this area that a great deal of rice has been supplied to the cities such as Jakarta and Bandung. However, the existing ricefields with older farming systems have not been able to fulfill the needs of a fast growing population with an increasing

demand for a higher standard of living. The country recently has had to import 10% of its rice every year. In order to reduce the quantity of imported rice and achieve greater self-sufficiency, as was mentioned, the government set up two programs: "extensification" and "intensification". The extensification program is aimed at creating new ricefields and the intensification programs attempt to increase productivity of the existing ricefields. In Java, however, it is impossible to expand rice acreage since almost all cultivatable land is being utilized. The forest area in Java, for instance, which could be transformed into ricefields as part of the extensification program, represent less than the minimum proportion of the area necessary to maintain an equilibrium of water sources and climatic condition. Thus, the government plan for the northern coastal plain of West Java emphasizes intensification. Fortunately, this area has a very high potential for the development of irrigation systems which is considered the basic method for increasing intensification efforts. A regular and consistent supply of water makes for better rice crops and, more important, makes it possible to practice double cropping. Therefore, the government decided to build an irrigation system in this area in order to increase the gross rice production.

In the Jatiluhur Irrigation Area, "small" and "medium" irrigation systems were started during the colonial period, after the first world war. Gadung, Walahar and Salamdarma, are some of them. These irrigation systems and several others that were built and rehabilitated recently but prior to Jatiluhur, were not equipped with water storage to hold excessive water during the wet monsoon. The barrages were built across the river just to divert water from river valleys into the

irrigation channels. A direct consequence of this system was that the capacity of the system to irrigate the farms during east monsoons (dry seasons) was limited and was determined by the small flow of water in the valleys. In addition, the systems did not have a flood control function. Some limited farms, however, can be planted twice a year. Thus, the main function of the "older" irrigation system was to regulate the distribution of water during west monsoon; they did not help in solving the problems of flooding which has caused severe damage in the region.

Beginning in the 1950s irrigation in the area has been characterized by three types of activities: the rehabilitation of "older" irrigation systems, the establishment of new medium sized systems, and the planning and initiation of the "giant" and "multi-purposed" Jatiluhur irrigation system.

b. The Jatiluhur Irrigation Project

1) Irrigation, a common technique for rice growing in the wet ricefields of Java, has been known and practiced for a long time. Geertz (1963), for instance, estimated that irrigation on this island was started "sometime before Christ." While some writers relate the development of irrigation in Java to Indian culture, Wertheim (1968) said that it has been practiced here "before contact was made with the Indian culture". Tarumanagara is a well-known ancient kingdom in West Java which developed an irrigation system around Bogor in the fourth century. Mataram is another kingdom which based her economy on growing rice in wet ricefields. After more than one and a half centuries of

colonialization, in the 1870s the Dutch government began the construction of irrigation in the "eastern territory". These new systems, for instance, were the Pekalen Sampean in 1781 in East Java (Taylor, 1978), Delta Brantas in the middle of 19th century, Demak in 1880s (Booth, 1977) and several others, including those in what is now the Jatiluhur Irrigation Area.

The history of the Jatiluhur project starts in 1948 when Blommenstein published his paper about "Development Project for the Western Part of Java" during the International Conference for Overseas Territories Engineering Development in Paris. He proposed an integrated irrigation system throughout the northern part of Java from Banten to Surabaya, connecting all stream areas with a navigable main channel for boats of 550 to 1350 tons, and with an irrigating capacity of more than one million hectares (1 hectare = 2.471 acres). He said that the principal water reservoir should be built in the Citarum, the biggest river of West Java. Caught up by Blommenstein's dream, President Soekarno ordered the initiation of the principal engineering project, the Jatiluhur dam in the Citarum (Blommenstein, 1977).

Another basic feature of the project was constructed by Lecomte for the generation of electricity (Schravendijk, 1955). Then, following and based on the Blommenstein-Lecomte ideas, many studies and proposals, evaluations and decisions were carried out, which in turn, brought about the concrete planning, programs and execution guides for the multipurposed project.

The Indonesian central government invested a lot of money in this project since its establishment in 1957. Some of the financing was

obtained from the national development budget and some from the national and international credit, including from the World Bank, the International Development Association (I.D.A.) and the governments of France and Germany. In 1970, when the project was not yet completed, the entire investment was calculated to have cost almost 100 billion rupiah (i.e., when one US $ = 378 rupiah).

Villagers who were "drowned" by the lake sold their land to the government and moved elsewhere. The government also bought a lot of land from farmers to construct the main and secondary irrigation channels; while the land for tertiary and quartairy channels was contributed by the farmers. So, many people were very happy because the government paid more for the land than the regular price. Eventually, however, some of them spent the money without investing it or replacing the land they sold.

Three French and several national contractors developed different parts of the project, such as the main dam, the electrical generating system, the channels and the access roads. French and national technicians worked hand in hand with huge, modern machinery, and with thousands of laborers. Many persons got jobs indirectly as food sellers, car drivers, etc. This project probably provided more job opportunities in the first fifteen years, than any others in the history of the Republic.

Despite economic difficulties at the end of 1950s and the whole 1960s, and political and security disturbances, construction of the project went on uninterruptedly. It took almost ten years before President Suharto innaugurated the beginning of its utilization in August

of 1967. At its innauguration, the project had not yet been totally completed, except for the dam and the main channels. In the western section (to the west of the Citarum), for instance, secondary channels were only about 25% completed (Ida Djuhaerani, 1970, p. 55). At the time of the present dissertation research during the first half of 1981, work on uncompleted parts of the Jatiluhur project was still proceeding.

In 1970 the "Jatiluhur Authority Public Business" (Perum Otorita Jatiluhur) was established to manage the development of electricity and irrigation, including other related activities such as forestry, land fisheries, tourism and industries in a region covering eleven stream areas of larger rivers. The authority is responsible to the Minister of Economy and Finance, and includes three directorates: Directorate of Electricity, Directorate of Irrigation and Directorate of Administrative Affairs. The Jatiluhur irrigation system, along with other irrigation systems in the region, are under the Directorate of Irrigation. At present, besides developing, managing and maintaining the Jatiluhur project, the "Authority" is in the process of building another huge dam in the upper valley of the Citarum (the Saguling dam). A feasibility study estimates that the Saguling dam, or Tarum I, will be able to generate 2,100 million Kwh of electric power per year, irrigate 50,000 hectare of ricefields, increase flood control on the lower area of the Citarum from the currently 60% to 80%, help reduce sedimentation in lake Juanda, increase the quantity of electricity produced by lake Juanda, and to increase land fisheries. The "Authority" has also planned to establish another dam, located between Saguling and Juanda in the Citarum, to

increase flood control to reach the total (100%) control, to irrigate another 50,000 hectare of ricefield and to add 720 million Kwh of electric power a year. Included in the long run program of the "Authority" is the establishment of 21 more dams in the upper valleys of the aforementioned rivers, in order to control flooding in their lower stream areas and to develop more irrigation.

The "Authority" is a huge and complex organization, working in a large geographic area and in a wide field of activities. The 1975 report recorded 4,635 persons who were working full-time for the authority, plus thousands of part-time and temporary workers depending upon the activities of the authority, and, of course, a lot more people who were working in informal sectors. But, it is important to note that the report also said that the authority has not been financially self-sufficient. Several sectors were money producing, including electricity, tourism and technical services; the authority's plan to collect a contribution from the farmers for irrigation water has not been practiced until recently.

Thus, the Jatiluhur Irrigation Project, which used to be an independent organization, since 1970 has been a division of a much bigger development effort operating in a wide geographic area and affecting the lives of millions of people. The focus of the present study, however, will be on the irrigation of the northern coastal lowland, and on the social impacts of the Jatiluhur Project.

2) General Purposes, Organization and Impacts of the Jatiluhur Irrigation Project

At the core of the Jatiluhur Irrigation Project is the huge lake that was generated by damming the Citarum, the biggest river in West Java. The Citarum springs from the slopes of the Wayang volcano in the border between Central and Southern (geomorphological) Zones of Java. Originating in the most humid area of the province and having several tributaries, the river pours 5.65 billion cubic meters of water into the Java Sea every year. The stream runs rapidly in its upper valley, slows down on the Bandung Plateau, increases its velocity again on the Bogor anticlinorium where the lake was constructed, and then meanders on the northern plain before emptying into the sea.

The lake is called "Lake Juanda" after the name of the Prime Minister who previously was the Minister of Public Works and Electricity, and chairperson of the National Planning Board, and who in that capacity was responsible for the Jatiluhur project.

Covering about 80 square kilometers (1 sq. km. = .36 sq. miles), and with the deepest part of more than 100 meters, the lake's carrying capacity of water is about three billion cubic meter or about 53% of the amount of water the river pours into the sea every year. The lake is not only ecologically sound, but its function in reducing floods in the downstream area is also very important. Currently, about 60% of the flooded area in the downstream Citarum is saved. Here, 700 million Kwh of electricity is generated every year, most going to the cities to develop industries and to improve city lives, by creating employment.

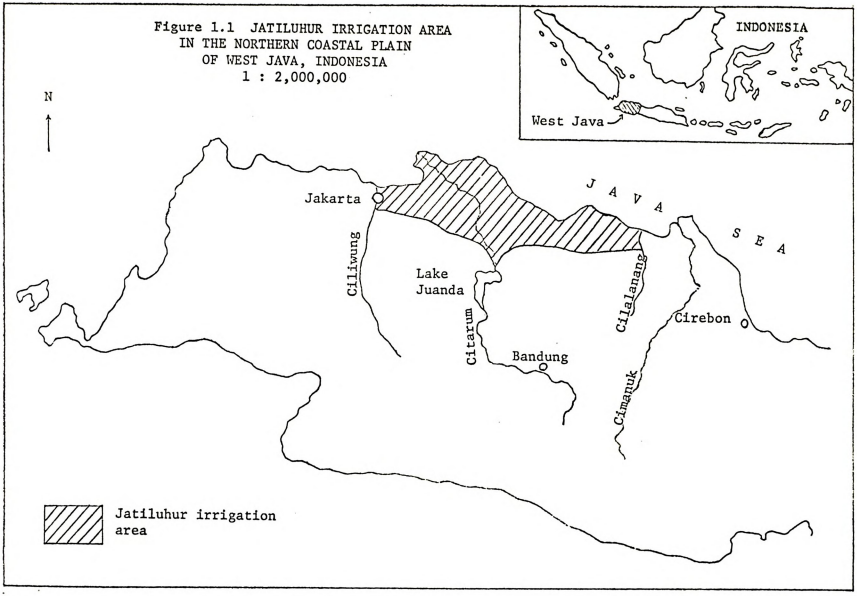


Figure 1.1 JATILUHUR IRRIGATION AREA
IN THE NORTHERN COASTAL PLAIN
OF WEST JAVA, INDONESIA
1 : 2,000,000

Of course, it also serves to increase the problems of urbanization. The lake and its surrounding area have become an important tourist center, helping to improve the quality of life of people while at the same time increasing employment and other economic benefits. Lake fisheries have also been developed with around 750 fishermen (full-time and part-time fishermen) working in the lake in 1975 and producing around 200 tons of fish.

About five miles downstream there is another dam, the Curug, with a carrying capacity of 350 million cubic meters of water, specializing in the distribution of water into two main irrigation channels. Tarum Barat and Tarum Timur (West and East Tarum) with a maximum capacity of 93.5 and 80 cubic meter per second, respectively. Tarum Timur irrigates around 96,000 hectares of ricefield (1 hectare = 2.471 acres); Tarum Barat, in addition to irrigating 85,000 hectares of ricefield, also helps the national capital city of Jakarta with more than 10 cubic meters per second in order to improve her drainage system and her clean water sources. Lake Juanda helps maintain the stability of the water content of the Curug dam.

Another dam, known as "Walahar dam", about five miles from the Curug dam, feeds the third main channel, Tarum Utara (North Tarum), in order to irrigate around 80,000 hectares of ricefield. The Walahar is one of the older irrigation systems. After it was rehabilitated and improved, it was integrated into the Jatiluhur system.

As noted, two other lakes are to be constructed at the upper valley of the Citarum. Lake Saguling (Tarum I) will be completed very soon and Lake Cirata (Tarum II), located between Saguling and Juanda will

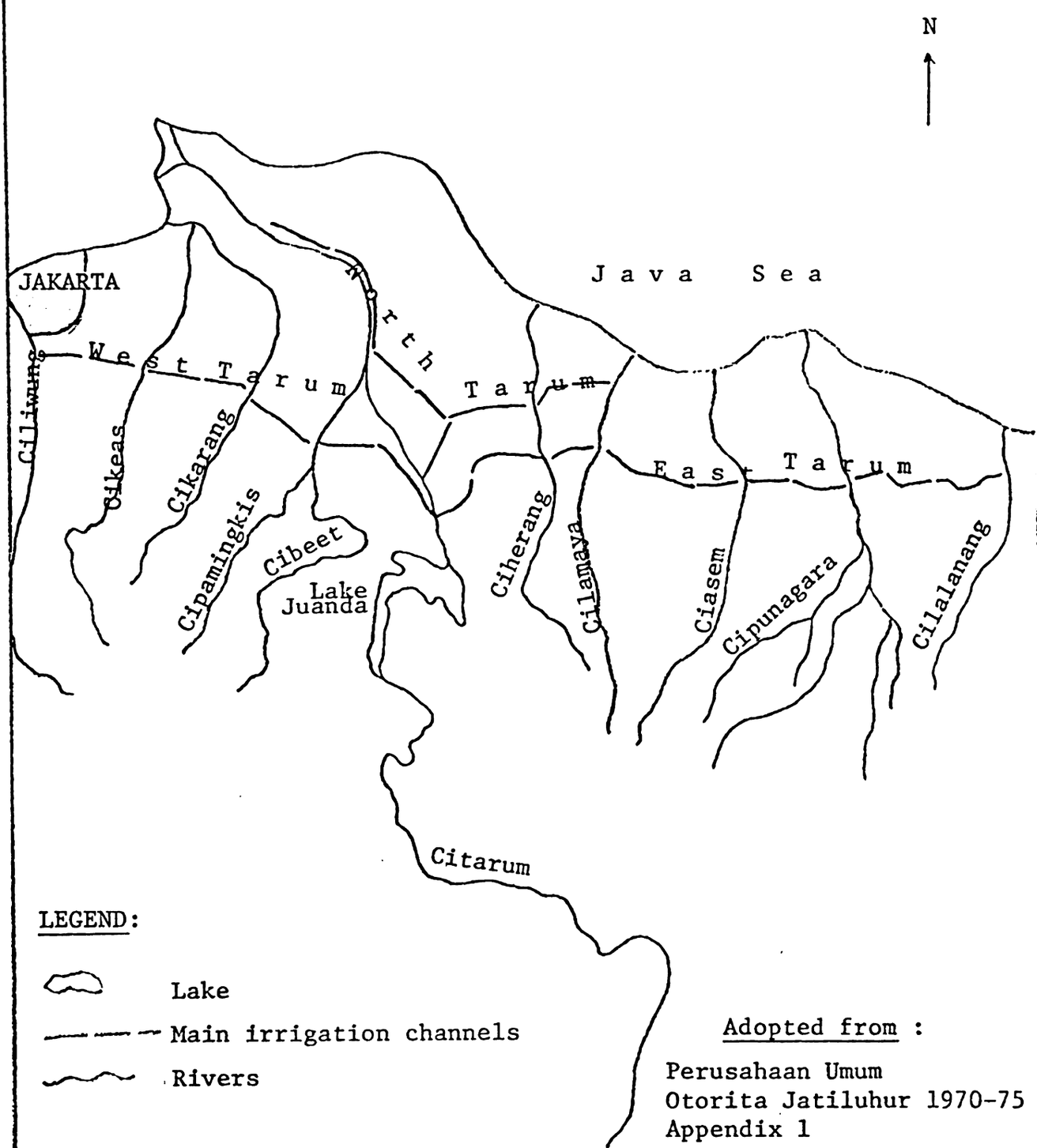
follow. These two lakes together will increase the irrigated ricefield by 100,000 hectares, produce electricity of more than three billion Kwh/year, reduce sedimentation at Lake Juanda (or increasing its life span from estimated 200 years), increase the safety of the lower stream from the threat of flooding, and increase land fisheries and recreation areas.

The second component of the project are the irrigation channels. A total of 252 kilometers of main channels, plus 1,000 kilometers of secondary channels, namely the branches of main channels, plus 3,700 kilometers of tertiary channels and more than 10,000 kilometers of quartairy channels, are distributing water to 260,000 hectares of ricefield. Included in this number are the channels of the older irrigation systems. The primary function of the main channels is to support the "older" systems, in order that they are able to irrigate all ricefields properly all year round. As we know, under the "older" systems alone, only in a small proportion of the ricefield could the farmers practice the double cropping system. Flood control of Lake Juanda does not protect the area beyond the Citarum stream area. In order to secure these areas, drainage channels have been constructed, and 21 water reservoirs similar to, but smaller than, Lake Juanda are going to be built in each stream area.

The third component of the Jatiluhur Project which deeply influences the life of farm families in the villages is channel dikes. Channel dikes play an important role in transportation and communication between villages, and between villages and main roads to urban areas. One can, for example, drive four wheel vehicles on the dikes of the main

Figure 1.2 Hydrographic map
of Jatiluhur Irrigation Area, West Java

1 : 1,000,000



channels and on some of the secondary channels. Thus, the isolation of villages is lessened, and it makes it possible for villagers to get a better access to markets which, in turn, brings about a better standard of living for the farmers. Transportation costs are reduced so that the farmers can buy what they need at lower prices, and on the other hand, they can sell their own production at a better or higher price. Better communication also makes it possible for farm laborers to have access to a broad range of job opportunities, and in addition, some farmers are themselves directly involved in providing transportation services to their neighbors.

Another important element of the project, as mentioned earlier, is the huge and complex organization of the project. One of the important things to note about this is that at the village level, local water users organizations have been formed, where farmers get together to discuss and solve their problems. This will be discussed in greater detail in Chapter III.

CHAPTER II

ORGANIZATION OF THE RESEARCH

This chapter outlines the research procedures and strategies. The study problem is specified in Section One and related literature is reviewed in Section Two. In Section Three, definitions of main terms are provided, along with a consideration of pertinent theories and the research hypothesis. Field strategies, including the general approach, and selection of village and farmer respondents, are reported in Section Four, Five and Six, respectively. Finally, the data analysis procedure and strategies of interpretation are dealt with in Section Seven. Seven.

1. Study Problem Specified

During this past decade, the northern coastal plain of West Java has become an important monuculture rice-producing region because of the completion of the multi-purposed Jatiluhur Irrigation Project. The project, carefully planned, strongly supported, and widely acclaimed, has been successful in promising a brighter future for farm families in the region by generating greater production efficiency, higher yields, and increasing seasonal employment opportunities. The introduction of "Green Revolution" varieties of rice has contributed in part to the expanded harvest.

The introduction of this irrigation system has changed the hydrological environment of the area which, in turn, has produced new and different patterns of farming enterprises and activities. The farmers do not have to leave their ricefields fallow during dry seasons. Al

the farm lands are now growing rice twice a year. Much dry land as well as many swamps have been changed into ricefields. Working in the ricefields has become less backbreaking because land is softer, planting and weeding are easier, and so are the daily maintenance chores. On the other hand, the farmers have stopped growing secondary crops such as sweet potatoes, peanuts and soybeans, on their ricefields during east monsoons (dry seasons). They have also lost some of their sources of firewood. In addition, many farmers lost grazing lands for their cattle, water buffaloes, sheep and goats. This situation has reduced the animal population and the use of animal power for agricultural purposes.

Coinciding with the environmental transportation, a cumulative change occurred in the Jatiluhur Irrigation Area. Some older socio-economic practices faded out while other new ones emerged. Many traditional farming practices that farmers inherited from their ancestors generations ago had to be modified and adjusted to the new environment. The differential speed and intensity of reaction to the irrigation project in various sectors of the agricultural millieu undoubtedly caused some disturbances in the previous balance of farm family life. Problems of adaptation to the new situation were inevitable.

The Jatiluhur Irrigation Project has changed and is continuing to change the lives and fortunes of farm families on the northern coastal plain of West Java. Like many similar projects in other parts of the world, its impacts in terms of commonly employed socio-economic indicators, have generally been of a positive nature. But not all the changes have been to the good; some pattern incongruities have been produced, dysfunctional elements, and institutional strains have been accompanied

or have been derived from the new systems of farming.

Numerous studies have been done in newly irrigated areas of the world, in order to understand the impacts of irrigation on the socio-economic lives of farmers and farm families. Among the findings that have been published include impacts on: agricultural production (Gabriel, 1973; Steinberg, 1980), employment opportunities (Soelistyo, 1975; Sriswadilek, 1979; Mohamed, 1979), farm laborer-employer relationship (Pasternak, 1968), social and political organization (Wittfogel, 1957; Bacdayan, 1974), etc. (Further information will be provided in Section Two). But there are still a lot of questions that have not been addressed by researchers in this field, especially in West Java, that need to be, in order to increase our knowledge about the consequences of such development projects.

The present study is concerned with social impacts of the Jatiluhur Irrigation Project, especially those on farm family work patterns in village communities. More specifically, the study investigages the way and the extent to which farm family work patterns are affected by the changed hydrological conditions brought about by the Jatiluhur Irrigation Project. The key questions are: 1) What changes have taken place in farm family work patterns? 2) Do the patterns of changes vary between different types of villages? 3) Do the patterns of changes vary among different socio-economic levels.?

2. Review of Literature

Many studies about the impacts of irrigation on the social fabric have been done since Wittfogel's classic, Oriental Despotism,was

first published in 1957. This is understandable, of course, because the use of irrigation as a method of increasing food production in order to meet the need of fast growing world population has increased enormously. Irrigation studies have become popular, too, because they invariably relate to many aspects of life among a large segment of the human population, and many parts of the world. Many academic disciplines have been involved in studying different aspects of irrigation, and numerous research reports have been published in various languages, in different journals, and in books.

Irrigation systems applied to agriculture were developed in many cultures from very early times onward. Christiansetn (1953) quotes O.W. Israelsen that "irrigation had been established when the writing of history began. The British Society of Anthropology accepts as a fundamental doctrine that, historically, "civilization followed the development of irrigation." Another statement, different from the "doctrine", is written by Cantor (1967) saying that irrigation is "the product of complex civilizations which had progressed beyond the subsistence stage of agriculture." In fact, irrigation and civilization have been developing each other, and irrigation could be used, perhaps, as one of the indicators of civilization.

Archeological studies provide evidence that ancient irrigation agriculture was practiced, among others, in highly civilized societies in the following areas:

1) China, Mohenjo-daro of the Indus Valley (India), Mesopotamia and Egypt at about 5,000 years ago or earlier (Cantor, 1967; Bennet, 1968; Adams, 1974;

Spooner, 1974).

2) Peru, at about 3750 years ago (Moseley, 1974), Deh Luran Plain of Iran around 2,500 years ago (Neely, 1974).

3) Java, sometimes before Christ (Geertz, 1963), that is supposed to be before contact was made with the Indian culture (Wertheim, 1968).

4) New Mexico and Arizona in the USA, soon after the birth of Christ (Cantor, 1967).

People of the historically Ancient Culture (Egypt, Mesopotamia, India, China) practiced irrigation to increase food production in order to meet the needs of an increasing population and to prevent famine (Moseley, 1974; Kappel, 1974; Lees, 1974; Bennet, 1968). In the New World, such as in many parts of the British Commonwealth and in the USA, irrigation has been introduced into areas of low population density in order to attract people and to establish communities of farmers in formerly barren regions; commercial farming especially stock farming, and related industries are encouraged (Carrier, 1932). In this case, transportation and trade on the one hand and irrigation agriculture on the other, have a mutual development relationship. That is, the socio-economic and cultural conditions of a society influence the initiation and development of irrigation. Similarly, the influences of irrigation on society are also shown by a large number of studies.

Through irrigation farmers can control the presence of water on their farms in relation to the amount and timing needed by the growing plants. Of course, water requirements vary among different types of

plants, but most farmers are familiar with the characteristics of the plants they are growing with respect to how much water is needed and when it must be supplied. In the case of growing rice, the regularity of water supplied through irrigation makes it possible for farmers to practice a double cropping system. Kikuchi and others (1978) write about the function of irrigation as follows:

> "Irrigation represents a critical infrastructure for agricultural development in rice growing regions in Asia. Not only does it increase and stabilize rice yields for a given technology, but it also facilitates the development and diffusion of high-yielding varieties with high level of application of fertilizers and related input -- the technology heralded as the Green Revolution."

A study carried out in Thailand by Sriswadilek and his collaborators (1975) also found that "adoption and yield of modern varieties were largely determined by the degree of water control." It means that irrigation is the necessary condition that should be provided before practicing other efforts in the development of rice farming.

The main and direct goal of irrigation is to increase agricultural production, and to make farming more profitable. Recent studies concerning the increase of agricultural production due to irrigation prove the frequent achievement of that goal. In Mediterranean countries, for example, Beraud and Gabriel (1972) find that production increases due to irrigation have been notable in fruits, vegetables, maize and industrial crops. In his study reports on the Philippines and Korea, Steinberg (1980) notes that rice production in the irrigated ricefields has increased significantly. In the Philippines' report he writes that "irrigation provided the opportunity to grow two crops each year, increasing rice production and gross farm income." And, in his Korean report he

says that Korean irrigation projects have assisted the country in becoming self-sufficient in rice and barley, and in elevating the income of farm households. Increasing agricultural production due to irrigation is also reported from other parts of the world, such as: West Bengal (Mukhopadyay, 1970); India (Singh, 1974); Indonesia (Geertz, 1963); Malaysia (Mohamed, 1979); Thailand (Sriswadilek, 1979); and Tana Irrigation Project of Africa (Baarspul, 1971).

Very closely related to the increase of agricultural production is a question about its distribution among farmers, especially with regard to farm size. Oudin (1973) reports that irrigation gives more benefit to big farmers who can save more money from the products of their farms while small farmers lag behind. Gonzalez (1972), and Singh and Patel (1974) talk about the same thing happening in the Dominican Republic and in India, respectively. The difference in total benefit, or total farm family income, makes farmers get different access to capital resources. Large farmers may be able to accumulate their own capital; and in addition, the banking or loan system in many societies give more opportunity to large farmers who are able to provide material guarantees. This situation creates a disparity between large farmers and small farmers, and between land owners and farm laborers -- a disparity which will increase further when labor saving machinery is introduced (Wills, 1972). Adams (1968) is sure that irrigation helps to set in motion those processes that increase social stratification. Farrington (1974), too, believes that irrigation is a prime causal factor in the development of social stratification.

It was mentioned that irrigation has something to do with population changes. Irrigation influences the demographic situation and geographic processes of an area. In ancient civilizations, such as China, India, Mesopotamia and Egypt, where the main goal of irrigation is to increase farm production in order to meet the needs for food of a dense population, a successful irrigation program may banish famine (Carrier, 1932) which in turn, causes a significant increase in population due to the decrease of mortality. This situation of "increasing prosperity" may also encourage people from other areas to migrate, such as the case reported by Moseley (1974) on coastal Peru. Moseley writes: "Irrigation causes the movement of population and settlement from the Pacific coastal area to the inland part of the country." On the dry north coast of Peru, Farrington (1974) reports that irrigation system controls the location of the villages, by putting them outside the irrigated area, or on the low mounds and hillsides within the cultivation area, in order not to reduce the land for farming. When the great dam across the Euphrates River was built, a village was flooded, and 60,000 peasants were forced to find new homes. They were transferred downstream to new settlements below the dam (Juan de Onis, 1973). This means that the irrigation dam was very important in helping people to increase quality of their lives. With regard to population growth and settlement pattern, Neely's study (1974) in the Deh Luran Plain of Iran points to a dramatic increase in population density with a concomitant change to numerous and dispersed sites and settlement pattern which he supposes to relate to the increase in the efficiency of water control and irrigation techniques. Another study in Iran by Schweizer (1973) finds that

irrigation turned the nomadic people of the steppe of northwest Iran into sedentary farmers or commercial livestock producers. Thus, irrigation in the ancient societies was aimed at solving a population problem and has affected the demographic situation and demographic processes of the area. In other words, irrigation and population growth have been mutually influencing.

The impact of irrigation with regard to employment opportunities is reported by many studies. Soelistyo (1975) reveals that irrigation facilities in East Java, Indonesia, are the most important means of providing employment opportunities to the rural population. To him, other means help also but not as much as irrigation facilities. Regarding the effort to increase job opportunities, he suggests that employment opportunities in rural areas of East Java should be provided by using as many means as possible, but emphasis should be given to the improvement and enlargement of the irrigation facilities. Similar findings are reported by Sriswadilek (1979) from Nam Pong Irrigation Project in Thailand and by Mohamed (1979) from Kemubu Irrigation Project in Malaysia. Prabowo (1978) focuses his attention on farm family labor of the Solo River basin in Java. His study reveals that in the fully irrigated farms, the use of family labor is significantly higher than in the partially irrigated and non-irrigated lands. In the Philippines, Steinberg (1980) finds that on-farm employment, including that of farm family labor, has grown. But, off-farm employment has decreased. This phenomenon is due mainly to the multiple cropping system that has been made possible following the introduction of irrigation systems. Another aspect of labor utilization is reported by Oudin (1973) when he writes that irrigation

has changed the rhythm of manpower use. An interesting analysis about the relationships between irrigation and labor use is made by Pasternak in his study report about irrigation in Formosa. He says that irrigation alters significantly the relationships between labor supply and demand, and between employers and farm laborers. He writes:

> "Because water suddenly became available to most villages at about the same time, fewer farmers are able to release labor for exchange. As a result, there is a growing reliance on hired labor. Labor must increasingly be brought from more distant places. Employer/employee relationships are consequently becoming more formal and impersonal as they cut across kinship, village, regional and ethnic lines."

In line with these studies there is a warning from Oudin (1973) that irrigation brings about a change from traditional farming to a modern highly mechanized type of farming, which makes big farmers bigger while small farmers lag behind. A study by Sinaga (1978) in Indramayu, West Java, reveals that tractorization in wet ricefields threatens farm laborers' opportunity to get jobs.

Irrigation systems of some kind can be developed by an individual farmer, by the cooperative effort of a group of farmers, by government, or by a combination. A small irrigation system can be part of a larger system; and an irrigation system may serve several communities. While some irrigation systems can fulfill the demand of farmers for water, many others cannot, so that the distribution of water can become a serious problem and social conflicts and tensions over water rights may arise. Even individually-owned irrigation projects deal with the public water supply, need an organization, regulation and leadership to facilitate their physical establishment and maintenance, to regulate water distribution, to accommodate conflicts over water, etc. Vajda (1965)

recognizes that the greatest obstacle to the success of irrigation and drainage schemes in most developing countries is not technical, but instead, is the lack of a well-organized and well-staffed administration able to design, carry out, and supervise operation of large irrigation projects.

Many studies about the social organization of irrigation projects have been reported and Wittfogel's Oriental Despotism (1957) is one of the best known. His proposition, namely, that irrigation necessitates a centralized control, bureaucracy and authority, is an issue that has been much discussed. Vijeyewardene and Millon are among those who do not agree with Wittfogel's despotism hypothesis. Vijeyewardene (1973) in his article "Hydraulic Society in Contemporary Thailand," writes that after a vast expansion of irrigation in this century, Thailand now is a hydraulic society without oriental despotism, but rather with agro-managerial rule by the bureaucracy. Millon, according to Hunt (1976) in the review of research reports opposed Wittfogel when he says that from his examination of seven case studies "centralized authority and the practice of irrigation are not necessarily related". Bacdayan's study (1974) in a Western Bontoc irrigation system of the Philippines reveals that the exapansion of irrigation serves to reinforce the traditional local organization and to help reinforce the regional collaboration of villages at the same time. Participation in an irrigation system, it is argued, enhances the articultion of the relatively isolated community with the outside world and in particular with the structure of the national state of the Philippines. While in Formosa, Pasternak (1968) finds that the introduction of groundpumps on canal irrigation

systems reduced the necessity for cooperation and coordination in water management, and removed one of the major causes of intervillage and intravillage conflicts. In relation to conflict, Hunt and Hunt (1974) in their study in Mexico find that conflict over water occurs very often. They think that the accomodation of conflict tend to be easier when persons in high power position are involved.

Apart from the debate about centralized - decentralized authority in "hydraulic" societies, there are a number of studies about the organization of irrigation activities in the field, i.e., at the micro level. The emphasis of the discussion is on irrigation organization in order to make irrigation more effective, especially for using in developing countries. Coward (1978) writes reports on a seminar involving research methodologists dealing with research methods for studying the organization of irrigation projects. Participant observation, survey research, documentary research and comparative analysis were discussed and evaluated. About the practical management of irrigation, Coward (1976) suggests that "indigenous irrigation leadership roles could be adapted to link the water bureaucracy with local users," in order to eliminate gaps between the objectives of farmers and those of irrigation bureaucracies. Levine (1977) touches on the essential social problems with respect to irrigation when he writes:

> "(1) Our knowledge of the interrelationships between water and plant growth far exceeds our knowledge of the inter-relations between water and the human element in delivery and utilization...
>
> (2) The efficiency concepts used in irrigation system design tend to understress the human component as a factor in water use crop production.

(3) Irrigation systems, on the one hand, and the farmers they serve, on the other, have criteria of optimal efficiencies of water use which may not coincide. When they are far apart there is friction between the system and the farmers and/or between the farmers.

(4) Within the resources available to the farmers and to the system, the operational optima for both parties can be brought closer together by effective liaison, e.g., feedback and response mechanism.

(5) As a result of (1) to (4) above, it is usually better for the irrigation engineer to 'recognize' probabilities initially and strive, through reasonably acceptable change, toward possibilities."

Finally, another aspect of social organization of irrigation appears in Hunt and Hunt's paper (1976) about role embededness. It concerns the relationship between roles which manage the irrigation systems and other roles in the local social organization. They point out that there is a high degree of irrigation role embededness in local society which relates to social stratification.

In conclusion, from the literature reviewed here, we understand how important the role of irrigation is in the modernization of agriculture especially in growing rice in wet ricefields. It enhances a basic condition for the development of rice agriculture, and it also produces significant impacts on social,economic and political aspects of life of farmers, farm families, and farming communities. Irrigation clearly helps a society solve one of its more difficult problems, namely, of assuring a reliable and adequate food supply for its population. But it also poses some rather sticky new problems that seem to emerge from the social and ecological disturbance that are necessary to bring an irrigation system into being.

An important aim of the present study is to explore one aspect of such disturbances, namely, the impacts upon farm family work patterns.

3. Theories Considered

By "family work" we mean here the involvement of family members in productive efforts to fulfill the needs of the family, and to maintain and to increase family property. Two things are included in "family work," namely "family economic enterprise" and "family economic activity." Farm family enterprise is any group of activities centered on one object that a farm family exploits as a resource of family income. It includes activities related to growing and harvesting of crops, raising animals, off-farming and nonfarming enterprises, etc. "Patterns of farm family enterprise" relates to the kinds of enterprises and their order of importance in the lives of the family involved. "Farm family economic activities" are understood to be the performance of specific function characterizing a farm family enterprise. The pattern of farm family activities is the kinds of those activities that a farm family practices and their order of importance in terms of the amount of time allocated by its members. The patterns of farm family enterprises and farm family activities reflect the changed composition and rhythm of each during the farming cycle.

A village is identified as a form of settlement in a rural area consisting of a group of houses and other related buildings, ranging from several up to one thousand or more, that are built on a piece of land separated from farm land. In West Java, among Sundanese, a village is called "lembur"; the word "kampung" is also sometimes used. Each

village is viewed as a social system, having a social structure and distinctive values.

Jatiluhur irrigation changed the hydrological circumstances of the region, to which village communities have been adapting. Adaptation is a process by which individuals or groups modify their way of living, in this case family enterprises and activities or labor utilization, to meet the requirement of their social and physical environment. In the process, farmers may abandon some of their family enterprises and labor practices, and adapt new ones relevant to the demands of the new environment. Hydrological circumstances, in wet ricefield areas, is a critical factor in the organization of the family enterprise and activities among the farmers.

The three villages under study previously had different levels of access to water sources for agricultural purposes. Betok village in the rainfed area had the least; Kamalsari with its irrigation system had the most; and Kalencabang in the regularly flooded area was somewhere between Betok and Kamalsari, but closer to Betok, namely with additional problems that came from flooding. As a consequence, the farmers had different opportunities for growing rice, which determines the number of enterprises, time spent and other features of the farm system. Farmers in Betok grew rice once a year which was during rainy seasons; farmers in Kamalsari could grow rice twice a year, during rainy as well as during dry season; while farmers in Kalencabang could grow rice once a year and their ricefields were often disturbed by flood. Irrigation brought these three villages under the same hydrological conditions in which all the farmers could grow rice twice a year. Hence the farmers

had to adapt their family enterprises and economic activities to this new condition. For reasons mentioned, the processes of adaptation and the nature of changes experienced by farm family households we expect will be rather similar in Betok and Kalencabang but the experiences of household in Kamalsari is expected to be quite different from the other two and probably not as disturbing of the old patterns. In other words, the impacts of Jatiluhur project will prove greater in those villages that had previously not been organized around a system of irrigation.

Since prior adaptation to the different environment required different roles and socio-economic differentiations, the impact of the change (the assured water supply) can be expected to differ by socio-economic status of the farmers. Farm size is a very important structural variable in the lives of farm families, particularly among full-time farmers, because other aspects and quality of living depend upon total farm production which is the function of farm size. But in a very densely populated area where farming is subsistence and where most farms are too small to support a family, the average amount of land per member of farm households is supposed to be a more accurate socio-economic indicator of a farm family, because the same size of land will mean differently to farm family of different size. Average amount of land per member determines the per capita income and surplus product to form capital sources which, in turn, influences the levels of other developmental variables such as: media communication, cosmopoliteness, opinion leadership, educational and job aspirations, achievement motives, contact with important persons, and courage to take risks.

These variables, on the other hand, differentiate socio-economic status of the farmers, which is an important variable in the adoption of innovations.

Among farm families in the lower (essentially landless) socio-economic category it is usual for men, women and older children to work together in pursuing a subsistence level of living. This situation is generally not the norm among upper status farmers who have more land. Irrigation changes the situation. Upper class women and children, we would expect, are not as likely anymore to engage in field work. Thus, the processes of adaptation and the nature of changes experienced by farm family households in each of the various types of villages will be affected by the social class position of those families. That is, a project such as the Jatiluhur irrigation system which was designed to stimulate the rapid modernization of agriculture and specifically of rice growing, will impact differently on the various socio-economic classes in the affected villages. Although those impacts cannot be observed directly by the present study, we expect that indirect evidence and some shift in the patterns of works will be manifested.

4. Study Design

Three kinds of comparisons will be made with respect to farm family work patterns:

a. Comparisons of three villages with quite different hydrological conditions prior to the Jatiluhur Irrigation Project. The village of Betok was completely dependent upon rain.

Kalencabang used to be flooded every rainy season of the year; and Kamalsari was irrigated from local streams.

b. Comparisons of changes noted by villages since introduction of the Jatiluhur Irrigation Project.

c. Comparisons between the various socio-economic groupings in these villages. Farm family work patterns of upper status (more land) farmers, middle status (enough land) farmers, and low status (less land and landless) farmers will be compared.

There are several possible models for the design of a "before and after" comparative study that deals with the introduction of a new program. The first model is a longitudinal design, comparing the information collected at "Time One" (before) with information collected at "Time Two" (after). This model provides by itself a firm foundation (data base) relevant to the main goal, because data that are collected before the treatment (in this case irrigation) are selected in such a way as to increase the degree of comparability with data collected at "Time Two". This longitudinal approach is considered the most appropriate strategy for investigating the impacts of development program, such as the Jatiluhur Irrigation Project. But a longitudinal approach require much time and lots of money.

The second possible model is a matching pairs comparison. This would contrast, for instance, information collected at present from

these three villages (now irrigated by Jatiluhur) with information collected also at present from another set of three comparable villages which are not irrigated (and not included in the Jatiluhur Irrigation Area). The second set of villages must be similar in every other sense, except for irrigation. This approach, like the longitudinal, is expensive, but it can reduce time constraints considerably, because both studies are done at the same time (i.e.,at "Time Two"). However, a matching pair comparison must deal with a serious problem namely the question of comparability of the two study sites and associated circumstances.

The third possible approach is to contrive a comparison by direct reference to data from a similar study done elsewhere. This design is the least expensive, but it depends upon the availability of a detailed report of the comparable study (and, of course, that the methodologies employed yielded reliable and valid information that is appropriate for the case at hand).

Given that the aim of this project is to explore the impacts of an irrigation project, one might ask how this can be done without a base study? The study was designed in such a way that comparisons between two situations at different points in time (before and after) could be made by using retrospective information collected at Time-Two (present situation). Thus, heads of households who had been self-employed farmers in the village since at least 1968, i.e., before the Jatiluhur project, were asked a series of questions: what kind of farming did they do in the past, what were the roles of the various members in the household, etc. Similarly, questions were asked about the present. Heads of

households were also asked about economic activities: what kind of tasks were they doing, and how important the tasks were in terms of total family labor time spent in the tasks.

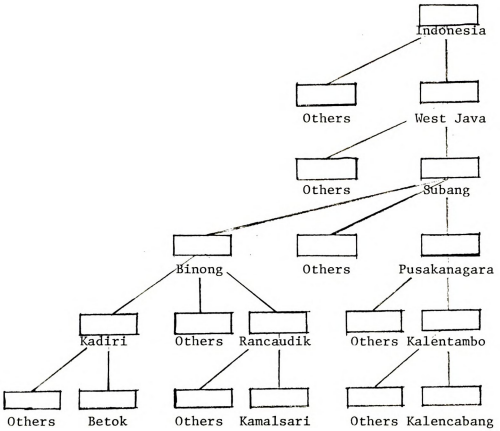
5. Selection of Villages

In this area, where about 2.5 million of people are living, there are hundreds of villages and small towns. Three dominant factors determine the location of villages in this low and flat land, including two natural phenomena and one man made, namely, low sand dunes along the coast, natural levees beside the river valleys, and a road system connecting cities with its branches. The first two factors give at least three kinds of benefit to the villagers: protection from floods, proximity to fishing and the advantages of water transportation. Road systems in this area make it easier for people to come into contact with themodern way of living.

The shapes of villages vary: "sand dune villages" are long and parallel to the coast; "levee villages" are long and usually bend following the meandering rivers; and villages dominated by road system are shaped from square to oblong or round.

Figure 2.1 shows the position of villages in the administrative structure of the country. The Republic of Indonesia consists of 27 provinces. Five of them, including the capital city of Jakarta, are in Java; West Java is one of them. Every province is administratively divided into regencies (kabupaten) and municipalities (kotamadya). In West Java there are 24, including 20 kabupatens and four kotamadyas. It was mentioned that the Jatiluhur irrigation area belongs to five

Figure 2.1. Position of the villages in the administrative structure of the country



regencies (Bekasi,Karawang,Purwakarta,Subang and Indramayu),although only a part of each kabupaten is irrigated by Jatiluhur. The three villages under study are located in kabupaten Subang. A kabupaten consists of several kecamatans (districts). In kabupaten Subang there are 12 kecamatans including Binong and Pusakanagara where the three villages are located. A kecamatan in turn, is subdivided into "desa's", which is the smallest and lowest administrative unit. There are 10 desas in Binong and 13 in Pusakanagara. Now we come to desa Kadiri and Rancaudik in Binong, and Kalentambo in Pusakanagara, where each of our villages is located. Depending upon the size of the villages in terms of the number of households and population, there are villages that are given a status as a desa, or even two desas are included in one village. If the village is small, it will join with another village and form a desa. In Figure 2.1 we can see clearly that our villages belong to the third category, namely, joined with other villages in one desa.

Our concern in this study is whether or not changes in farm family work patterns vary by village types in terms of the hydrological history of the villages. Thus from a methodological point of view, village type will be regarded as the independent variable and work patterns the dependent variable. The characteristics of these villages play an important part in setting the stage for our observations and, therefore, the villages should be similar in every sense except in their history of hydrological condition. Although the selection is basically purposive, four criteria were taken into consideration, including location, size, level of development and hydrological background.

With regard to location, the three villages are in the Jatiluhur irrigation area. They have similar access to transportation facilities,

and they are similar in terms of number of households. A detailed description of the villages will be provided in subsequent chapters. Suffice to note here that Betok village has 356 households, Kalencabang 255, and Kamalsari 170.

Regarding level of development, the central government categorized desas into "swadaya", "swakarya" and "swasembada" (traditional, transitional and developed), based on their achievement and potentials with respect to development. The villages involved in this study are at the same level of development.

As to the hydrological background of the villages, it was mentioned that they initially differed markedly, one was rainfed, another regularly flooded, and the third irrigated from local water sources.

Final selection of the villages was based on information derived from existing documents, interviews with government officials, and field observation. Firstly, the hydrological history of the region was studied. With help from administrative officers of the Jatiluhur project, three areas of different hydrological background in the Jatiluhur Irrigation Area were identified, namely those that used to depend upon rainfall for farming practices, those that were regularly flooded every rainy season, and those that had been irrigated earlier from local water sources. In order to get further more specific details about potential study sites, additional information was obtained from administrators at the regency and district levels. (Note: Five regencies are included in the Jatiluhur Irrigation Area; see Chapter III). At the

district level, desas in the three different hydrological areas were identified relative to their levels of development. Desas were grouped into "swadaya", "swakarya" and "swasembada" (traditional, transitional, and developed). Their geographic location, especially relative to relative centrality and ease of communication with urban areas were considered. At this stage, desas with similar levels of development and geographic location were identified. Finally, visits to the villages and general interviews with local leaders helped to determine the villages eventually selected for study. It should be noted that, prior to the initiating this study, the researcher was not acquainted with any persons in any of the villages selected. (And it also may be of interest that the selection process took considerable time; over a month was spent perusing records and documents, talking with officals, and visiting potential sites).

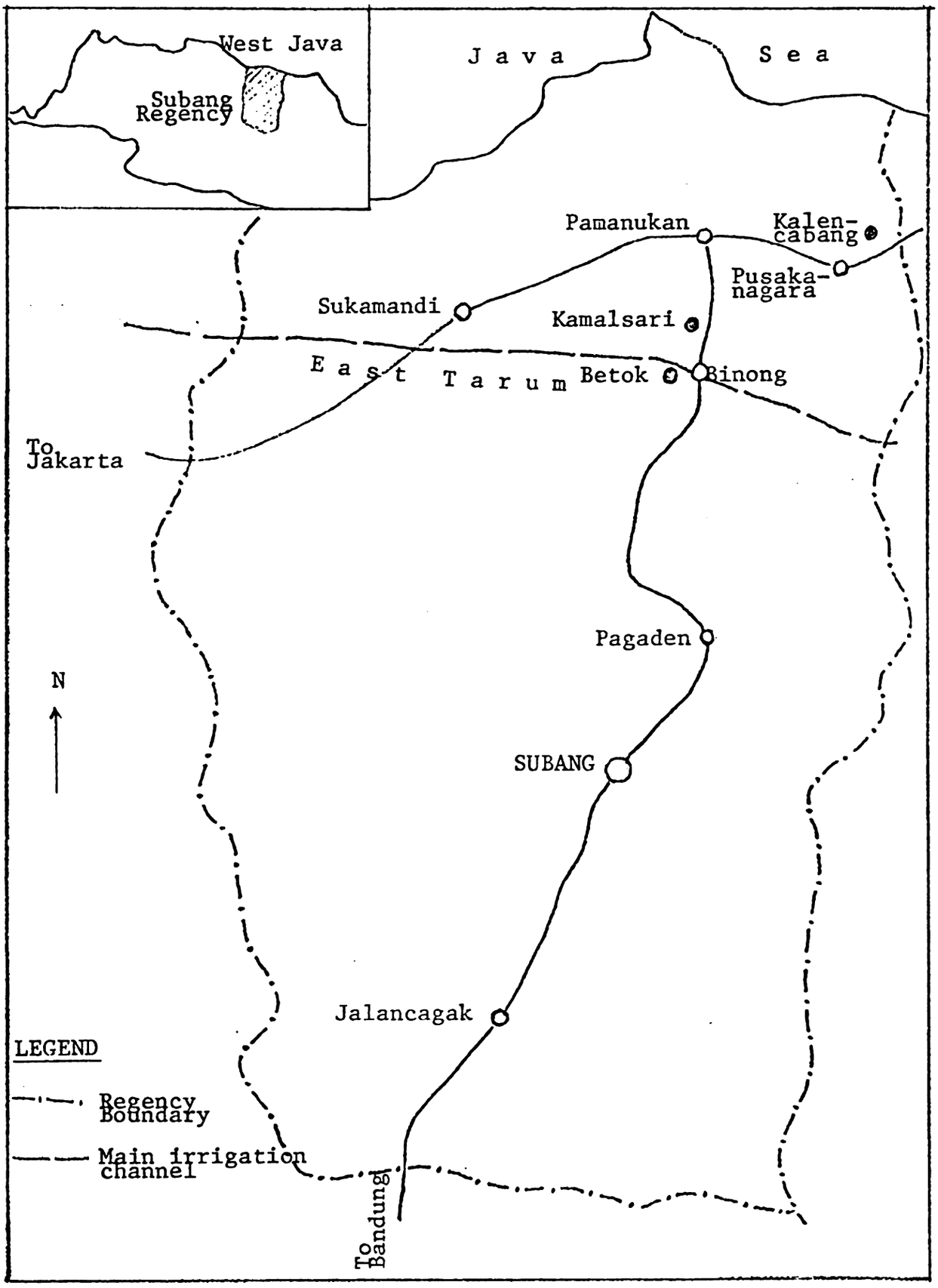
Figure 2.2 The characteristics of selected villages

Names of the Villages	Distance from main road (miles)	Size (# of households)	Level of development	Hydrological history
Betok	2	356	transitional	rainfed
Kalencabang	2	255	transitional	regularly flooded
Kamalsari	1	170	transitional	irrigated from local sources

Figure 2.5 presents the location of the three selected villages.

Figure 2.3. The three villages
in the Subang regency

1 : 100,000



6. Selection of Respondents, Other Sources of Information

Three major sources of data are utilized, namely relevant secondary information, direct interviews and field observation. Secondary information sources include census records, reports and documents of government institutes (especially at desa level), research reports, and articles in periodicals and newspapers. Interviews were conducted with some informants and with a cross-section of farmers.

Informants, about five key persons from each village, were selected because they knew a great deal about the village and the various farm households. They included former and present elected heads of the village and neighborhoods, some local informal leaders, and older farmers, and, in some cases, their wives. Young farmers also were included.

For purposes of this study, farmer respondents were defined as heads of farm households that had been self-employed farmers since at least 1968. Those who did not fulfill this criterion, including farmers who moved in to these villages after 1968 and those who had not been self-employed since 1968 were excluded. This criterion was set up based on the following reasons. First of all, it was mentioned that retrospective approach was utilized in order to establish a data base for estimating the change in work patterns, namely by asking the household heads their memories back to 1967. In the second place, this study assessed the continuity of changes that came about in the patterns of work in the households during a period of time. Finally, newcomers would not have experienced the changes directly as household heads.

The specified study population was enumerated based on desa population documents, in which the lists of household heads, their age,

family size, and other basic demographic characteristics were available. Village informants and village documents added some informations about when the family was established relative to the Jatiluhur project, and about the size of land owned by each household. The households were grouped into three socio-economic categories designated as "more land" (upper status) farmers, "enough land" (middle status) farmers, and a combination of "landless and less land" (low status) farmers. This categorization of farm families was based on the average land owned per member of a farm household. The National Socio-Economic Survey report with respect to average per capita expenditure and "Tertiary Plot Pilot" record regarding balance product per hectare of ricefield per year, constitute a firm foundation for this classification. This socio-economic indicator is considered reasonably sensitive to variations in economic situation and able to provide a good estimate of farm family socio-economic level.

The activities of more land families with surplus farm production are not restricted by necessity to providing for the basic daily needs of their households. Generally they enjoy rather secure economic circumstance, many of the amenities of modern life, and a relatively high social status. They often encounter and are able to take advantage of opportunities to form and develop capital for future development of their economic condition, and they can finance better and higher education for their children. Thus, more land families can live reasonably well today and, for them, the future looks bright.

Enough land families, on the other hand, obtain just enough agricultural production from their own land for the daily needs of their

households. From this economic point of view, they are marginal men, whose lives depend totally upon the success of their harvests. For additional income and to accumulate any capital, they must work off-farm for wages or expand their farm operation by renting some ricefields from others. The latter is rather difficult because cash money for rent is scarce. Generally they enjoy a moderate style of life today, but they have to work very hard to secure a better future for themselves and their children.

Lessland families cannot produce enough harvest from their land to provide for the basic needs of their households. Indeed, many are landless or own only a small plot for some gardening. Doing off-farm work or renting farm land is imperative for them. The latter is difficult because they lack of capital, both for the rent and operation. Opportunities for saving is minimum among this group of families. The future appears a bit tenuous for them; many must be quite content simply to survive through tomorrow.

The three categories of the farmers can be described as follows:

a. "More land" (upper status) farm family households are those with an average of two persons or less per hectare of ricefield.

b. "Enough land" (middle status) farm families are those with an average of two to six persons per hectare of ricefield.

c. "Lessland and landless" (low status) farm families are those with an average of more than six persons per hectare of ricefield and includes those who

do not own any farm land at all.

A sample of 162, or 54 from each village type, was drawn randomly, including 30 "more land", 66 "enough land" and 66 "less land landless" farm families. Sample size was not proportional.

Two sets of interview instruments were prepared, one for village informants and one for farm families. Most questions for the informants were open ended, whereas most of those for the farmers were structured.

The interview team, in addition to myself, included an assistant professor of geography at Bandung Institute of Education, a senior high school teacher, an agricultural extension worker, plus three primary school teachers per village. All received some orientation and training before doing interviews. Personal observation of family work patterns in daily practice was made. This included especially my becoming familiar with every stage of the rice growing cycle.

7. Analytical Procedures and Data Interpretation Strategies

This study is concerned with comparisons of changing patterns of farm family enterprises and farm family activities (or labor utilization) in three different villages, among three different socio-economic status within villages, and comparison of each socio-economic status between villages. We asked farmers questions about family economic enterprises (farm-related and nonfarming enterprises) and farm family economic activities (rice growing, second crops farming, dry land farming, animal production, wage working and nonfarming activities). The questions were whether or not changes in the relative

importance of particular farm family economic enterprises and farm family economic activities, or foci of labor utilization, were observed since introduction of the Jatiluhur Irrigation Project. Their answers, informed assessments about the current practices of their families and the direction of change over the years were classified in a simple scale form.

Weightings were assigned as follows:

1 = the enterprise was considered "very important", or the importance of the activity in terms of total family labor time allocation was "increasing"

2 = the enterprise was considered "somewhat important," or the importance of activity was "about the same"

3 = the enterprise was considered "not too important," or the importance of activity was "decreasing"

4 = enterprise or activity was not done.

For between village comparisons the summed scores of a series of items were used. Similarly, for socio-economic status comparisons within villages, and for between village comparisons of each particular socio-economic category, those that were given by all farmer respondents of the same socio-economic category per village were totalled. Depending upon the context, these totalled scores were called "index of importance", "index of activities expansion" or "activities expansion index".

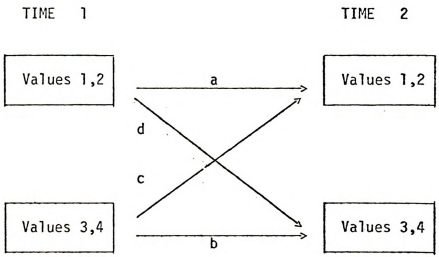
For each set of items, such as "farm-related enterprises", "rice farming activities", "dry land farming activities," etc. the aforementioned total scores were ranked, so that we can figure out the

patterns of family enterprises, or patterns of family labor allocation, either by village or by socio-economic category. Thus, we obtained, for example, patterns of farm-related enterprises of Betok village, of Kalencabang and of Kamalsari; patterns of farm-related enterprises of upper status farmers of Betok, of middle status farmers of Betok, and lower status farmers of Betok, etc. Similarly, we got patterns of changes of importance of, for instance, wage working of upper status farmers of Kalencabang, of middle status farmers of Kalencabang, of lower status of Kalencabang, etc.

Comparisons between patterns was made possible by comparing rank order correlation coefficients of the patterns involved. The utilization of Spearman's technique is considered appropriate for this purpose.

Comparisons between patterns of economic enterprises can also be presented by utilizing "directional change indices," namely the difference in proportion (percentage) of respondents whose practices of an enterprise has been increasing (+) or decreasing (-) in importance. For present purposes, answer categories were collapsed; answer categories "1" and "2" were treated as "important," and "3" and "4" as "not important." Over time, then, there were four possibilities of change as is shown in Figure 2.4.

Figure 2.4. Construction of directional change index of farm family enterprises



a = the enterprise was and remains "important"

b = the enterprise was and remains "not important"

c = the enterprise has been increasing in importance

d = the enterprise has been decreasing in importance

The percentage difference indicated by "c" minus that was noted by "d" is the directional change index of a particular enterprise.

CHAPTER III

THREE VILLAGES IN SUBANG REGENCY: PRESENT SITUATION AND STRUCTURE OF THE VILLAGES

This chapter provides a more detailed description of the three villages. Their specific geographical setting, population, household and occupational structures, formal organization and public amenities will be discussed with reference to the study's objectives. Most of the data here were derived from the various sources mentioned earlier, including samples of farm family households in the villages. We will discover through information presented in this chapter, that the three villages today are quite similar in terms of cropping practices, economic structures and socio-cultural patterns. One should keep in mind, of course, that they were selected because they represented three very different hydrological situations prior to the Jatiluhur project.

1. The Setting

The three villages, Betok, Kalencabang and Kamalsari are located in the eastern section of Jatiluhur area, almost at the end of Tarum Timur. Betok and Kamalsari belong to Binong district (a part of desa Kadiri and Rancaudik). The third village, Kalencabang, belongs to desa Kalentambo, Pusakanagara district. All are in Subang regency. (See Figure 2.4).

Betok village (topographic map 39/xxxviii B) is located about two miles from the main road connecting Jakarta and Bandung via Pamanukan. This village and Binong, the district capital, are connected by a wide

sand surfaced road, which is on the dike of Tarum Timur. Motorcycles, becaks (pedicabs, three cycles) and bicycles are the main kinds of transportation. At least twice a week, a small truck visits this village to take the roof tiles produced by the villagers at Betok to customers in other villages. Subang, the capital town of the regency, is about 20 miles south of Binong.

Kamalsari village in Rancaudik desa is about five miles to the north of Binong and about one mile west of the main road (topographic map 39/xxxviii B). The unsurfaced road connecting Kamalsari and the main road to the east and other villages to the west, is good for trucks and other smaller means of transportation only during the dry seasons.

Kalencabang village, which is a part of Kalentambo desa and Pusakanagara district, is about 10 miles to the northeast from Rancaudik via Pamanukan, two miles away to the north from the main road connecting Jakarta and Cirebon (near "Gempol" on topographic map 39/xxxvii C). A stone-surfaced road, part of which is the dike of a secondary channel, connects Pusakanagara and other villages, including Kalencabang. The same means of transportation as those in the other two villages, are also operating here.

The three villages are surrounded by vast ricefields, and often appear like islands in an ocean. The settlement pattern is more or less circular, with a diameter of about one kilometer each. Tall coconut trees, other perennial plants and banana leaves are the landmarks of every village in this low plain. Newly-built houses are oriented toward the road network with branching systems perpendicular to the six meter wide, but unsurfaced, rural main road. Most of the houses,

however, are located in such a way that they can only be reached through small alleys or through the yards of other houses.

The typical homestead of a rich farmer consists of a brick house surrounded by a cement-paved yard, where the family dries its harvest in the sun. A paddy storehouse and buffalo or other animal barn is located here also. Around the yard, tall coconut and fruit trees shadow the yard and make it cool.

Most middle status farmers do not have a special store house; instead they put their paddy in the back part of the house. The houses of the poor, of course, are very simple and they are made of wood and bamboo. Most of them are without a yard area as well, and in some cases the land where the houses are built does not belong to the owners of the house.

About 30% of the houses in each of the villages are made of brick. As elsewhere in the world, the form of construction is a symbol of status and prosperity. Currently, several more brick houses are being built, and it is expected that in the near future there will be no more wooden and bamboo houses in these villages. Building lots are at a premium, but there is still some space between houses and on the periphery of the villages.

The drainage system at Betok is very good, because close to the village there is a river valley of about five to ten meters below the average land surface. Although irrigation channels, namely Tarum Timur and the "older" Cimacan, are about at the same elevation as the village, in order to get drinking water, people have to dig wells of around ten meters deep. On the average, one common well, common bath and common

washing place is available for every four households. A hand water pump and a common bathroom owned by the village community is available for public use near the village mosque. When water in the main irrigation channels is not filthy, people often go there to wash and swim.

Kamalsari and Kalencabang do not have a good a drainage system as Betok. Having an elevation of only several inches higher than the surrounding ricefields, the ground in these two villages changes into mud very easily during rainy weather; drainage water moves very slowly. At Kamalsari, there are several community and privately-owned arthesian water sources (in addition to shallow wells) for drinking water.

Currently, then, to get clean water is not as big a problem in these three villages as it was several years ago. Before the Jatiluhur project, the water table was much deeper, especially during dry seasons. Nevertheless, the management of water for drinking, home use, and sanitation needs some more improvement.

2. Population and Household Structure

The populations in 1980 were 1258, 980 and 586 for Betok, Kalencabang and Kamalsari, respectively. Because village documents do not provide the inforamtion needed to describe the demographic situation, we also utilized census tract data. To estimate population growth we took census data at the desa level as the best estimate; census tract data are not available prior to 1980 and the census tract boundary does not coincide with the village boundary. On the other hand, we obtained population data at the desa level for 1980 and 1976. The following table (Table 3.1) presents a demographic profile of the three villages.

Table 3.1. Demographic characteristics of the three villages

Demographic Characteristics	Unit	Betok	Kalencabang	Kamalsari
Number of Population[a]	Person	1258	980	586
Age Group <15[b]	Percent	33.8	41.3	34.2
15-49		57.7	47.9	51.3
≥ 50		8.5	10.9	14.5
Sex Ratio[b]	100M/F	104	101	92
Growth 1976 - 1980[b]				
$\frac{P1980 - P1976}{P1976} \times 100$	Percent	12.1	13.2	6.4

Resources: [a] Village documents

[b] Census data

We see in the table that Kamalsari has a higher proportion of population aged 50 or more, a lower sex ratio and a lower 1976 - 1980 growth rate. Kalencabang has a higher proportion of persons under 15, while Betok has the highest proportion aged 15-49.

In 1981 there were 781 households in these three villages. A household, by definition, consists of one or more persons normally residing in a house or part of it and, if more than one person, sharing the same kitchen and living quarters. It usually includes a head of the household (male or female), a spouse, their children and others who have been drawn into the situation. Some households may consist of only one adult, but in the rural villages of West Java this is rare and generally applies to aged widows or widowers living close by their adult children.

Three groups of households were identified in the study villages:

a. Those where the current household head had been a self-employed farmer in the village since at least 1968. In some cases, the household is now headed by the female spouse whose husband had died.

b. Those where the current household (including head and its other members) had moved into the village after 1968.

c. Those households that were established in 1968

    1) Both husband and wife originated from these villages

    2) One of the couple (either husband or wife) originated from these villages

while the other from another village.

The last two types of households (b and c) were omitted from the survey interviewing phase. As was mentioned in Chapter II, Section 6, this omission is based on, first of all, the nature of the study in which retrospective approach was utilized in order to establish data base for estimating the change of the work patterns; secondly, this study assessed the continuity of changes that came about in the patterns of work in the household during a period of time, and finally, newcomers would not have experienced the changes directly as household heads.

In this study, households are also classified in terms of socio-economic status as indicated by per capita land owned. Table 3.2 shows the number of the households in each class in the three villages.

Table 3.2. Number and classification of households

Household Groups	Betok	Kalencabang	Kamalsari	Total
Total households	356	255	170	781
Newly-moved in	26	39	16	81
Newly-established	117	91	41	249
Established before 1968	195	146	123	464
Upper status households	25	24	13	62
Middle status households	87	52	31	170
Lower status households	244	179	126	549

Nuclear family type and neolocal rule of residence characterize the households in these three villages as well as in other villages in the area. Thus as soon as a couple marry, they move into a new house, generally their own. House rental is not practiced in these villages. As far as the sample shows, there is only one case where a married daughter and another case where a married son are living temporarily with their parents. However, they are waiting until their new houses are completed. In some cases the parents or parents-in-law of the household head, if they need help, live in the household. There are also cases where other relatives and servants are included, either adults (16 years old or older) or children. Table 3.3 shows those who are included in the sample households besides the core members.

Table 3.3. Peripheral members of the household

Peripheral Members	Betok	Kalencabang	Kamalsari
Married son and his wife	0	1	0
Married daughter and her husband	1	0	0
Parents (in-law): father only	4	0	0
mother only	2	3	1
father and mother	0	0	0
Other relatives: adult	1	3	1
child	6	9	10
Servant: adult	2	0	0
child	6	1	1

Villagers accept polygyny; it does not violate their religious principles. Polygyny was noted in each of the three villages. Among the sample households, there were two cases at Kalencabang and one case at Kamalsari (two percent of the sample). At Betok village, although not represented in the sample, one of the village informants supported two households, each with a separate wife.

Household size is one of the interesting demographic characteristics of these villages. Java is the most densely populated island of the country (661.7 persons per square kilometer in 1979). The average household size was 4.7. The average household size of West Java was 4.5 and that of Subang regency was 4.1 in 1979. (Population of Java, p.59-71). Our three villages (1981) had a considerably lower mean household size, namely 3.53, 3.84 and 3.45 for Betok, Kalencabang and Kamalsari, respectively (village head's documents). This lower mean household size is probably related to the lower age at marriage and the neolocal rule of residence. The distribution of sample households by size is shown in Table 3.4. Clearly, the three villages are not too different in terms

Table 3.4. Size of households

Household Size	Betok %	Kalencabang %	Kamalsari %
1 - 2	28	33	24
3 - 4	39	35	61
5 or more	33	32	15
n	(54)	(54)	(54)

of median household size. But in Kamalsari there is less of range. Each sample household included at least one adult, normally two, (husband and wife), but in some cases there were three or more adults.

Including child servants and the young children of relatives, the mean number of young children (under 16) in the sample households was 1.6 in Betok, 1.6 in Kalencabang and 1.3 in Kamalsari. This is equivalent to less than one young boy and one young girl per household.

A household head of lower status in the villages, might consent if his son or daughter was asked to stay in the household of an upper or middle status family. By this, the child gets an informal education and helps the parents economically.

Newly married couples, in these communities, create new household separate from their parents and they locate either in the same village or they move out to other villages or to a city. We asked the sample heads about their children living elsewhere -- where did they locate and what were they doing? Tables 3.5 and 3.6 present the information.

There were 57% of the household heads who have one or more children living outside their household. The difference between villages is not great, but Kamalsari has a slightly higher proportion than the other two villages. Table 3.6 shows that Kamalsari had a more dispersed type of family pattern.

What about the employment of these dispersed children? In Betok, there is a tendency that most of them are not engaged in agriculture. In fact, our informants explained that transportation helped the development of the rooftile manufactures in the village which was started before Jatiluhur irrigation. Although at the same time irrigation put

Table 3.5. Number of children per household head living elsewhere, by village.

Number of Children from Household Living Elsewhere Outside the Household	Betok		Kalencabang		Kamalsari		Total	
	Person	%	Person	%	Person	%	Person	%
0	22	41	21	39	26	48	69	43
1 - 2	16	30	22	41	16	30	54	33
3 - 4	11	20	5	9	9	17	25	15
5 or more	5	9	6	11	3	6	14	9
n	54	100	54	100	54	101	162	100

Table 3.6. Dispersal pattern and current employment of children living elsewhere, by village, in percent[x)]

Villages	Dispersal Patterns			Current Employment		
	Localized	Some dispersal	Very dispersed	All agriculture	Some agriculture & some nonfarm	More on nonfarm
Betok	26 (81)	3 (9)	3 (9)	12 (41)	16 (55)	1 (3)
Kalencabang	25 (76)	8 (24)	0 (0)	28 (93)	2 (7)	0 (0)
Kamalsari	15 (54)	13 (46)	0 (0)	13 (57)	8 (35)	2 (9)
Vilages totalled	66 (71)	24 (26)	3 (3)	53 (65)	26 (32)	3 (4)

x)Numbers between parentheses are the percentage

some limitation in getting clay due to change of clay sources into permanent ricefield, transportation facilities made it possible for the producers to maintain a positive balance by carrying raw material from other sources and by enlarging the marketing area as well. In Kalencabang, on the other hand, those children who were living outside the household were concentrated in agriculture. Although the majority of those of Kamalsari were engated in agriculture, a high proportion were also doing nonfarming activities.

Table 3.7 presents the distribution of children living outside the household by location and by village. In this table it is clearly shown that in Kamalsari, where irrigation and double crop farming system have been practiced since before the Jatiluhur, the proportion of children living outside the village is higher. However, a majority of them are living in rural area.

Table 3.7. Children living outside households by location, and by village.

Location of Children Outside of Households	Betok		Kalencabang		Kamalsari	
	Number	%	Number	%	Number	%
This village	73	81	64	75	38	54
Other village, this district	5	6	11	13	19	27
Other district, this regency	2	2	0	0	8	11
Other regency rural	6	7	9	11	2	3
Other regency urban	4	4	1	1	4	6
Total	90	100	85	100	71	101

We also asked about the residence location of siblings (brothers and sisters) of the household heads. The distribution of these siblings, by village, is presented in Tables 3.8, 3.9 and 3.10. Table 3.7 shows that 84% of the household heads had at least one sibling living outside their household. The difference between villages was not great. Data in Table 3.8 shows that there are some differences in the patterns of sibling dispersal, in which Kamalsari tended to be more dispersed than the other two villages. The difference in the patterns of sibling dispersal was confirmed by data in Table 3.9, in which Kamalsari was the most dispersed in comparison to the others, followed by Kalencabang and Betok the least dispersed. However, invariably in the three villages, most of the siblings were living elsewhere in rural areas, where most of them were engaged in farming activities.

Table 3.8. Number of siblings, per household head, living elsewhere, by village.

Number of Siblings	Betok		Kalencabang		Kamalsari		Total	
Living Elsewhere	Person	%	Person	%	Person	%	Person	%
0	5	9	9	17	12	22	26	16
1 - 2	15	28	19	35	16	30	50	31
3 - 4	18	33	18	33	17	31	53	33
5 or more	16	30	8	15	9	17	33	20
n	(54)		(54)		(54)		(162)	

Table 3.9. Dispersal patterns and current employment of siblings living elsewhere, by village[x)]

Villages	Dispersal Patterns			Current Employment		
	Local-ized	Some dis-persal	Very dis-persed	All agri-culture	Some agri-culture & Some non-farm	More on nonfarm
Betok	33 (67)	11 (22)	5 (10)	32 (65)	13 (27)	4 (8)
Kalencabang	25 (56)	18 (40)	2 (4)	42 (93)	3 (7)	0 (0)
Kamalsari	22 (50)	16 (38)	4 (10)	28 (67)	11 (26)	3 (7)
Villages totalled	80 (59)	45 (33)	11 (8)	102 (63)	27 (17)	7 (4)

x)Numbers in parentheses are the percentage.

Table 3.10. Siblings Living Outside Household, by Location and by Village

	Betok		Kalencabang		Kamalsari	
	Number	%	Number	%	Number	%
This village	125	71	74	58	49	36
Other village, this district	7	10	16	13	47	34
Other district, this regency	9	5	1	1	30	22
Other regency,rural	21	12	37	29	7	5
Other regency, urban	3	2	0	0	5	4
Total	175	100	128	101	138	101

The birthplace of household heads and their spouse was also considered. Table 3.11 presents the distribution by place of birth. In the table we see that most male heads of households were not born in their present village of residence (53%). A few (26%) were born in other regencies. The three villages, however, differ consistently. Most male heads and their wives in Betok were born in that village. Most of their counterparts in Kalencabang, on the other hand, were born in other regencies. The pattern for Kamalsari is mixed, that is, a few of the male heads were born in the village but most of their wives were local.

With a little computation, we also find that 40% of the female heads and heads' wives were born outside these villages, including 23% who were born in other regencies.

Table 3.11. Birthplace of male heads and their spouses or female heads by village in percent.

Male head			Birthplace	Spouse or Female Head		
Betok	Kalenca-bang	Kamal-sari		Betok	Kalenca-bang	Kamal-sari
76	13	46	This village	80	18	78
8	31	40	Other village, this regency	13	31	11
16	56	14	Other regency	7	50	11
(50)	(39)	(52)	n	(54)	(51)	(54)

From the information about migration of three groups of people, namely household heads' children, household heads' siblings and household heads themselves, we see that the three villages have three different patterns. The patterns of migration of Betok village and Kalencabang are quite similar, while that of Kamalsari differs from the other two villages.

3. Structure of Economic Activities

Most adults in these three villages call themselves farmers, although a considerable proportion do not have land for farming. To the landless, a farmer is one who works on the land and makes a living from agriculture. The local concept includes those who farm their own land, those who rent/share others' land, and those who do wage work as farm laborers. In addition to farming, some land owners/operators also work as farm laborers for others and/or hold nonfarm jobs. It is important that we consider these various kinds of farm and nonfarm activities.

a. Land Tenure Situation

Land is the prime economic resource in these villages. In West Java in general, however, where the agricultural density is 686.3 per square kilometer (1 sq.km.=.36 sq. mile) in 1978 (Indicator kesejahteraan Rakyat,p.21) the average amount of land per household is very small. Tables 3.12, 3.13 and 3.14 show the land tenure situation in the province, in the three villages and for the sampled households.

Almost three fifths of the farmers in West Java own less than half a hectare of ricefield (Table 3.12) to support their families. The landless, who constitute a majority in the three study villages, are not

Table 3.12. Size of ricefield holdings (owned) in West Java[x)]

Size of holding (hectares)	Percent of farmers
<.5	58.99
.5 - 1.00	22.62
1.00 - 2.00	13.07
2.00 or more	5.32
n	(2,151,405)

x)Data are adopted from 1973 Agricultural Census, Vol. II, June 1977, p. 7.

Table 3.13. Classification of all farm households relative to land ownership, by village, in percent.

Household classification	Betok	Kalen-cabang	Kamal-sari	Total
More land (upper status) farmers	7	9	8	8
Enough land (middle status) farmers	24	24	18	22
Less land farmers	27	15	7	16
> lower status				
Landless farmers	42	52	67	54
n	(356)	(255)	(170)	(781)

included in this table. Based on information collected from several sources, farm households in the three study villages can be grouped as is shown in Table 3.13. (See also Chapter II, Section 6).

We see that 54% of the household do not own land for farming (landless) and 16% do not have sufficient land to provide for the sustenance of their family members. This segment of the population must look to wage work for additional income. We also observe that the lower status farmers, especially the landless groups, at Kamalsari was slightly bigger than in the other two villages.

Size of holdings for the sample household is presented in Table 3.14. It does not include the landless segment of our sample who constitute 19% of the farm households sampled in Betok, 20% in Kalencabang and 30% in Kamalsari. A total of 23% of the sampled households were landless in these three villages.

To provide land for the landless who wanted to farm or to accommodate those in general who wanted more land, many households (20% in Betok, 35% in Kalencabang and 31% in Kamalsari) rented out some of their land to others (on a cash or share basis). On the other hand, 28%, 17% and 35% of the farm households in Betok, Kalencabang and Kamalsari, respectively, rent land from others (on a cash or share basis). This system, in addition to helping the landless and those who want to farm more land, also helps the large land owners, of course, in various ways. One may not generally recognize that it encourages the maintenance of higher productivity of land, because there is a tendency that with larger holdings one farms land less intensively. Thus, the larger owner gain both farm rent or shares and from being able to concentrate

Table 3.14. Ricefield ownership and operation among sample, by village, in percent.

Village	Less than .5 hectare		.5-.99 hectare		1.00-1.99 hectare		2.00 hectare and more	
	owner-ship	opera-tion	owner-ship	opera-tion	owner-ship	opera-tion	owner-ship	opera-tion
Betok	27	29	39	42	23	22	11	7
Kalencabang	35	31	37	26	12	31	16	12
Kamalsari	21	23	45	28	16	40	18	9
Total	28	28	40	32	17	31	15	9

(Note: maximum ownership is 15 hectare; maximum operation is 4.55 hectare).

n = 54 per village

his own labor on a smaller scale.

However, only a smaller proportion of the landless took part in renting or sharing land, because they do not have capital to operate the land. While on the other hand, working for wages is considered, by some, more productive than operating a small piece of land which makes them less mobile.

b. Rice Growing and Other Cropping Practices

In these three villages, growing rice is the main subsistence and income producing occupation. Farmers have been growing two crops of rice a year in Kamalsari since the early 1960's and with the introduction of the Jatiluhur irrigation system, since the late 1960's in Betok and Kalencabang. The rice growing cycle for a farm family starts as soon as it is their turn to get irrigation water. For the purpose of water distribution, the whole Jatiluhur area is divided into sections. The first section is two weeks later in starting the water distribution cycle than the second section and similarly there are two week intervals between the second and the third section, the third and the fourth, and so on. Figure 3.1 illustrates the division of the Jatiluhur area into sections and the water distribution cycle for each section.

Betok and Kamalsari are in Section 2, for example, and start their wet season water distribution cycle (and their wet season rice growing cycle) in the middle of September. They have irrigation water available until the end of January of the following year. For Betok and Kamalsari, the dry season cycle begins on the first day of February and continues to the middle of June. Thereafter, farmers must wait for two and a half

months before the next wet season cycle begins again. Figure 3.1 shows that Kalencabang, in Section 4, begins its cycles a month after Betok and Kamalsari, namely in the third week of October.

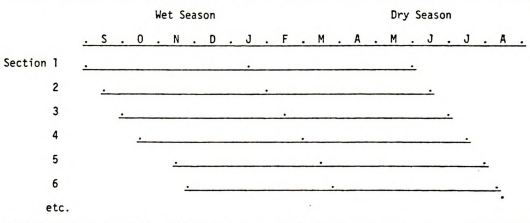
In every cycle, as soon as water comes to the ricefields, farmers start preparing the land and seedbeds. It takes 25 days before seedlings can be transplanted, therefore land preparation must be completed by that time. A next step is to pull seedlings for transplanting, and this is usually done by women but in some cases, especially in Kalencabang, by men. The seedlings are lifted out of the seedbed one by one, and by hand, then they are tied into bundles. Men carry bundles to the fields and distribute them across the well-prepared land. Parallel lines about 10 inches apart are made lengthwise on the surface of the land and then similar parallel lines are made running across the width of the field. Women plant about three seedlings at each intersect of these lines. This straight rows facilitate weeding and other cultivation activities. Thereafter, care must be taken to assure that the young plants are always covered by about two inches of water, otherwise they might die.

By the third week after transplanting, a first weeding is necessary. Rice plants that have not survived are replaced with new ones, and the first applications of fertilizers and insecticides are accomplished.

When the young plants are about six weeks old, a second weeding is done followed by a second application of fertilizer. The application of insecticides may be repeated if necessary; at the time, too, very often, rats must be poisoned or hunted down and killed. Toward the end

of the third month, stalks of rice begin to appear, and about a month later, it is time for the harvest.

Figure 3.1. Water distribution pattern of the Jatiluhur Irrigation Area*



*Adopted from "Water Distribution Pattern, 1977-1978" (unpublished note at Binong Irrigation Section).

Harvesting occurs when about 90% of the rice grains change their color from green into golden yellow. Harvest time is the busiest but also the happiest season for the land owners and rice harvesters. The stalks are cut by sickle, which have replaced the traditional "ani-ani", a small knife. Both men and women participate in the cutting of the stalks, but only the men transport the sheaves on their shoulders or by bicycle to the homeyard of the owners where the threshing is done. After threshing the grain is dried first in the sun before being stored. Laborers who have participated in the harvesting generally get one sixth to one tenth of the product.

This, then, is a brief summary of activities in a rice growing cycle. If the harvest was at the end of a wet season cycle, the dry season cycle can begin immediately; but if it was a dry season harvest, a "long break" is necessitated. It is important to note that in order

to keep water stagnant, a requisite for rice growing, fields are surrounded by dikes 10 to 15 inches wide and about 10 inches high; these dikes are also used as footpaths in the daily monitoring and control of water levels. Farmers can and sometimes do grow vegetables on the dikes, but most farmers in these three villages do not.

In other villages farmers also raise fish along with rice in the ricefields. "Troughs" or "deeps" are made so that the water covered fields are more suitable for fish. Indirectly fish culture is also beneficial for rice plants. Farmers will be less likely to neglect monitoring the proper water levels and in addition, the feeding and presence of fish generally means some added fertilizer for the plants. A pilot project report says that at Ciberes, which is not far from the three villages, an experiment on raising fish in the ricefield successfully produced more than half a ton of fish per rice cycle, or more than one ton/hectare/year. The report says that a ricefield fishery gives more benefit than growing rice itself. However, the addition of ricefield fishery is not popular among farmers in the three villages; it is only practiced by 9% in Betok, 2% in Kalencabang and 4% in Kamalsari.

Raising fish in special ponds in this area is not as common here as in the hilly lands in the southern part of the regency. There are a few fishponds in Betok and Kamalsari, but the enterprise is of no commercial importance.

Another reported piloting achievement is the growing of second crops between consecutive dry and wet cycles. The Ciberes "farm piloting" project has successfully produced a ton of soybeans per hectare of

ricefield in addition to two rice harvests with two fish raising periods. The report says that growing soybeans as a second crop produces a net benefit of almost twice as much as that of growing rice. (See table in the footnote).

Dry land farming, that is farming on land that is never flooded for rice growing, is practiced to only a limited extent by farmers in the three villages. In this lowland area, there were only two or three sampled households per village that owned more than a half hectare of dry farm. These fields are located further away from the village, and the farmers grow bamboo and wood that do not take much care. Home gardening is also limited to growing perennial plants such as cocoanut mangoes and bananas. A number of household heads reported that they changed their dry land into ricefield, because rice production is a more intensive use of the land and yields a staple in their diet. But several farmers around Kamalsari changed their wet ricefield into dry

The achievement of tertiary plot farm piloting project at Ciberes, 1980.

Investments	Invested capital (x Rp 1000,-)	Production (ton)	Production (x Rp 1000)	Net benefit (x Rp 1000)
Rice (wet growing season)	187	4	320	133
Rice (dry growing season)	199	4	320	121
Fish (two growing seasons)	444	1.80	864	420
Soybean	125	1	350	225
Total	955	-	1,854	

Notes: 1. Data adopted from unpublished report of Tertiary Plot Farm Piloting Project (PTP), Ciberes, 1980.
2. Rp 625.00 = U.S. $1.00

farms where they grew oranges for commercial purposes. They learn from farmers in a neighboring district that successful dry farming (e.g., the growing of oranges) is more profitable than successful rice farming. (The market price of rice is controlled by the government, whereas the price of oranges is not).

c. Animal Production

Animal production is the most important agricultural enterprise for only one household in the sample. Dulhanan, at Betok, owns 200 egg-producing ducks which the family manages and tends by themselves in the harvested ricefields. Some farmers raise buffaloes to use for work in plowing land and often also to provide him with wage work opportunities on other's land. In addition, the raising of buffaloes represents a saving and investment, produces animal fertilizers, raises the value of children's labor because they are made responsible for the feeding and care of the animals, and there is no doubt that it enhances a family's social prestige in the village. Small ruminants are raised by a few families for similar reasons (except, of course, for work power). Only on special occasions do families slaughter a small ruminant or buffalo.

Thirteen percent of the sampled household owned buffaloes and 12% raised small ruminants. More than half of these families were in Betok and the rest were divided almost equally among the other two villages. Lack of grazing land is the reason why some households sold their animals, especially those in Kamalsari.

There were more duck breeders in Kamalsari than in Betok and

Kalencabang; overall, 14% of these households had some ducks for eggs. Duck raising techniques are very simple and cheap. The tenders move their flocks from one rice growing section to another following the progression of harvests. Every morning they collect and sell eggs. Egg production per day is at a rate of about 75% to 90% of the total. It seems, too, that ducks, in addition to their high productivity, are very resistant to diseases as well. Therefore, duck farming is on the increase and is becoming a luctrative farming enterprise in the region.

Chicken is the more popular fowl, however, and some chickens are raised by almost every farm family wife. The family chickens are free to move in the farm yard during the day and are returned to their coop in the evening. Chicken raising is mainly for home use, to get some eggs and meat for the family table. However, at least once a week, a dealer goes from door to door looking to buy chickens and eggs for the urban market.

Thus, generally, the three villages can be regarded as having some potential for increased animal production. But for whatever reasons, the villagers do not choose to exploit these opportunities. As a consequence, the villagers are not self-sufficient in the production of meat, eggs, chicken, fish, etc. Further, a lot of fish which constitutes an important item in the diet of these farm families, is "imported".

d. Wage Work

Wage work, locally known as "kuli" , or coolie labor, is the second most important occupation, next to rice farming. Almost 50% of the sampled household heads engaged in some coolie labor during the

year and almost 60% of them have been doing so since before 1968, a considerable proportion regarding this as their most important source of income. Wage work activities are spread over every stage of rice growing cycle. There is variability among socio-economic classes of course.

None of the upper status farmers do wage work whereas all of the "lessland and landless" depend upon coolie jobs. The middle status group is mixed. Some upper status farmers said that they had some experience in doing kuli jobs; and in the field I happened to talk with a rich farmer who was doing wage work with his tractor. The point is that the rich farmer and the middle group of farmers are not dependent upon kuli work. Both men and women, and from the ages of 12 years to over 50 may engage in kuli work in the fields. In many cases the entire household is engaged by a landowner.

Harvest season is the busiest time for wage workers, and this applies to every age and sex group. The work of preparing land is limited to adult males; planting and weeding seasons are women jobs; and it seems that applying fertilizers and insecticides are a male specialization. Animal tending is dominated by children who, instead of being hired by the day, are paid seasonally. Many wage laborers come to these villages from other areas, including Central and East Java and they often spend weeks or even months in these villages. On the other hand, some of the household heads from the three villages themselves go off to other areas to do seasonal wage works.

Kuli activities are also done in areas other than farming, but these activities are of minor importance in our villages, except for

the small roof tile industry in Betok. Essentially, these are agriculture villages.

e. Nonfarming Activities

Out of five specified nonfarming activities (trade, handicraft, services, transportation and "official works") there are two in which a considerable proportion of villagers take part, namely trade and handicraft (home industry). The number of people doing nonfarm work fluctuates by stage in the rice growing cycle, because these activities are mainly side job for most of them. Thus, during the land preparation, transplanting and harvesting periods, the number of persons doing nonfarm jobs drops but during the slower weeding period and when the rice is flowering, the number increases.

In trade and handicraft, in which 19% and 13% of the total household heads are engaged (part-time), Betok village leads, followed by Kalencabang and Kamalsari. The rooftile industry in Betok has been developed to a commercial level and some tiles are sold in other districts. Many people, including women and children, participate in some part of the rooftile production process. At the other two villages, brick making and pleit works are only aimed at home or village consumption.

There are two or three small groceries and retail stores in the village and these are managed as a family household business. Although the grocery and retail stores are open every day and all day, the enterprises serve only to supplement the farming activities. Farming for the families is more important. Some people are casually involved in trading

paddy and other farm products, farming tools, and clothing, of course, in Betok, rooftile marketing is somewhat important, too.

Three other areas of nonfarming activities are of far lesser importance, in terms of the number of persons involved. There are some villagers who on occasion will serve as bricklayers, carpenters, tailors, midwives, and barbers. But no more than two persons per activity and per village were noted.

4. Formal Organization

In these three villages, as in most other villages in the Jatiluhur area, there are three prominent formal associations that are active and that were formed to achieve specific goals. These are: "Rukun Tatangga" (neighborhood organization), "Rukun Kampung" (village organization) and "Mitra Cai" (water users association).

Rukun Tatangga (R.T.) consists of a group of households (30 to 100) located in a certain part of the village and is led by an elected "Ketua R.T." (head of the neighborhood). Betok has four R.T.s, Kalencabang has three, and Kamalsari four. The purpose of the neighborhood association is to organize local resources in order to solve local problems and to build facilities based on the principle of "gotong-royong" (mutual help). The goal may be, for instance, to build a neighborhood mosque or a public bath, to maintain neighborhood security, or to help construct someone's house. A subgroup may be formed to concentrate on youth affairs, and another of women affairs, and so on.

"Rukun Kampung" (R.K.) coordinates all the R.T.s at the village (kampung) level. Thus, the school, the village mosque, and the village

meeting place are under the responsibility of runkun kampung. The leaders are elected by and among the villagers and are mostly young, brighter and more energetic persons.

In addition to these local leaders, there is also a government representative in each village, representing the head of the desa. This official has the duty of managing government business in the village. He is also elected by and among the villagers. He, Ketua R.T. and Ketua R.K. are supposed to work together in almost all activities for the benefit of the villagers.

"Mitra Cai" (water users association) is an organization of the owners of ricefields that are located close together and are irrigated by a common tertiary channel covering an area of 75 to 150 hectares. The membership of this association does not coincide with those of RT or RK. Chairman, treasurer and water manager are elected by and among the members for a certain period. They are especially responsible for the regularity of water in the tertiary block, including organizing "gotong royong" works to facilitate the goals, for instance, rehabilitating the channels. This organization is very similar to the well-known water user organization named "Subak" in Bali.

For coordinating and controlling purposes, the provincial government, the Governor of West Java, established the rules and constitution regarding these three associations that are applied throughout the province.

5. Public Amenities

Making good facilities accessible to all villagers,

regardless of their sex, age and socio-economic status, is one of the foci of development efforts at the village level. It is one of the criteria for development established by the government. Village communities and local governments work together in planning, developing and mobilizing resources, and executing the development of public facilities. Thus, the availability and the quality of facilities in each village to a certain extent are determined by the efforts and activities of its people.

There are different types of development projects in rural areas, from pure government projects such as building main roads and main irrigation, up to pure community projects such as sanitary project and building and rehabilitating intra village roads. Between these extremes there are: government-community joint projects such as building schools when the government provides money for the building and the local community provides the land; government supported community projects such as building village mosques in which the government supports the community by subsidizing the budget; government created models in that the villagers imitate it, such as public bath/toilet and arthesian water sources.

Generally our three villages have similar access to different public facilities, either those of pure government, community, or those developed jointly by the two, especially in education, health, religion, and markets.

a. Education

There is one "Sekolah Dasar Negeri" (public school at primary

level of six years) in each of the villages to keep young children from having to go far away from home for formal education. At Betok, in addition, there is a six-year religious school. Junior high school is available at every district capital, including Binong and Pusakanagara, and a senior high school with different specializations is located at Subang (regency capital) with a branch of general program (S.M.A.) at Pamanukan (about 10 miles away from Betok and Kalencabang, and about five miles from Kamalsari.)

Although there is no compulsory education, all children of seven go to school. The biggest problem of education here is that the drop-out rate is very high, especially at grade five and six when young adults are supposed to help their parents on the farm. Several young adults from our villages go to junior high school, but it is very rare if any to go to senior high school. When the study was conducted in 1981, one young man from Betok and another from Kamalsari were attending college in Bandung.

b. Public Health

No government polyclinic with medical doctors is available at the village or desa levels, but there is one "Puskesmas" (Public Health Center) at every district capital and some private clinical services at larger towns. A larger hospital with some specialist medical doctors and several beds is in Subang. On certain days of the week, a para-medical service is opened in every desa and family planning services are open every day at the district capital. In addition, a trained midwife is available in each of our villages. Thus many villagers depend more

on traditional and free market medicine than on modern medical services But, local government is very much concerned about the daily lives of villagers. They try to educate people on how to achieve a healthier way of life, and on maintaining cleanliness in the villages, and in addition, they provide people with free service to protect them from contagious diseases such as cholera, dysentery and typhoid.

c. Market

It was mentioned that at the villages there are several mini-grocery and retail stores, where the villagers can buy such things as spices, vegetables, fish, tobacco and simple medicines. In addition, there are peddlers who carry their merchandise including kitchen utensils, simple clothing and farming tools, trade them from door to door, and from one village into another. Similarly, there are the travelling dealers who want to buy coconuts, bananas, chickens and rice. During harvest seasons, government agencies come to the villages to buy paddy at a standardized price in order to help the farmers. The nearest well organized and permanent markets and shopping centers are at district capital or at bigger towns such as Pamanukan and Pagaden.

d. Religious Facilities

All residents of the three villages are Moslem. In every village there is one big village mosque where people go for Friday noon and evening prayers, and several smaller mosques (surau, langgar) owned by neighborhoods or by individuals but publicly used. Mosques and suraus are also centers for religious education, and are especially concerned with reading and interpreting the Holy Qur'an.

e. Sport and Recreation

Young men in these villages are enthusiastically involved in sports. Three kinds of sports are popular and organized by young villagers: volleyball, badminton and soccer. At least once or twice a week we see groups of young men playing either one of the three games in the available courts in the village. A volleyball court is set up in the school yard, and two or more badminton courts in the home yards. A soccer court is available at the desa level where village club is allowed to play certain afternoons. Pingpong is also played, but it seems limited to school children. It is interesting to note that women are less involved in all these activities.

No special recreation facility, other than sport places, is located in these villages. There are some facilities, of course, that belong to individuals. Some people regard fishing and hunting as recreation, while others do these things as economic enterprises. There are occasions that are considered public entertainment/recreation, namely family celebrations such as during marriage or circumcission. "Gamelan" (local music), "wayang" (leather or wooden puppets) show, dance, and "western" music are popular among the villagers. Drinking and gambling are not allowed in the villages. Listening to the radio and watching television are also considered recreation by many villagers.

This then is a basic picture of the villages, their people and the structure of the households, where the study was carried out. We see that the villages have similar geographical environments in terms of location, current hydrological situations, communication and settlement patterns. They also have quite similar public facilities and social

organizations to fulfill their needs. General family patterns, basic occupational structure and farming practices are not different in these villages. But we see some differences in the dynamics of population, especially in those aspects related to migration. Kamalsari seems different in several cases from the other two villages in terms of the dispersal of children and sibling as well as the birthplaces of household heads and their spouses. Our question is whether or not these differences are derived from a different history of hydrological conditions of the three villages.

CHAPTER IV.

CHANGING WORK PATTERNS

From previous chapters we understand that the Jatiluhur Irrigation Project replaced variability in hydrologic circumstances with a degree of homogeneity in the availability of a reliable water supply for agriculture on the northern coastal plain of West Java. A reliable water supply throughout the year is a necessary condition for intensive wetland rice cultivation. Farmers in most villages in the region can now practice similar farming techniques, particularly in rice growing, and the trend toward that has been reinforced by the introduction of new practices in rice production and a modern system of extension education administered by the central and provincial governments.

The process of adaptation of the impacted villages, of course, has been occurring for over a decade now. Nevertheless since there were great differences among villages in the region in hydrological situations prior to Jatiluhur, one would expect that the adaptation processes themselves varied to some extent among villages entering the new era from different hydrological backgrounds. This would be reflected in current practices of work and by the villagers in their recollections about what changes had come about.

This chapter attempts to explore such changes in the economic enterprises and activities of farmers in these three villages. Section One focuses on the farmers' perceptions of changes in the farm labor situation, local economic opportunities, and quality of life. We want

to know whether or not the changes perceived vary by village in terms of their hydrological backgrounds. Section Two explores the changes in economic enterprises, both in the farm and nonfarming sector. Section Three deals with related changes in the organization of economic practices or activities. Our main question is: Do the patterns of change in enterprises and in the organization of economic activities, particularly in rice growing, vary among villages with different hydrological histories?

It is important to note that in Chapter V attention focusses on socio-economic variations. We will consider "within village comparisons" (comparing impacts on the various socio-economic levels in each village) and "between village comparisons" (comparing impacts on particular socio-economic levels across villages.)

1. Villagers' Perception of Changes.

The sampled heads of households were asked about three kinds of changes relating to the introduction of a modern irrigation system: changes in the farm labor situation, local economic opportunities and quality of life.

With respect to changes in the farm labor situation, a large proportion of household heads in the three villages agree that in comparison with the situation before the Jatiluhur Project, the following changes have come about. (See Table 4.1)

a. Labor force needs per planting have decreased.

b. In some households, women now work more on farms and in other households they work less; the

pattern is mixed.

c. Children now work less on farms.

d. Farm labor is more difficult to hire now.

e. Farm labor costs are greater now.

In terms of changes perceived in local economic opportunities, a large proportion of household heads feel that currently:

f. Landless laborers are better off now.

g. Employment opportunities in the villages are better now.

h. People are now more likely to leave farms.

In terms of changes in quality of life, the large proportion of household heads believe that at present:

i. Quality of life generally is better now in the villages.

j. Their own life is more satisfactory now.

k. There are no families that have not done well in the past ten years.

Comparing the three villages reveals that for most aspects of change there are no significant differences in percent agreements. Appendix Table 4.1 reports the patterns by village in the direction of changes perceived by household heads. There are, however, a few noteworthy exceptions. Significant differences in three aspects of change were observed: a) labor force needs per planting, b) women's work on the farm, and c) likelihood of people leaving farms.

Table 4.1. Perception of changes by household heads (from before Jatiluhur Irrigation Project to now)

	Character of change	Percent of household heads who agree
a.	Labor force needs per planting have decreased	59
b.	Women now work less on farms	36
c.	Children now work less on farms	62
d.	Farm labor is more difficult to hire now	50
e.	Farm labor costs are greater now	92
f.	Landless laborers are better off now	83
g.	Employment opportunities in the villages are better	82
h.	People are now more likely to leave farms	43
i.	Generally, the quality of life is better now	96
j.	Own life more satisfactory now	81
k.	There is no family in the village that has not done well in the past ten years	51

(n = 162)

Table 4.2 shows that, although there is general agreement among household heads that labor needs per planting have decreased, the proportion of those who agree in Kamalsari is significantly higher than in the other two villages. This variation undoubtedly relates also to a decrease in big animal production (and use of such animals for power);

the decline was greater in Kamalsari (see Table 4.5). In connection with this, I also observed (in 1981) that during land preparation, the use of hand tractors in the rice fields was more evident around Kamalsari than around the other two villages. For some reasons, Kamalsari has been more mechanized than the other two villages. Thus, we see that there is an interrelationship between the decrease in use of animal power, the increase in level of mechanization and perception of changes in labor force needs per planting.

Table 4.2. Changes in labor needs per planting, as perceived by household heads, by village*

Labor force needs per planting	Betok (%)	Kalenca-bang (%)	Kamal-sari (%)
More now	26	32	6
About the same	24	17	20
Less now	50	52	74
Total	100	100	100
n	(54)	(54)	(54)

*
Chi square = 24.63; d.f. = 4; α = <.01

Table 4.3 shows differences in the perceptions of household heads of changes in the participation of women in farm work. Most household heads in Betok (46%) believe that women now participate more in the rice fields than they used to. In Kalencabang most say that the degree of participation is about the same. But in Kamalsari a large majority feel that it is less now. There are several possible reasons for these differences. First, we were told by informants that previously at Betok village where the rice fields were rainfed, it was too dangerous for a woman to manage water in the field. Indeed there was some village conflict about this issue. At present, however, it is no longer dangerous and women participate a lot more in irrigation control. Secondly, new varieties of rice and new developments in rice farming technology in this area have made it necessary for males to take part more in traditional women's work in the fields, especially in harvesting and weeding. Thirdly, the people's general attitude toward work and its relation to economic prosperity and the proper role of women appears to be shifting. Traditionally, women of higher socio-economic levels are not supposed to do hard work in the field; they are supposed to manage the home. With increasing economic prosperity lower class families may be accepting traditional upper class attitudes.

Although a large proportion of household heads agree that people are now more likely to leave farms, agreement varies between villages (Table 4.4). Only about one third of the household heads in Betok village, as compared with nearly one half in the other two villages, think that the likelihood is more now. This situation may be related to the growth of home industry in Betok, namely the roof tile industry,

Table 4.3. Changes in the work participation of women in the rice-fields, as perceived by household heads, by village*

Participation of women in the ricefields	Betok (%)	Kalencabang (%)	Kamalsari (%)
More now	46	26	11
About the same	28	54	28
Less now	26	20	61
Total	100	100	100
n	(54)	(54)	(54)

* Chi square = 62.06; d.f. = 4; α = <.01

Table 4.4. Changes in the likelihood of people leaving farms, as perceived by household heads, by village*

Likelihood of people leaving farms	Betok (%)	Kalencabang (%)	Kamalsari (%)
More now	35	46	48
About the same	39	26	43
Less now	26	28	9
Total	100	100	100
n	(54)	(54)	(54)

* Chi square = 17.05; d.f. = 4; α<.01

as is shown in (see Table 4.9) so that people do not have to leave the village and the farm to get an additional job and income.

Thus, with respect to these three aspects of change, there appear to be some variations in the experiences of the villagers as represented by the response patterns of household heads (and their recollections).

2. Patterns of Economic Enterprises.

An economic enterprise is a unit of economic organization, and in an agricultural situation it refers to an element of the farming operation. It includes a group of activities that, in this case, are practiced by members of the farm household as a source of income and/or a contribution to the subsistence of the family. For present purposes, the enterprises are classified into farm-related and nonfarming enterprises. Farm related enterprises include the growing of various kinds of crops, animal husbandry, hunting and gathering activities, and also farm work for others. Nonfarming enterprises include activities dealing with handicrafts, trade, services, transportation and official works.

Our discussion here focusses on comparisons between villages in the changing importance of enterprises that are practiced by the farm households. Within village and between village comparisons of different socio-economic classes will be provided in Chapter V.

a. Farm-Related Enterprises:

Seventeen farm-related enterprises were identified as important income sources in the three villages. The heads of households were

asked whether or not they engaged in these enterprises in the past, before the Jatiluhur Irrigation Project, and whether or not they practice them now. If an enterprise was practiced in the past and/or is being practiced now, the respondent was asked how important it was (and/or is now) to the economy of the household. The answer categories were: "very important", "somewhat important", "not important", and "was not done". For present purposes, enterprises considered very or somewhat important were collapsed to "important" and those not done or considered not too important were treated as "unimportant".

Table 4.5 shows the percent of households that practiced and are practicing each of the 17 farm-related enterprises. In effect, this table indicates the past and present structure of agriculture or farming systems in these villages. The left side of the table shows the percentage of household heads, per village, who informed us that the enterprises were important sources of family income before Jatiluhur.

In the rainfed situation of Betok, prior to Jatiluhur, where ricefields were planted only once a year during the rainy season and were left fallow during the dry season, four enterprises were considered to have been important by more than 50% of the household heads as important sources of income. They were: rice growing, wage work in ricefields, firewood collection, and fishing in the rivers and the sea. At Kalencabang, where the land was threatened by regular and dangerous flooding and rice was planted only once a year during the rainy season, two farm-related occupations were considered important by more than 50% of the households, namely, rice growing and wage work in the ricefields. At Kamalsari, the village with a relatively good irrigation system

before Jatiluhur, rice growing and wage work in ricefields were reported as important sources of income by more than 50% of the households.

At the present (reported on the right side of Table 4.5) more than 50% of the household heads in Betok concentrated on rice growing and wage work in ricefields; most of the heads of households in Kalencabang and Kamalsari concentrated on rice growing.

Thus, we see that prior to Jatiluhur, the economic resources of family households in Betok village were more differentiated than in the other two villages. Betok had four very important sources of income including rice farming and three off-farm enterprises; while both of the other two villages had only two very important resources of income, namely rice farming and one off-farming enterprise. The introduction of Jatiluhur irrigation has changed a great deal; the lives of the families now are more dependent upon rice farming. In Betok, however, one type of off-farm work (wage work in the ricefields) is still considered a very important source of family income.

Table 4.6 indicates the direction of trends in the relative importance of the aforementioned farming-related enterprises in the three villages. It is based on the proportion of households whose income sources changed in importance, either increasing or decreasing (or remaining the same) since the Jatiluhur irrigation system was introduced.

A directional change indicator was constructed by subtracting the percentage of households that had increased emphasis on a particular enterprise by the percentage of those that had experienced a decrease in the importance of the enterprise. The resulting percentage differ-

Table 4.5. Farm related enterprises considered important by household heads, before Jatiluhur and now, by village, in percent

Before Jatiluhur				Present Situation		
Betok	Kalenca-bang	Kamal-sari	Farm related enterprises	Betok	Kalenca-bang	Kamal-sari
85.2	83.4	81.5	Rice growing	83.3	77.8	79.6
31.5	29.6	11.2	Second crops	11.1	11.1	1.9
1.9	7.5	1.9	Dike planting	1.9	14.9	3.7
35.2	37.0	29.6	Dry land farming	42.6	35.2	33.3
5.6	3.8	0	Fish raised in ricefield	9.3	1.9	1.9
0	1.9	0	Fish raised in fishpond	7.4	0	0
35.2	7.4	16.7	Big animal production	29.8	3.7	3.7
27.8	11.2	11.1	Small ruminant production	16.7	7.5	13.0
7.5	5.6	13.0	Duck farming	9.3	9.3	18.6
11.1	1.9	7.4	Leasing tractor or animal	7.4	0	1.9
57.4	57.4	64.8	Wage work in ricefields	51.8	48.1	40.8
37.1	27.8	18.6	Wage work in dry land	33.4	14.9	14.9
57.4	29.6	40.7	Firewood collection	46.3	20.4	1.9
20.4	16.7	16.7	Clay transportation	24.1	14.9	9.3
0	9.3	0	Reed gathering	0	7.4	0
59.2	7.4	40.8	Fishing in sea, river,etc.	0	0	1.9
0	0	7.5	Hunting game	0	0	1.9

ence or net change is referred to as a "directional change index". "Directional change" can be negative (decreasing in importance), positive (increasing in importance), or zero (the importance of this enterprise remains at about the same level). Using this index, in effect, permits us to assess what has been happening in terms of the changing structure of agriculture since Jatiluhur.

For making comparisons between trends of change that happened in the three villages, the directional change indices were categorized as follows:

a. >15 - "increased a great deal"

b. > 5 - 15 "increased somewhat"

c. -5 - 5 "remained the same"

d. <-5 - -15 "decreased somewhat"

e. <-15 "decreased a great deal"

Using these data, we see that quantitatively, in terms of the number of enterprises changing in importance, Betok experienced the largest change, followed by Kamalsari and Kalencabang. In all villages, in general, the direction of change tended toward a decline rather than an increase. Kamalsari experienced the largest decline, followed by Betok and Kalencabang. But on the other hand, there was more of an increase in Betok than in the other two villages.

Thus far we have explored changes in the importance of farm-related enterprises among the households in these villages. Our next question is whether or not there are any changes in the patterns of farm-related enterprises. Patterns of farm-related enterprises are understood as the kinds of enterprises and their order of importance in

Table 4.6. Directional change indices of the importance of farming related enterprises, by village, in percent (including trends of before Jatiluhur to now)

Farm related enterprise	Betok			Kalencabang			Kamalsari		
	% of households		Net	% of households		Net	% of households		Net
	Increase	Decrease	Change	Increase	Decrease	Change	Increase	Decrease	Change
Rice growing	3.7	5.6	-1.9	3.7	9.3	-5.6	3.7	5.6	-1.9
Second crops	1.9	22.2	-20.3	5.6	24.1	-18.5	1.9	11.1	-9.2
Dike plantings	0	0	0	11.1	3.7	7.4	3.7	1.9	1.8
Dry land farming	11.1	3.7	7.4	3.7	5.5	-1.8	7.4	3.7	3.7
Fish raised in ricefields	7.4	3.7	3.7	1.9	3.7	-1.8	1.9	0	1.9
Fish raised in fishpond	7.4	0	7.4	0	1.9	-1.9	0	0	0
Big animal production	16.7	22.2	-5.5	0	3.7	-3.7	3.7	16.7	-13.0
Small ruminant production	5.6	16.7	-11.1	1.9	5.6	-3.7	9.3	7.4	1.9
Duck farming	3.7	1.9	1.8	5.6	1.9	3.7	14.8	9.3	5.5
Leasing tractor or animal	3.7	7.4	-3.7	0	1.9	-1.9	0	5.6	-5.6
Wage work in ricefield	3.7	9.3	-5.6	1.9	11.1	-9.2	0	24.1	-24.1
Wage work in dry land	11.1	3.7	7.4	3.7	5.5	-1.8	7.4	3.7	3.7
Firewood collection	3.7	14.8	-11.1	0	9.3	-9.3	0	38.9	-38.9
Clay transportation	7.4	3.7	3.7	3.7	5.6	-1.9	5.6	13.0	-7.4
Reed gathering	0	0	0	0	1.9	-1.9	0	0	0
Fishing in sea, river, swamp,etc.	3.7	14.8	-11.1	1.9	5.6	-3.7	0	27.8	-27.8
Hunting game	0	0	0	0	0	0	0	3.7	-3.7
# of enterprises									
a. increase a great deal		-	-		-	-		-	-
b. increase somewhat		(3)	18%		(1)	6%		(1)	6%
c. remained the same		(8)	47%		(12)	71%		(9)	53%
d. decreased somewhat		(5)	29%		(3)	18%		(4)	24%
e. decreased a great deal		(1)	6%		(1)	6%		(3)	18%

farm family lives, in this case, in each village.

The farm enterprises were ranked in terms of importance; this ranking was based upon an "index of importance" for each enterprise. The enterprises coded "1", "2", "3" or "4", for "very important", "somewhat important", "not too important" and "not done", respectively. Using the degree of importance per household as a weighting factor and summing up the weighted values of each enterprise (item) in a village, we get the "index of importance". Then, a rank order of importance is made and this, in effect, permits us to explore the pattern of enterprises, and changing structure of agriculture in the villages. Thus, we can observe the patterns of farm-related enterprises in each village before Jatiluhur and currently. Table 4.7 reports the "indices of importance" or patterns of farm-related enterprises.

One of the goals of this study is to investigate whether or not there were any changes in the patterns of farm-related enterprises, following the environmental changes brought about by the introduction of the Jatiluhur Irrigation Project, and whether or not such changes were affected by the hydrological history of the villages. Spearman's rank order correlation coefficient was used to compare patterns of change. Table 4.8 notes three types of comparisons: 1) between village comparisons of the old patterns, before Jatiluhur; 2) between village comparisons of the new patterns, currently; and 3) within village comparisons between the old and the new patterns.

Table 4.7. Index and rank order of importance of farm-related enterprises, by village, before Jatiluhur Irrigation Project and now

Index of importance of farm-related enterprises						Farm-related enterprises	Rank order of importance of farm related enterprise					
Betok		Kalencabang		Kamalsari			Betok		Kalencabang		Kamalsari	
Before	Now	Before	Now	Before	Now		Before	Now	Before	Now	Before	Now
88	81	80	90	88	87	Rice growing	1	1	1	1	1	1
173	202	174	202	202	214	Second crops	8	10	5	8	10.5	13.5
214	213	205	197	214	211	Dike plantings	14	15	10	6	14	9
165	160	164	168	178	173	Dry land farming	7	5	3	3	5	3
207	205	211	214	216	212	Fish raised in ricefields	13	12	14	14	16	10.5
216	208	214	216	216	215	Fish raised in fishpond	16.5	14	16	16	16	16
162	171	206	211	193	212	Big animal production	5	7	11	12.5	7	10.5
176	193	201	207	202	202	Small ruminant production	9	9	8	11	10.5	7
205	203	207	199	195	214	Duck farming	12	11	12.5	7	9	4.5
204	208	213	216	208	214	Leasing tractor or animal	11	13	15	16	12	13.5
135	144	131	143	126	155	Wage work in ricefield	3	2	2	2	2	2
163	169	179	203	191	195	Wage work in dry land	6	6	6	9	6	4.5
133	148	173	188	165	214	Firewood collection	2	3	4	4	3.5	13.5
188	179	196	196	197	205	Clay transportation	10	8	7	5	8	8
216	216	204	206	216	216	Reed gathering	16.5	16.5	9	10	16	17
139	153	207	211	165	201	Fishing in sea, river, etc.	4	4	12.5	12.5	3.5	6
215	216	216	216	209	214	Hunting game	15	16.5	17	16	13	13.5

Table 4.8. Rank order correlation coefficients comparing patterns of farm-related enterprises, by villages, before Jatiluhur and now.

Temporal Situation or comparison	Village comparison or situation	Correlation Coefficient
Before Jatiluhur Project	Betok vs. Kalencabang	.70
	Betok vs. Kamalsari	.94
	Kalencabang vs. Kamalsari	.70
After Jatiluhur Project	Betok vs. Kalencabang	.64
	Betok vs. Kamalsari	.70
	Kalencabang vs. Kamalsari	.63
Before and after Jatiluhur	Betok	.96
	Kalencabang	.90
	Kamalsari	.72

The set of correlation coefficients reported in Table 4.8 brings us to the following conclusions:

a). Before Jatiluhur, there were some differences in the patterns of farm-related enterprises among the three villages; Kalencabang was somewhat different from the other two, while Betok and Kamalsari were quite similar.

b). After 13 years of irrigation, namely in 1981, the

pattern of enterprises between villages had not changed much from the earlier situation except that Betok is now more dissimilar from Kamalsari.

c). Overtime, Kamalsari has made the biggest change in the pattern of enterprises; patterned changes in Kalencabang and Betok were minimal.

b. Nonfarming Enterprises:

Five nonfarming enterprises were considered in the villages, including handicrafts (home industry), trade, services, transportation and official works. As with farm-related enterprises, household heads were asked whether or not they or members of the household had been engaged in these enterprises in the past and whether or not they were now. We also wanted to know how important the enterprise was in the household's economy.

Table 4.9 shows the proportions of households that had engaged in the various nonfarming enterprises in the past and/or are pursuing them now. This table, along with Table 4.5, also reflects the occupational structure of the villages in the past and now.

The left side of Table 4.9 indicates the proportion of household heads, who considered various nonfarming enterprises as important to their household before Jatiluhur. Trade (dealing in groceries, agricultural tools, clothing, etc.) was the most important source of nonfarm employment in the past. In Kalencabang and Betok more than 20% of the households, and 19% in Kamalsari, had some income from trade work. Handicrafts, such as rooftile production in Betok, brick making in the

other two villages, and plaitwork, ranked second, with around 14% participation among families. Three others, including services (barber, bricklayer, midwife, tailor, etc.), transportation (ojeg, that is utilizing a motorcycle as taxi, and threecycle driving), and official works (staff of desa office, irrigation workers, etc.), were also important to several villagers. Essentially, the patterns of nonfarming enterprises in the three villages were quite similar, with only slight variations.

The present structure of nonfarming occupations is reported on the right side of Table 4.9. Trade is still rather important in all three villages. In Betok the importance of handicraft and services increased slightly. However, in Kamalsari for some reason the importance of handicrafts declined somewhat. A slight decline was also observed in other nonfarming areas in all the three villages.

In general, then, nonfarming enterprises were and continue to play a part in the economy of these villages. Many households depend upon wage labor of this kind. Fourteen percent of the sampled households stated that wage labor in the nonfarming area was an important economic enterprise. However, it appears that the pattern has not changed a great deal with the introduction of the Jatiluhur Irrigation Project.

Table 4.10 shows the direction of change in the relative importance of the various nonfarming enterprises in the three villages. A "directional change index" was constructed as before. This table supports the observations derived from Table 4.9 as discussed previously.

Table 4.9. Nonfarming enterprises considered important by household heads, before Jatiluhur and now, by village, in percent*

Before Jatiluhur			Nonfarming enterprises	Present situation		
Betok	Kalenca-bang	Kamal-sari		Betok	Kalenca-bang	Kamal-sari
16.7	14.8	14.9	Handicraft	22.2	11.1	5.6
22.2	25.9	18.5	Trade	20.4	22.2	16.7
13.0	1.9	3.8	Services	16.7	1.9	9.3
1.9	9.3	5.6	Transportation	1.9	7.5	1.9
5.6	5.6	11.2	Official works	5.6	3.7	9.3

* Note: It was possible for a respondent to mention from one to as many as five enterprises as being important to the household.

Table 4.10. Directional change indices of importance of nonfarming enterprises, by village, in percent

Nonfarming enterprises	Betok			Kalencabang			Kamalsari		
	% of households		Net change	% of households		Net change	% of households		Net change
	In-crease	De-crease		In-crease	De-crease		In-crease	De-crease	
Handicraft	5.6	0	5.6	1.9	5.6	-3.7	1.9	13.0	-11.1
Trade	9.3	11.1	-1.8	5.6	9.3	-3.7	7.4	9.3	-1.9
Services	7.4	3.7	3.7	1.9	1.9	0	5.6	5.6	0
Transporta-tion	1.9	1.9	0	3.7	5.6	-1.9	1.9	5.6	-3.7
Official works	1.9	1.9	0	1.9	3.7	-1.8	5.6	7.4	-1.8

3. Organization of Economic Activities

Economic activities, for present purposes, are regarded as the performance of specific functions associated with, and in pursuit of, an economic enterprise. In rice growing, for instance, there are several functions that constitute very important parts of the enterprise and must be done if the enterprise is to succeed. This includes land preparation, preparing a seedbed, transplanting young rice plants, weeding, etc.

In this section, our focus is on comparisons between villages in the changing patterns of importance of activities that are performed by households, both in farm-related and nonfarming enterprises. Emphasis is on rice growing activities that are practiced by most households in these three villages.

Comparisons between socio-economic classes within and between villages will be provided in Chapter V.

a. Farm-Related Activities

Four areas of farm-related activities are considered: 1) rice growing activities, 2) second crops and dry land farming activities, 3) animal husbandry, and 4) farm wage work activities.

1) Rice Growing Activities:

Household heads were asked about 19 rice growing activities. First, we wanted to know whether or not they or other members of the household engaged in these activities. Secondly, we wanted to know if each of these activities had increased or decreased in importance during the past 13 years, especially in terms of how much total family labor

time the activity required.

Between village comparisons are made through an examination of percentage distributions of change in importance as noted by household heads in the three villages (see Appendix Table 4.3). Table 4.11 indicates the direction of trends in the relative importance of the rice farming activities. It is based on the proportion of households whose labor utilization changed in importance, either increasing or decreasing since Jatiluhur.

A directional change indicator was constructed by subtracting the percentage of households that had increased their labor allocation to a particular activity by the percentage of those who had experienced a decrease in the labor allocation to the activity. The percentage difference or net change is referred to as a "directional change index". Directional change can be negative (decrease in labor allocation), positive (increase in labor allocation), or zero (labor allocation remains at about the same level). Using this index, in effect, permits us to assess the changing pattern of rice farming activities from the point of view of labor allocation.

The percentage distribution of change in importance of activities as noted by household heads in each village is presented in Appendix Table 4.3 and the directional change indices in Table 4.11. Our general impression is that there has been a trend toward the decreasing importance of most rice growing activities for most families, especially those activities that relate to irrigation and land maintenance, such as land preparation, transplanting, weeding, maintaining water and daily inspection/care. Land is now easier to prepare for seedbed and

transplanting purposes as a result of irrigation water being easily available. Weeding is also easier, and, of course, so too, is the daily chore of maintaining water levels and controlling the irrigation process.

On the other hand, changes in other rice farming activities are also influenced by factors not directly related to the introduction of irrigation, especially those activities that occur after harvest. This includes drying of the rice, storing the harvest, husking or selling the paddy, etc.

It is interesting to note that two rice farming activities in Kalencabang seem to have increased in importance and presumably need more labor time than before, namely the application of fertilizers and the use of pesticides/insecticides. There is probably a relationship between irrigation and the increasing need for fertilizer. Growing two crops of rice in one year on the same piece of land creates certain soil nutrient deficiencies. In Betok, however, application of fertilizer has decreased in importance as a rice growing activity. Perhaps many farmers in this village changed from the use of animal fertilizer, which required much labor, to chemical fertilizer which requires less labor. In Kamalsari a little increase in applying fertilizer was observed. The use of pesticides and insecticides in Kalencabng is also greater than in Betok and Kamalsari because during the last years ricefields in this village have been attacked by rats and insects, locally known as "wereng" which was probably more serious than in Betok and Kamalsari. When this study was carried out in 1981, the farmers at Kalencabang were still waging a war against the rats.

Table 4.11. Directional change indices of the changes in importance of rice farming activities as noted by household heads, by village, in percent.

Rice farming Activities	Betok			Kalencabang			Kamalsari		
	% of households		Net	% of households		Net	% of households		Net
	Increase	Decrease	Change	Increase	Decrease	Change	Increase	Decrease	Change
Prepare land	11.1	48.1	-37.1	5.6	63.0	-57.4	0	72.2	-72.2
Make seedbed	3.7	27.8	-24.1	3.7	24.1	-20.4	0	14.8	-14.8
Pull out seedling	1.9	37.0	-35.1	1.9	46.3	-44.4	0	22.2	-22.2
Distribute young plant	3.7	27.8	-24.1	1.9	9.3	-7.4	0	0	0
Make lines	11.1	31.5	-20.4	9.3	13.0	-3.7	0	0	0
Transplant young plant	13.0	51.9	-38.9	3.7	63.0	-59.3	0	74.1	-74.1
Weed	11.1	51.9	-40.8	5.6	61.1	-55.5	1.9	74.1	-72.2
Apply fertilizer	13.0	37.0	-24.0	55.6	13.0	42.6	9.3	0	9.3
Maintain water	0	63.0	-63.0	3.7	68.5	-64.8	0	77.8	-77.8
Apply pesticides	24.1	37.0	-12.9	57.4	9.3	48.1	11.1	0	11.1
Daily care/ inspection	5.6	37.0	-31.4	18.5	33.3	-14.8	1.9	68.5	-66.6
Harvest	11.1	44.4	-33.3	3.7	38.9	-35.2	0	5.6	-5.6
Dry the harvest	1.9	40.7	-38.8	3.7	33.3	-29.6	0	1.9	-1.9
Storage	0	42.6	-42.6	1.9	24.1	-22.2	0	1.9	-1.9
Take out of storage	0	38.9	-38.9	0	14.8	-14.8	0	0	0
Mill/decide to mill	3.7	46.3	-42.6	5.6	18.5	-12.9	0	1.9	-1.9
Sell/decide to sell	1.9	37.0	-35.1	1.9	1.9	0	0	0	0
Buy farm eq.	1.9	29.6	-27.7	5.6	5.6	0	0	0	0
Pay bills	3.7	24.1	-20.4	0	1.9	-1.9	1.9	0	1.9

Appendix Table 4.3 and Table 4.11 show changes in the importance of various rice growing activities in these villages. In this case, it seems that the pattern change in Kamalsari has not been as great as in the other two villages; Kamalsari, of course, had irrigation before Jatiluhur and the new system seemed to have made it even easier to plant and to irrigate. It also seems that Betok, formerly dependent upon rain, changed the most. In Betok, some tasks increased and some decreased in importance; the patterns of changes suggest a major disturbance.

To compare patterns of change in rice farming activities the directional change indices (Table 4.11) were ranked. Between village comparisons of these indices were made by computing correlation coefficient (Table 4.12).

From these coefficients we conclude that the pattern of changes in family labor allocated to the various rice farming activities is much different in Betok than in other two villages. The Betok pattern again suggests a major disturbance.

2) Second Crops and Dry Land Farming Activities:

Second crop farming is the growing of seasonal crops such as soybeans, peanuts, sweet potatoes, corn, vegetables, etc., in the ricefield during the period between the end of the dry season and the beginning of the wet season of rice growing cycles. Between the dry and wet seasons there is a fallow period of three months which is generally long enough for growing certain second crops.

Table 4.12. Directional change indices of changes in importance of rice farming activities, rank orders and their between village correlation coefficients.

Directional change indices			Rice farming activities	Rank orders		
Betok	Kalencabang	Kamalsari		Betok	Kalencabang	Kamalsari
-37.1	-57.4	-72.2	Prepare land	12	17	16
-24.1	-20.4	-14.8	Make seedbed	5.5	11	13
-35.1	-44.4	-22.2	Pull out seedling	10.5	15	14
-24.1	-7.4	0	Distribute young plant	5.5	7	6
-20.4	-3.7	0	Make lines	2.5	6	6
-38.9	-59.3	-74.1	Transplant young plant	14.5	18	18
-40.8	-55.5	-72.2	Weed	16	16	17
-24.0	42.6	9.3	Apply fertilizer	4	2	2
-63.0	-64.8	-77.8	Maintain water	19	19	19
-12.9	48.1	11.1	Apply pesticides	1	1	1
-31.4	-14.8	-66.6	Daily care/inspection	8	9.5	15
-33.3	-35.2	-5.6	Harvest	9	14	12
-38.8	-29.6	-1.9	Dry the harvest	13	13	10
-42.6	-22.2	-1.9	Storage	17.5	12	10
-38.9	-14.8	0	Take out of storage	14.5	9.5	6
-42.6	-12.9	-1.9	Mill/decide to mill	17.5	8	10
-35.1	0	0	Sell/decide to sell	10.5	3.5	6
-27.7	0	0	Buy farm equipment	7	3.5	6
-20.4	-1.9	-1.9	Pay bills	2.5	5	3

Rank order correlation coefficient: Betok - Kalencabang .70
Betok - Kamalsari .66
Kalencabang - Kamalsari .92

Dry land farming is the growing of crops on land that is never flooded or used for rice growing (normally this refers to gardens and home yards).

Household heads were asked about various activities associated with second crops and dry land farming. The format of questions was similar to that for exploring rice growing activities and the answers were also treated similarly. However, it must be noted that only a small proportion of the households practiced these two kinds of farming.

Table 4.5 shows the change in proportion of households per village engaged in second crop farming who considered the enterprise an important economic resource. At Betok the proportion was 31.5% before Jatiluhur but has dropped to 11.1% now. Kalencabang, too, dropped somewhat, from 29.6% to 11.9% as did Kamalsari from 11.2% to 1.9%. This is mainly due to the soil being too wet for second crops, and probably also because people prefer to work for wages by harvesting rice in other areas. Some people may simply be satisfied with two harvests of rice a year. Clearly, though, there is a great need to provide farmers with some guidance in practicing second crop farming.

Table 4.5 shows small changes in the proportion of households engaged in dry land farming. Betok increased from 35.2% to 42.6% and Kamalsari increased from 29.6% to 33.3%. Kalencabang, on the other hand, decreased slightly from 37.0% to 35.2%. It was mentioned on the one hand that some people (especially at Kalencabang) transformed their dry land into wet ricefield (due to the availability of irrigation water), while on the other hand some people (especially around Kamalsari) transformed their wet ricefields into land for dry land farming.

In addition, the local government encourages people to make every inch of land, including the home yard, productive.

Appendix Table 4.4 and 4.5 report the percentage distribution of changes in importance of these activities before Jatiluhur and now.

Although the majority of household heads engaged in second crop farming in Betok explained that the labor allocation is about the same now as it used to be, there was a considerably large proportion of them who believe that the use of labor in these activities has declined. Land is more moist now, and if plants need watering, it is also not as difficult to get. In Kalencabang and Kamalsari the situation of labor utilization for second crop farming is about the same as in Betok village.

Irrigation did not influence the techniques of farming on dry land in this region. Therefore, as indicated by Appendix Table 4.5, the majority of households engaged in dry land farming report that labor allocation for this enterprise is about the same now as it used to be. The slight change noted is mainly related to the transformation of land use.

In general, then, second crop farming and dry land farming were and continue to play a part in the economy of these villages. There is a rather large proportion of households engaged in these two farming enterprises and many people (33% in Betok, 15% in Kalencabang and 15% in Kamalsari) have seasonal jobs as wage workers in dry land farming. Irrigation has changed the extent of family participation in these two enterprises through changes in the pattern of land use. However, the pattern of labor allocation did not change a great deal.

3) Animal Production

Five kinds of animal enterprises were considered: big animal production (water buffaloes and cattle); small ruminant production (sheep and goats); duck farming, chicken farming; and the raising of fish.

Table 4.5 shows the change in proportion of households engaged in animal production enterprises before Jatiluhur and now. In general, the care and breeding of grass eating animals has declined somewhat following a decline in the grazing land area due to the introduction of the Jatiluhur irrigation system. On the other hand, there has been some increase in duck farming (and Betok now has a bit of fish farming). Chickens are very popular, in that almost all households in all villages own some. But raising chickens commercially is of no importance and there has been no change in that.

Animal production plays and has played an important part in the economy of these villages. A large proportion of households engage in this enterprise. Some children contributed to the economy of their household through their participation in freeding and tending the animals. Following the establishment of Jatiluhur irrigation the proportion of households reporting this activity changed. At present, Betok is the busiest village in animal production as a whole. In general, though, there have been no big changes in the patterns of labor allowed to animal husbandry. (See Appendix Table 4.6)

4) Wage Work Activities

Wage work on neighboring farms, locally known as "kuli" (collie labor), is an important enterprise in the three villages and the second most common source of household income. It is necessary to exclude the percentage of wage workers in dry land farming and focus on the proportion engaged in wage work in the ricefields (since both is done by the same persons at different season.)

The proportion of households depending upon such work in Betok declined slightly from 57.4% in 1967 to 51.8% now. In Kalencabang the decline was a bit greater, from 57.4% to 48.1%, and in Kamalsari, it was rather dramatic, from 64.8% to 40.8% (see Table 4.5).

Table 4.13 indicates the work status of households before Jatiluhur and now with respect to farming, farm wage work and doing nonfarm jobs. There has been a negligible increase in the proportion of households engaged only in farming. This table also shows a decline in proportion of households engaged in farm wage work and the decline in Kamalsari was rather dramatic. Indeed, in Kamalsari the most noteworthy change was the decrease in farm wage work. The increase in nonfarm jobs was rather significant in Betok while the changes in Kalencabang and Kamalsari were slight.

In these three villages most household heads who reported some wage work activities noted that the importance of wage work to the economy of the households had increased somewhat over the years. (see Appendix Table 4.7).

Table 4.13. Work status of households before Jatiluhur Irrigation Project and now, by village, in percent.

Before Jatiluhur			Work done	Present time		
Betok	Kalenca-bang	Kamal-sari		Betok	Kalenca-bang	Kamal-sari
20	20	20	Farming only	20	22	26
57	57	65	Farm wage work	52	48	41
46	46	37	Nonfarm work	55	44	41

b. Nonfarming Activities.

Household heads were asked about activities relevant to each nonfarming enterprise. First we wanted to know whether or not they were doing the activities. Secondly, if they did these things we wanted to know whether the importance of the activity had increased, decreased or remained the same during the past 13 years, in terms of total family labor time spent on the activity. These data are viewed in a manner similar to those dealing with rice growing activities.

Appendix Table 4.8 shows the changes in importance of the activities associated with each enterprise and for each village. To most Betok villagers, handicrafts have become slightly more important now than before the Jatiluhur while in the other two villages its importance has decreased somewhat.

Activities centering on trade enterprises have been increasing a little in importance among households in every village. Service activities have become a little more important in Betok and Kamalsari, but

have remained the same in Kalencabang. Transportation activities experienced a little decline in Betok and Kamalsari, but remained at the same level in Kalencabang. Finally, activities in official works have not changed in importance in the three villages for the last 13 years.

In general, trade, handicrafts and service activities increased slightly in importance in Betok; trade and services activities increased a little in Kamalsari; and trade activities increased a little in Kalencabang. On the other hand, there were also some enterprises that experienced no change or a decline.

4. Summary.

In this chapter, discussion focused on variations in the changing pattern of importance of economic enterprises and activities in three different villages. The villages differed considerably in their hydrological circumstances prior to the Jatiluhur Irrigation Project. Betok village represents areas that used to be rainfed, Kalencabang is an example of villages that were regularly flooded, and Kamalsari is a village that had been irrigated from local sources before Jatiluhur.

The Jatiluhur project brought about a significant change in the structure of agriculture in these three villages. The village economics, previously more differentiated, becamse more focussed on rice farming. Off-farm and nonfarm enterprises decreased in importance.

Although the general trend were toward monoculturalization and a greater specialization in the structure of agriculture, there were many differences in the patterns of experience between villages. In

Kamalsari, where an effective irrigation system was in effect several years before the village became part of the Jatiluhur irrigation area the process of monuculturalization proceeded somewhat faster than in the other two villages. It seems that farmers in Kamalsari were more ready to adapt to the new environmental conditions and to take advantage of them. Indeed the difference between their previous circumstances and the new one which was brought by the Jatiluhur Irrigation Project was less disturbing of the old patterns than was the case in the other two villages.

The new environment, with its reliable water supply, a necessity for intensive rice farming, has forced farmers to modify and intensify their farming techniques, especially with respect to rice production. Their allocation of family labor to work in the ricefields also changed. Betok experienced the greatest change in the re-allocation of labor, followed by Kalencabang, and then Kamalsari.

Other economic enterprises and activities changed also, but in lesser magnitude and with only minor village variability. Most of the changes in these areas were toward a decline in importance, in terms of proportion of households participating, and in terms of family labor allocation.

These changes were accompanied by changes in the farm labor situation, local economic opportunities and quality of life. In particular, it was observed that significant changes had occurred in labor force needs (the demand is high now and so too is the cost), the role of women on farms (in some households women are working harder in the ricefields

and in other households less), and the likelihood of people leaving farms (outmigration patterns are mixed).

CHAPTER V.

SOCIO-ECONOMIC LEVELS AND CHANGING WORK PATTERNS

In the previous chapter, discussion focussed on differences and similarities between the three villages in terms of changing work patterns. The three villages, now served by a modern irrigation system, entered the new era from quite different hydrological circumstances. Today there are some variabilities evident in the structure of agriculture and nonfarming activities.

Tracing back the patterns of family economic enterprises in each village to before the introduction of Jatiluhur irrigation, we found that the previously more differentiated economic enterprises of the three villages had become more focussed on rice farming. Other enterprises decreased in importance in terms of the proportion of households that considered the enterprise an important economic activity. The experiences of families in the three villages were different with respect to changes in the structure of agriculture. Differing experiences in the allocation of labor are also noted. In addition, there are some other between-village differences in the perceptions of changes by household heads concerning the farm labor situation, local economic opportunities and quality of life.

This chapter takes social class differences into account. It explores the variabilities in economic enterprises and work patterns in

these villages relative to socio-economic differences of the households. The main question is whether or not the structure of economic activity and the changes experienced since the Jatiluhur Project was introduced vary by socio-economic class.

Two analytical strategies are utilized: within village comparisons of current practices and changes that occurred among the three different socio-economic levels in each of the villages, and between village comparisons of the experiences of households in similar socio-economic circumstances in the three villages.

1. Socio-economic variabilities within villages.

It was mentioned previously that all adults in the three villages consider themselves farmers, no matter whether they own a piece of farm land or not. For present purposes, then, we have categorized farm family households into three socio-economic groups: more land farmers (upper class), enough land farmers (middle class, and less land farmers (lower class). These class positions, of course, are relative to the economic situation in the agricultural villages of West Java. An upper class household owns some farmland (in this case, ricefield) from which it produces more than the amount needed to provide an adequate living for the family. Those in the middle class own just enough farmland to provide a reasonably secure living for the family, but surplus production and income from farming is minimal. A lower class farm family, on the other hand, does not own enough land to sustain the family, and many do not own any farm land at all. Lower class farm families depend upon outside work, Kuli and non-farm labor, to

maintain their households.

Information from the National Socio-economic Survey, a report on the "farm piloting project" of Ciberes, and recent data about socio-economic indicators were used to establish the specific criteria for classification of households:

a. Upper class or more land farmers are those who own at least one hectare of riceland for every two persons in the household.

b. Middle class or enough land farmers are those who own no more than one hectare of riceland for between two and six persons.

c. Lower class or less land farmers are those who own no more than one hectare of riceland for more than six persons; some of these farmers do not own any riceland at all.

Based on these criteria, all the households in these three villages were classified (Table 5.1). In general, eight percent of the households had more land than absolutely necessary to provide for their basic needs, 22 percent had enough land, and 70 percent were land poor or landless. Between village differences were minor.

2. Villagers' perception of changes.

Between village comparisons of the perception of changes by household heads was discussed earlier, in Chapter IV. In general the experiences of household heads in the villages were comparable, following introduction of the Jatiluhur irrigation system, but there were

significant differences between villages in perception of: a) labor needs per growing season, b) women's participation in farm work, and c) likelihood of people migrating from farms.

Table 5.1. Socio-economic classification of all households in the three villages.*

Socio-economic status	Betok		Kalencabang		Kamalsari		Total	
Upper (more land)	25	(7)	24	(9)	13	(8)	62	(8)
Middle (enough land)	87	(24)	52	(20)	31	(18)	170	(22)
Lower (less land)	244	(69)	179	(70)	126	(74)	549	(70)
Total	356	(100)	255	(100)	170	(100)	781	(100)

*Note: 1. Numbers in parentheses are percentages.
2. Data from notes of the informants.

In this section, two kinds of comparisons about perceptions of changes with respect to socio-economic differences of farm households will be discussed. In the first place, within village comparisons will be made, namely comparisons of perceptions among three socio-economic groups in each of the three villages. In the second place, between village comparisons of perceptions by each socio-economic group of households will be discussed.

Table 5.2 and 5.3 show the pattern of perceptions of the household heads relating to five selected issues about changes that differ significantly by socio-economic status in almost all villages and between

villages with respect to almost every socio-economic stratum. (The findings for all items are reported in Appendix Table 4.2).

In Betok and Kalencabang, but not in Kamalsari, perceptions of changing labor needs per rice growing season differ significantly by socio-economic status. In these two villages, the lower socio-economic group perceived an increase in the need for labor, whereas those of higher status perceived a decrease. In Kamalsari, all socio-economic groups invariably saw a decrease.

Between village comparisons of perceptions of labor force needs per rice planting season reveal no differences among higher socio-economic group in the three villages: they invariably experienced a decrease. Middle class households in different villages perceived the change in this matter differently: an increase was noted in Kamalsari and a decrease in the two other villages. Larger proportions of lower class farmers in Betok and Kalencabang perceived an increase in labor force needs, whereas those in Kamalsari saw a decrease.

These variabilities in perception about the labor needs per rice planting season, probably reflect differences in the use of machinery for land preparation in the three villages among people of different socio-economic groups. Upper and middle class farmers, in all villages, rented tractors to prepare land for growing rice. To them, using a tractor is more convenient than utilizing manpower, because: a) it takes less time, b) it costs less, c) it is easier to manage, d) it is easier to rent than to rely upon a large labor force, and e) it probably produces better quality work as well. In Kamalsari, the

use of tractor was more common than in Betok and Kalencabang so that in Kamalsari there were less job opportunities for the lower class. These differences may account for differences in perception of labor force needs among lower class people in Betok and Kalencabang as compared with Kamalsari.

Perceptions about the work of women on farms in each of the three villages differ markedly by socio-economic status. In Betok, upper class families saw a decrease, whereas the middle and lower classes saw an increase. In Kalencabang, perceptions about this matter also differ by socio-economic status. Here, the perceptions are rather like that in Betok, with slight differences among the middle class who see it about the same now as it was in the past. In Kamalsari, irrespective of socio-economic class, household heads believe that the direct participation of women in the farm work declined.

Between village comparisons about participation of women on the farm also found significant differences. Upper class household heads in all villages, with a slight difference in Kalencabang, experienced a decrease. Middle class households in the three villages perceived this matter differently: in Betok the highest proportion said "more", in Kalencabang "about the same", while in Kamalsari "less". Lower class households in the three villages manifested similar patterns of perceptions as those of the middle class in the village involved.

These variabilities of perceptions about women's work in the fields is probably influenced by several factors. In the three villages, it seems that hard work in the fields is considered less

prestigious. Women are responsible for managing the home rather than doing hard work in the field. Therefore, upper class women, invariably by village type, tended to spend more time in managing their home, which needed more attention due to the increasing prosperity. Middle and lower class women in Betok work more now in the ricefield where more jobs can be done by women than before, including managing water which used to be considered too dangerous for a woman. The development of rooftile factories in the village which absorbed a lot of male workers, and the custom of looking for nonfarming jobs outside the village by males during the leisure period of a rice growing cycle, left much field work to be done by women, especially weeding and daily control of irrigation. In Kamalsari, probably middle and lower class women have adopted the values and attitudes of upperclass people, and in addition, in this village there were not many nonfarming activities for men during the leisure period of the rice growing cycle. Hence, in Kamalsari most males continue working in the fields during all stages of the rice growing cycle, including weeding and daily irrigation control. In Kalencabang, women of the middle and lower classes were considered working now similarly as they did previously. There are two interrelated reasons that need to be taken into consideration in this matter. First of all, prior to the Jatiluhur irrigation, the main problem arising in ricefarming was floods that damaged the ricefields so that the farmers had to replant them when flooding ceased. Women, especially of middle and lower status groups, took part in replanting the damaged ricefields, either in those of their own or did it for wages. Now with no more threatening floods, there is no need for

replanting, but job opportunities in the fields increased due to the fact that more ricefields have been created, and due to the fact that work in the field today needs to be done more quickly because the new rice varieties grow faster. Secondly, although jobs in the field have been increasing, lack of side jobs for males in the village have kept men continually working in the field, including the activities that were traditionally done by women, such as pulling out the seedlings and weeding.

With regard to the participation of children in farm work, it is generally recognized that it has been reduced. However, it is important to note that a large proportion of middle and lower socio-economic groups perceived an increase or felt that it had remained at the same level. For these two segments, the contribution of children to the household economy continues to be important.

In this matter there are also some village differences by socio-economic status. The majority of lower class households in Kalencabang observed that the participation of children on farms is about the same as it was before.

The changing roles of children on the farm probably relates to the increase of household prosperity and an easier access to education. There is a tendency for upper class farmers to send their children to school in the cities for higher education and to get a nonfarming (white collar) job; lower class families are (or must be) satisfied with the local level of education, and with jobs available in the village. Kuli activities, especially in rice harvesting, where laborers move from one irrigation section to another for a certain period,

provide some useful employment for lower class children.

Within village comparisons of the perceptions of household heads concerning changes in the difficulty of hiring farm laborers, found significant class differences. In each village, there is a tendency for the upper class to observe an increase in difficulty, whereas the lower classes see a decrease.

There are some between-village variations by each socio-economic status group regarding perceptions about the difficulty of hiring farm laborers. Upper class households in all villages perceived a greater difficulty in hiring farm labor now than before Jatiluhur irrigation. The middle class experience was somewhat different from one village to another: the majority of middle class farmers in Betok observed an increase in difficulty, whereas the majority of those in the two other villages perceived a decrease in difficulty. Lower class perceptions also varied by village: those in Betok tend to see less difficult now; those in Kalencabang tend to see more difficulties now; the perceptions of those in Kamalsari are mixed.

Several factors must be taken into consideration in explaining these variabilities in perceptions of difficulty to hire farm laborers. First of all, there was the fact that land owners became busier working on their own land so that they have less time to sell their labor to other larger farmers. Secondly, more prosperous farmers hesitate to do wage work on others' land. Thus, in general there were less wage workers now than formerly. Upper class farmers, in this situation, experienced the difficulties in getting farm laborers, while on the other hand, low class people experienced it easier to get a job.

Between village variabilities in this matter relate to the differences in the use of machinery that was mentioned earlier, and to the differences in the availability of nonfarming job opportunities. Thus, middle class families in Betok find it more difficult now to get hired labor, while on the other hand, lower class people find it easier to get a job now. In Kalencabang, lower class farmers (laborers) experienced difficulties in getting jobs especially during the leisure period, while at the same time middle class farmers experienced less difficulties in getting laborers to hire. The labor situation in Kamalsari was like that in Kalencabang.

Finally we noted significant within class differences with regard to the likelihood now of people leaving farms. In Betok upper class people perceive that more people leave farms now for other jobs; middle class farmers see no change; the perceptions of lower class farmers were mixed. In Kalencabang and Kamalsari, both upper and middle class groups perceived that more people were likely to leave farms now, whereas the lower groups said they observed no changes.

Between village comparisons by socio-economic status of changes in the likelihood of people leaving farms, revealed significant variabilities. Whereas the opinions of upper class household heads in Betok were mixed (some said "less", some said "remained the same"), those in Kalencabang and Kamalsari tended to say more people were likely leaving farms now. The majority of middle class farmers in Kalencabang and Kamalsari also noted that more people were likely leaving farms, and the perceptions of those classes in Betok also were mixed. The opinions of lower class people in Betok and Kalencabang in this matter

were mixed, while the majority of lower class people in Kamalsari observed no change.

In this matter, in three villages there was a tendency to believe that the likelihood of people leaving farms was increasing. It probably relates to the development of transportation between the villages and the urban areas, changing attitudes of people toward working on the land, and the possibility of getting better pay in other jobs, especially in urban centers. The core problem is that people in the three villages need more, and better paid, jobs. The small between village variabilities relate to the availability of internal job opportunities, about which Betok provided more than the other two villages.

3. Socio-economic Levels and Organization of Economic Enterprises.

Between village comparisons about patterns of changes in the importance of economic enterprises were outlined in Chapter IV. The data revealed a monoculturalization process in the three villages, where people were concentrating more on, and becoming more dependent upon, rice farming. Off farming and nonfarming enterprises declined in terms of the proportion of households that considered them important sources of income. The changes in farm-related enterprises were bigger than in nonfarming enterprises.

These changes in economic enterprises were accompanied by changes in the allocation of family labor. Betok experienced the biggest changes in labor allocated to rice farming activities, followed by Kalencabang, and then Kamalsari. Changes in the allocation of labor to other enterprises were less significant.

Table 5.2. Socio-economic status and perceptions of selected changes by household heads, within villages.

Character of change	Variabilities within villages			
	Village	X^2	α	Gamma
Labor force needs per planting	Betok	52.14	<.01	.52
	Kalencabang	36.28	<.01	.40
	Kamalsari	4.15	NS	.25
Women work on farm	Betok	41.73	<.01	.44
	Kalencabang	45.96	<.01	.45
	Kamalsari	29.11	<.01	.02
Children work on farm	Betok	48.85	<.01	.47
	Kalencabang	47.59	<.01	.31
	Kamalsari	48.66	<.01	.25
Difficulty of hiring farm labor	Betok	40.09	<.01	-.42
	Kalencabang	73.37	<.01	-.26
	Kamalsari	16.72	<.01	-.19
Likelihood of people leaving farms	Betok	18.6	<.01	.24
	Kalencabang	20.5	<.01	-.20
	Kamalsari	20.60	<.01	-.10

NS = Not significant

Table 5.3. Comparisons between villages in perception of selected changes by household heads, socio-economic status controlled*)

Character of change	Variabilities between villages			Observation
	Socio-economic status	χ^2	α	
Labor force needs per planting	Upper	3.74	NS	
	Middle	15.77	<.01	Kamalsari highest on 'less'
	Lower	24.59	<.01	Betok and Kalencabang highest on 'more', Kamalsari highest on 'less'
Women work on farm	Upper	10.6	<.05	
	Middle	46.44	<.01	Betok high on 'more', Kalencabang on 'same', and Kamalsari on 'less'
	Lower	134.1	<.01	Betok high on 'more', Kalencabang on 'same', and Kamalsari on 'less'
Children work on farm	Upper	12.5	<.025	Betok highest on 'less'
	Middle	28.22	<.01	Kamalsari highest on 'less'
	Lower	14.49	<.01	Kalencabang highest on 'same'
Difficulty of hiring farm labor	Upper	12.50	<.025	Kamalsari least on 'more'
	Middle	9.87	<.05	Betok high on 'more', others high on 'less'
	Lower	23.91	<.01	Betok highest on 'less'
Likelihood of people	Upper	28.2	<.01	Betok high on 'same' and 'less'
	Middle	21.96	<.01	Kamalsari highest on 'more'
	Lower	29.72	<.01	Betok highest on 'more', Kamalsari highest on 'same'

Notes: *) Data derived from Appendix Table 4.2; NS = Not significant

In this section three kinds of comparisons are made.

a. Changes overtime in importance of economic activities experienced by each of the three socio-economic groups within each of the villages (comparisons at two points in time).

b. Comparisons of changes experienced by the three different socio-economic groups in each village.

c. Between village comparisons of changes in importance of economic activities experienced by each of the three socio-economic groups.

Our attention focusses primarily on farm-related enterprises and rice growing activities, for the lives of a great majority of households are dependent upon these activities. Changes in other economic enterprises and activities are explored, but of secondary concern.

a. Farm-related enterprises.

Tables 5.4 and 5.5 show the percent of households, categorized by socio-economic status and by village, that practiced and are practicing each of 17 farm-related enterprises and considered the enterprises an important economic resource. In effect, these two tables indicate the past and present structure of agriculture or farming system characteristic of each socio-economic stratum in the three villages.

Before Jatiluhur, in comparison with the upper and middle class, a smaller proportion of lower class farmers considered rice growing, dry land farming, and big animal or small ruminant production important

sources of income. On the other hand, the greater proportion of lower class families, many of whom were landless, did wage work either in the ricefield or on dry lands. Although there have been some small changes, this pattern still persists today. Thus, in the past some economic activities were dominated by certain classes of people in each of the three villages; irrigation did not change this pattern of domination.

Tables 5.4 and 5.5 also show the number of enterprises considered important by 50% of the household heads. These can be regarded as "core enterprises" for each socio-economic class in each village, and the information reported permits comparisons of the situation before the Jatiluhur irrigation system was introduced with the present. We conclude that in general there has been a strong tendency over time for the number of core enterprises to have decreased in number; and within villages the pattern of decreases differed by socio-economic status. In other words, what we have called "monoculturalization process" in the three villages was not evenly experienced among the socio-economic classes.

For comparative purposes, first of all, an "index of importance" of enterprises was constructed (Table 5.6) and these indices were converted to a "rank order of importance" (Table 5.7). The procedure of constructing the "index of importance" was outlined in Chapter IV (Section 2).

There are two sets of rank orders: one set consists of rank orders for socio-economic groups in each village before Jatiluhur, and another set of rank orders for the present situation. Then, rank order

Table 5.4. Farm-related enterprises considered important by household heads, by socio-economic status and by village, before irrigation, in percentage of households.

	Betok			Kalencabang			Kamalsari		
Farm-related enterprises	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
Rice growing	100	96	68	100	100	55	90	96	64
Second crops	40	41	18	50	14	36	20	18	0
Dike plantings	0	5	0	20	5	5	10	0	0
Dry land farming	50	41	23	60	32	32	60	27	18
Fish raised in ricefield	10	9	0	20	0	0	0	0	0
Fish raised in fishpond	0	0	0	10	0	0	0	0	0
Big animal production	90	41	5	30	5	0	20	27	5
Small ruminant production	60	32	9	20	9	9	20	5	14
Duck farming	0	0	18	0	9	5	20	18	5
Leasing tractor or animal	30	14	0	10	0	0	10	14	0
Wage work in ricefields	10	46	91	30	64	68	50	41	95
Wage work in dry land	0	23	68	10	32	32	0	9	36
Firewood collection	70	50	59	40	32	23	40	36	46
Clay transportation	20	18	23	20	18	14	30	14	14
Reed gathering	0	0	0	0	9	14	0	0	0
Fishing in sea, river, etc.	70	50	63	0	9	9	40	23	59
Hunting game	0	0	0	0	0	0	10	0	9
# of enterprises considered important by at least 50%	(6)	(2)	(5)	(3)	(2)	(2)	(3)	(1)	(3)

Table 5.5. Farm-related enterprises considered important by household heads, by socio-economic status and by village, current situation, in percentage of households.

Farm-related enterprises	Betok			Kalencabang			Kamalsari		
	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
Rice growing	100	100	59	100	91	55	90	91	64
Second crops	10	18	5	30	14	0	0	0	5
Dike planting	0	5	0	30	14	9	0	9	0
Dry land farming	50	59	23	60	27	32	50	36	23
Fish raised in ricefield	20	14	0	10	0	0	10	0	0
Fish raised in fishpond	10	14	0	0	0	0	0	0	0
Big animal production	60	32	14	10	5	0	10	5	0
Small ruminant production	30	9	18	10	5	9	10	14	14
Duck farming	10	0	18	10	9	9	20	18	18
Leasing tractor or animal	20	9	0	0	0	0	0	5	0
Wage work in ricefields	0	41	86	0	50	68	0	9	91
Wage work in dry land	0	18	64	0	18	18	0	0	36
Firewood collection	40	50	46	40	18	14	0	5	0
Clay transportation	10	18	36	10	18	14	10	5	14
Reed gathering	0	0	0	0	5	14	0	0	0
Fishing in sea, river, etc.	30	55	50	0	0	9	0	5	27
Hunting game	0	0	0	0	0	0	0	0	5
# of enterprises considered important by at least 50%	(3)	(4)	(4)	(2)	(2)	(2)	(2)	(1)	(2)

correlation coeffiecients are computed (Tables 5.8, 5.9 and 5.10).

Table 5.8 summarizes the within village comparisons overtime in patterns of importance of farm-related enterprises per socio-economic status group; i.e., the pre-Jatiluhur rank order is compared with the current rank order for each socio-economic group in each village.

In Betok and Kalencabang, the current patterns of enterprises characteristic of the various socio-economic groups are not very different from those in the past; in Kamalsari the present patterns for each socio-economic group are much different from the old. Also, the magnitude of difference varies by socio-economic status (the higher the socio-economic status, the bigger the difference). This means that upper class farmers changed their pattern of enterprises the most and the lower class changed the least).

Table 5.9 presents rank order correlation coefficients comparing selected socio-economic groups within each village by patterns of importance of farm-related enterprises before the introduction of the Jatiluhur irrigation system and currently. In Betok, previous differences were greater between the upper and lower classes. The present pattern is not much different from that of the past. In Kalencabang, although the middle and lower classes were somewhat more similar in the past, the situation today is about the same as in Betok, namely, that the most marked differences are between the upper and lower classes. But in Kamalsari, whereas the three classes were very similar in the past, currently they appear more consistently separated than in the other two villages. In other words, in Kamalsari the new irrigation system appears to have encouraged sharper class differences in the

patterns of farm enterprises characteristic of the status groups.

Table 5.10 presents rank order correlation coefficients comparing villages by patterns of importance of farm-related enterprises before the introduction of the Jatiluhur irrigation and at present for each of the socio-economic groups.

Before Jatiluhur, between village differences were evident, though moderate, in the patterns of importance in farm-related enterprises within each socio-economic class. The biggest difference was between the lower classes in Kalencabang and Kamalsari. At present, between village differences have become more exaggerated for the upper and middle socio-economic status groups. However, between village differences in pattern for the lower socio-economic status groups (namely, landless workers) remain essentially similar (patterned differences are minor). Thus, upper and middle class households, relative to the patterns of importance of farm-related enterprises, experienced greater change than lower class farmers. These data suggest that the landless, in effect, constitute a work force with similar patterns in the three villages.

In order to compare the trends in changes "directional change indices" were constructed. The index is computed as the difference between percentage of households who considered the enterprise as increasing in importance, minus the percentage of households who considered the enterprise as decreasing. Directional change can be positive (a net increase in importance), negative (a net decrease in importance) or zero (equal proportions of households reporting an increase and a

Table 5.6. Index of importance of farm-related enterprises as noted by household heads, by village and by socio-economic status, before irrigation and now.

Before Jatiluhur irrigation										Present situation								
Betok			Kalencabang			Kamalsari				Betok			Kalencabang			Kamalsari		
Upper	Mid.	Lower	Upper	Mid.	Lower	Upper	Mid.	Lower	Farm-related enterprises	Upper	Mid.	Lower	Upper	Mid.	Lower	Upper	Mid.	Lower
22	25	43	22	22	50	29	25	46	Rice growing	22	22	49	22	28	52	29	28	46
70	65	76	62	80	56	79	78	88	Second crops	84	79	85	73	81	88	88	88	86
88	86	88	75	85	86	84	88	88	Dike planting	88	85	88	73	80	84	88	83	88
62	64	73	57	68	70	55	73	88	Dry land farming	62	58	74	55	72	71	59	68	38
81	83	87	77	88	87	88	88	88	Fish raised in ricefield	77	82	88	84	88	88	81	87	88
88	88	88	84	88	88	88	88	88	Fish raised in fishpond	84	79	88	88	88	88	88	87	88
31	63	85	70	86	88	75	74	85	Big animal production	48	68	81	81	86	88	84	86	88
53	70	82	79	83	82	75	86	88	Small ruminant production	73	83	77	84	86	83	84	82	82
88	88	79	86	83	85	77	78	86	Duck farming	88	87	78	77	82	83	79	79	80
75	82	88	81	88	88	84	82	88	Leasing tractor or animal	79	84	88	88	88	88	88	86	88
84	64	33	73	49	51	62	68	30	Wage works in ricefields	86	87	37	88	60	43	88	82	33
88	77	46	84	71	70	88	84	67	Wage work in dry land	88	79	50	88	79	76	88	88	67
46	58	54	68	68	74	64	71	65	Firewood collection	62	58	62	68	77	80	88	86	88
77	77	72	79	78	82	73	82	82	Clay transportation	81	78	64	81	78	81	84	86	81
88	88	88	88	83	81	88	88	88	Reed gathering	88	88	88	88	85	81	88	88	88
51	62	54	88	83	84	66	75	60	Fishing in sea, river, etc.	68	60	62	88	88	83	88	85	76
88	88	88	88	88	88	71	88	84	Hunting game	88	88	88	88	88	88	88	88	86

Table 5.7. Rank orders of importance of farm related enterprises as noted by household heads, by village and by socio-economic status, before irrigation and now.

Before Jatiluhur irrigation										Present situation								
Betok			Kalencabang			Kamalsari				Betok			Kalencabang			Kamalsari		
Upper	Mid.	Lower	Upper	Mid.	Lower	Upper	Mid.	Lower	Farm related enterprises	Upper	Mid.	Lower	Upper	Mid.	Lower	Upper	Mid.	Lower
1	1	2	1	1	1	1	1	3	Rice growing	1	1	2	1	1	2	1	1	3
7	7	8	3	7	3	10	7.5	14.5	Second crops	11	9	11	4.5	8	14.5	12.5	15.5	9.5
14.5	13	14.5	7	12	12	12.5	15	14.5	Dike plantings	15	14	14.5	4.5	7	11	12.5	6	14
6	5.5	7	2	3.5	4.5	2	4	2	Dry land farming	3.5	2.5	7	2	3	3	2	2	2
10	12	14.5	8	15.5	13	15.5	15	14.5	Fish raised in ricefield	7	11	14.5	9.5	15	14.5	4	12.5	14
14.5	15.5	14.5	12.5	15.5	15.5	15.5	15	14.5	Fish raised in fishpond	11	9	14.5	14	15	14.5	12.5	12.5	14
2	4	11	5	13	15.5	7.5	5	10	Big animal production	2	6	10	7.5	11.5	14.5	6	9.5	14
5	8	10	9.5	9.5	8.5	7.5	12	7.5	Small ruminant production	6	12	8	9.5	11.5	9	6	4.5	8
14.5	15.5	9	14	9.5	11	9	7.5	11	Duck farming	11	15	9	6	9	9	3	3	6
8	11	14.5	11	15.5	15.5	12.5	9.5	14.5	Leasing tractor or animal	8	13	14.5	14	15	14.5	12.5	9.5	14
11	5.5	1	6	2	2	3	2	1	Wage works in ricefields	15	5	1	14	2	1	12.5	4.5	1
14.5	9.5	3	12.5	5	4.5	15.5	11	6	Wage work in dry land	15	9	3	14	6	4	12.5	15.5	4
3	2	4.5	4	3.5	6	4	3	5	Firewood collection	3.5	2.5	4.5	3	4	5	12.5	9.5	14
9	9.5	6	9.5	6	8.5	6	9.5	7.5	Clay transportation	9	7	6	7.5	5	6.5	6	9.5	7
14.5	15.5	14.5	16	9.5	7	15.5	15	14.5	Reed gathering	15	16.5	14.5	14	10	6.5	12.5	15.5	14
4	3	4.5	16	9.5	10	5	6	4	Fishing in sea, river,etc.	5	4	4.5	14	15	9	12.5	7	5
14.5	15.5	14.5	16	15.5	15.5	11	15	9	Hunting game	15	16.5	14.5	14	15	14.5	12.5	15.5	9.5

Table 5.8. Rank order correlation coefficients comparing patterns of importance of farm-related enterprises by socio-economic status groups, before Jatiluhur and now, within villages.

Socio-Economic Status Group	Correlation Coefficients[x)]		
	Betok	Kalencabang	Kamalsari
Upper	.91	.78	.48
Middle	.81	.92	.60
Lower	.97	.81	.81

[x)]Note: Rank orders in the past compared with now.

Table 5.9. Rank order correlation coefficients comparing selected socio-economic status groups by patterns of importance of farm-related enterprises, before Jatiluhur and now, by village.

Socio-economic Status Group Compared	Correlation Coefficients					
	Betok		Kalencabang		Kamalsari	
	Before	Now	Before	Now	Before	Now
Upper - Middle	.89	.60	.53	.62	.87	.65
Upper - Lower	.45	.33	.50	.35	.82	.42
Middle - Lower	.75	.75	.95	.80	.74	.53

Table 5.10. Rank order correlation coefficients comparing villages by patterns of importance of farm-related enterprises, before Jatiluhur and now, by selected socio-economic status group.

Villages compared	Correlation Coefficients					
	Upper Status		Middle Status		Lower Status	
	Before	Now	Before	Now	Before	Now
Betok - Kalencabang	.79	.40	.64	.56	.78	.82
Betok - Kamalsari	.69	.48	.84	.44	.84	.79
Kalencabang-Kamal-sari	.71	.66	.81	.47	.60	.72

decrease in the importance of the enterprise). Table 5.11 notes these indices.

For making comparisons of trends in changes by socio-economic status and by villages, the magnitude of directional changes are categorized as follows:

≥ 16 "increased a great deal"

6 to 15 "increased somewhat"

5 to -5 "remained the same"

-6 to -15 "decreased somewhat"

≤-16 "decreased a great deal"

Using this classification, we see that the pattern of enterprises changed significantly. In each village there has been a decrease rather than an increase. Within each of the villages, the pattern varies by socio-economic class: the higher the socio-economic status the greater the magnitude of changes in the direction of decreasing importance. Between village comparisons of the magnitude in changes of economic enterprises experienced by any particular socio-economic status groups show no significant differences between villages.

b. Nonfarming enterprises:

Tables 5.12 and 5.13 show the proportion of families, categorized by socio-economic status and by village, who practiced and are practicing each of the identified nonfarming enterprises, and considered the enterprise an important source of income.

The data indicate that for nonfarming enterprises, contrary to what was observed for farm-related enterprises, there is not a general

Table 5.11. Directional change indices of the importance of farm-related enterprises as noted by household heads, by village and by socio-economic status, in percent.

Farm-related enterprises	Betok			Kalencabang			Kamalsari		
	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
Rice growing	0	4.5	-9	0	-9	-5	5	-5	0
Second crops	-30	-23	-14	-20	0	-36	-20	-18	5
Dike plantings	0	0	0	10	9	5	-10	9	0
Dry land farming	0	18	0	0	-5	0	-10	9	5
Fish raised in ricefield	10	5	0	-10	0	0	10	0	0
Fish raised in fishpond	10	14	0	-10	0	0	0	0	0
Big animal production	-30	-9	9	-20	0	0	-10	-23	-5
Small ruminant production	-30	-23	9	-10	-5	0	-10	9	0
Duck farming	10	0	0	10	0	5	0	0	14
Leasing tractor or animal	-10	-5	0	-10	0	0	-10	-9	0
Wage work in ricefields	-10	-5	-5	-30	-14	5	-50	-32	-5
Wage work in dry lands	0	-5	-5	-10	-14	-14	0	-9	0
Firewood collection	-30	0	-14	0	-14	-9	-40	-32	-46
Clay transportation	-10	0	14	-10	0	0	-20	-9	0
Reed gathering	0	0	0	0	-5	0	0	0	0
Fishing in sea,river,etc.	-40	5	-14	0	-9	0	-40	-18	-32
Hunting game	0	0	0	0	0	0	-10	0	-5
Summary total enterprises:									
increased a great deal	-	1	-	-	-	-	-	-	-
increased slightly	3	1	3	2	1	-	1	3	1
remained the same	6	12	10	6	11	14	5	6	14
decreased slightly	3	1	4	6	5	2	6	3	-
decreased a great deal	5	2	-	3		1	5	5	2

pattern where an enterprise is unique to a particular socio-economic status group. Villagewise, however, a tendency toward socio-economic status variations can be observed.

In the past, in Betok, the lower the socio-economic level, in terms of average land holdings per capita in the household, the greater the likelihood of being engaged in handicrafts. The lower class also participated to some extent in trade. The middle class was more inclined toward work in trade and services whereas the upper class group participated more in official works. (See Table 5.12).

In Kalencabang, lower class participation in nonfarming activities was not quite as common as in Betok, but a considerable proportion participated in trade and to a much lesser extent in handicrafts and transportation. The middle class group participated the most in handicrafts and trade. The upper class monopolized official works and also was involved some in trade and transportation.

In Kamalsari, in the past, lower class people were mainly involved in handicraft and trade. Middle class people, although the least dependent upon nonfarming activities, were most likely to be in trade. On the other hand, in this village, upper class participation in most areas of nonfarming activity, except services, was especially high.

Table 5.12 indicates that there are some differences in the patterns of importance of nonfarming enterprises among villages in terms of socio-economic class and by village. In Betok and Kalencabang the patterns are quite similar: middle class people are more likely to be engaged in the various nonfarm enterprises and especially in trade,

handicrafts and services. In Kamalsari, the upper class tends to be much more involved in nonfarming enterprises and especially in transportation and official works as well as trade and handicrafts.

Between village differences concerning the importance of various nonfarming enterprises for each particular socio-economic class (Table 5.12) indicate some big differences. The upper class group in Kamalsari is more likely to be doing nonfarm work than the upper classes in other villages; the middle class group in Kamalsari, however, is less likely; and for the lower class, there are no big differences. The lower class, it appears, serves as an undifferentiated labor pool that is not affected much by village circumstances and opportunities.

Over time, the changes in importance of these enterprises, by socio-economic class and by village, were not great. (Compare Tables 5.12 with 5.13). Negative signs of directional change indices (see Table 5.14) mean that most of the changes were toward a decline. The biggest change seems to have been experienced by the upper class in Kamalsari. This class is now much less involved in nonfarming activities than before.

4. Economic activity patterns of status groups.

Between village comparisons of patterns of change in importance of economic activities among households in both farm-related and nonfarm enterprises were presented in Chapter IV (Section 3). The data showed that changes in the allocation of family labor time in rice growing varied from village to village. Betok changed the most and

Table 5.12. Nonfarming enterprises considered important by household heads, by socio-economic status and by village, before irrigation, in percentage.

Nonfarming enterprises	Betok			Kalencabang			Kamalsari		
	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
Handicraft	10	14	23	0	27	9	20	9	18
Trade	0	32	23	20	32	23	40	14	14
Services	10	24	5	0	5	0	0	0	9
Transportation	0	0	5	10	9	9	30	0	0
Official works	20	5	0	30	0	0	20	9	9

Table 5.13. Nonfarming enterprises considered important by household heads, by socio-economic status and by village, current situation, in percent.

Nonfarming enterprises	Betok			Kalencabang			Kamalsari		
	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
Handicraft	10	18	32	0	14	14	10	5	0
Trade	10	27	18	20	18	27	30	14	9
Services	20	23	9	0	0	5	0	14	9
Transportation	0	0	5	20	5	5	0	5	0
Official works	20	5	0	20	0	0	10	5	14

Table 5.14. Directional change indices of the importance of nonfarming enterprises as noted by household heads, by village and by socio-economic status, in percentage.

Nonfarming enterprises	Betok			Kalencabang			Kamalsari		
	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
Handicraft	0	5	9	0	14	5	-10	-5	-18
Trade	10	-4	-5	0	-13	5	-10	5	-5
Services	10	0	5	0	-5	5	0	14	0
Transportation	0	0	0	10	-5	-5	-30	5	0
Official works	0	0	0	-10	0	0	-10	-5	5

Kamalsari the least. The changes in labor allocated to other economic enterprises were of smaller magnitude and were almost without village variabilities.

This section elaborates further; two types of comparisons are made: (1) within village comparisons by socio-economic level of patterns of change in importance of the various farming activities associated with the designated enterprises, and (2) between village comparisons by socio-economic levels of patterns of change in importance of the various farming activities.

a. Activity patterns in farm-related enterprises.

To begin with our attention focusses on rice growing activities, upon which the lives of a great majority of families are dependent. Changes in other economic activities, although of secondary importance, also will be explored.

(1) Rice farming activities

Household heads were asked about 19 rice growing activities. First we wanted to know whether or not they or other members of the household engaged in these activities. Secondly, we wanted to know if these activities had increased or decreased in importance since the introduction of Jatiluhur irrigation, especially in terms of how much total family labor time an activity required.

Appendix Table 5.1 presents the data, in percentages, showing changes in importance of rice farming activities among families categorized relative to their socio-economic status in the village. For comparative purposes, directional change indicators were constructed

by subtracting the percentage of households that had increased their allocation of labor to a particular activity by the percentage of those who had decreased their allocation of labor to that activity (see Tables 5.15, 5.16 and 5.17). The difference or net change is reflected by the "directional change index". Directional change can be positive (a net increase in labor allocation), negative (a net decrease in labor allocation) or zero (equal proportions of households reporting an increase and a decrease in the allocation of family labor). This index, in effect, makes it possible for us to assess what has been happening in terms of changing patterns of rice farming activities, from the point of view of labor allocation.

For the purpose of comparing patterns of changes in importance of rice growing activities (within and between villages) with respect to socio-economic status of farm families, the directional change indices were ranked, and then correlation coefficients were computed. The rank orders by socio-economic status group in each village are presented in Tables 5.15, 5.16 and 5.17, while the correlation coefficients are presented in Table 5.18 for within village comparisons, and in Table 5.19 for between village comparisons of any particular socio-economic status group.

Concerning within village comparisons, we can draw the following conclusions (Table 5.18):

(1) In Betok village, the patterns of change in labor allocated to various rice farming activities were quite different among socio-economic status groups. The upper class pattern differed considerably from the other two classes.

Table 5.15. Directional change indices, and rank orders of net changes in importance of rice farming activities, by socio-economic status, in Betok village in percent.

Rice farming activities	Upper status				Middle status				Lower status			
	In-crease	De-crease	Net change	Rank	In-crease	De-crease	Net change	Rank	In-crease	De-crease	Net change	Rank
Prepare land	10	80	-70	5	14	50	-36	16	9	32	-23	12
Make seedbed	0	70	-70	5	5	18	-13	3.5	5	18	-13	5.5
Pull out seedling	0	80	-80	9	5	27	-22	8.5	0	27	-27	15.5
Distribute young plant	0	80	-80	9	0	18	-18	6.5	9	14	-5	2
Make lines	0	80	-80	9	23	23	0	2	5	18	-13	5.5
Transplant young plant	0	90	-90	13	18	55	-37	17	14	32	-18	8
Weed	10	70	-60	3	9	59	-50	18	14	36	-22	9
Apply fertilizer	10	90	-80	9	18	32	-14	5	9	18	-9	3
Maintain water	0	90	-90	13	0	77	-77	19	0	36	-36	19
Apply pesticides	0	100	-100	17	41	27	14	1	18	18	0	1
Daily care/inspection	10	80	-70	5	5	23	-18	6.5	5	32	-27	15.5
Harvest	10	90	-80	9	9	41	-32	14.5	14	27	-13	5.5
Dry the harvest	0	100	-100	17	5	32	-27	12	0	23	-23	12
Storage	0	100	-100	17	0	32	-32	14.5	0	27	-27	17
Take out of storage	0	100	-100	17	0	27	-27	12	0	23	-23	12
Mill/decide to mill	0	100	-100	17	9	36	-27	12	0	32	-32	18
Sell/decide to sell	0	90	-90	13	5	27	-22	8.5	0	23	-23	12
Buy farm equipment	10	60	-50	1.5	0	23	-23	10	0	23	-23	12
Pay bills	0	50	-50	1.5	5	18	-13	3.5	5	18	-13	5.5

Table 5.16. Directional change indices, and rank orders of net changes in importance of rice farming activities, by socio-economic status, in Kalencabang village, in percent

Rice farming activities	Upper status				Middle status				Lower status			
	In-crease	De-crease	Net change	Rank	In-crease	De-crease	Net change	Rank	In-crease	De-crease	Net change	Rank
Prepare land	0	100	-100	19	14	68	-54	17	0	41	-41	16
Make seedbed	0	50	-50	14	9	27	-18	11.5	0	9	-9	8
Pull out seedling	0	50	-50	14	5	45	-40	14	0	36	-36	14.5
Distribute young plant	0	0	0	6	5	18	-13	10	0	5	-5	5.5
Make lines	0	10	-10	8.5	18	23	-5	7.5	5	5	0	3
Transplant young plant	0	9	-90	17.5	9	64	-55	18	0	50	-50	18
Weed	0	80	-80	16	14	64	-50	16	0	50	-50	18
Apply fertilizer	60	10	50	2	73	14	59	1.5	36	14	22	2
Maintain water	0	90	-90	17.5	9	77	-68	19	0	50	-50	18
Apply pesticides	70	10	60	1	73	14	59	1.5	36	5	31	1
Daily care/inspection	0	50	-50	14	46	23	23	3	0	36	-36	14.5
Harvest	0	30	-30	11.5	9	50	-41	15	0	32	-32	12.5
Dry the harvest	0	30	-30	11.5	9	36	-27	13	0	32	-32	12.5
Storage	0	20	-20	10	5	23	-18	11.5	0	27	-27	10.5
Take out of storage	0	10	-10	8.5	0	5	-5	7.5	0	27	-27	10.5
Mill/decide to mill	10	10	0	6	9	18	-9	9	0	23	-23	9
Sell/decide to sell	10	0	10	3.5	0	0	0	5	0	5	-5	5.5
Buy farm equipment	10	0	10	3.5	9	9	0	5	0	5	-5	5.5
Pay bills	0	0	0	6	0	0	0	5	0	5	-5	5.5

Table 5.17. Directional change indices, and rank orders of net changes in importance of rice farming activities, by socio-economic status, in Kamalsari village, in percent.

Rice farming activities	Upper status				Middle status				Lower status			
	Increase	Decrease	Net change	Rank	Increase	Decrease	Net change	Rank	Increase	Decrease	Net change	Rank
Prepare land	0	80	80	17	0	82	-82	15.5	0	59	-59	18
Make seedbed	0	20	-20	13	0	18	-18	13	0	9	-9	13
Pull out seedling	0	50	-50	14	0	23	-23	14	0	9	-9	13
Distribute young plant	0	0	0	7.5	0	0	0	7	0	0	0	5.5
Make lines	0	0	0	7.5	0	0	0	7	0	0	0	5.5
Transplant young plant	0	70	-70	15	0	91	-91	18	0	59	-59	18
Weed	0	80	-80	17	0	91	-91	18	5	55	-50	16
Apply fertilizer	20	0	20	2	5	0	5	2	9	0	9	1.5
Maintain water	0	90	-90	19	0	91	-91	18	0	59	-59	18
Apply pesticides	30	0	30	1	5	0	5	2	9	0	9	1.5
Daily care/inspection	0	80	-80	17	0	82	-82	15.5	5	50	-45	15
Harvest	0	0	0	7.5	0	5	-5	11.5	0	9	-9	13
Dry the harvest	0	0	0	7.5	0	0	0	7	0	5	-5	10
Storage	0	0	0	7.5	0	0	0	7	0	5	-5	10
Take out of storage	0	0	0	7.5	0	0	0	7	0	0	0	5.5
Mill/decide to mill	0	0	0	7.5	0	5	-5	11.5	0	0	0	5.5
Sell/decide to sell	0	0	0	7.5	0	0	0	7	0	0	0	5.5
Buy farm equipment	0	0	0	7.5	0	0	0	7	0	0	0	5.5
Pay bills	0	0	0	7.5	5	0	5	2	0	5	-5	10

Table 5.18. Rank order correlation coefficients comparing patterns of change in importance of rice farming activities, by socio-economic status, within village.

Socio-economic status compared	Betok	Kalencabang	Kamalsari
Upper vs. Middle	.18	.84	.93
Upper vs. Lower	.26	.91	.71
Middle vs. Lower	.57	.82	.70

Table 5.19. Rank order correlation coefficients comparing patterns of change in importance of rice farming activities, by socio-economic status between villages.

Villages compared	Socio-economic status		
	Upper status	Middle status	Lower status
Betok - Kalencabang	-.14	.78	.57
Betok - Kamalsari	-.22	.68	.24
Kalencabang - Kamalsari	.91	.77	.76

(2) In Kalencabang village, there are no significant differences in the patterns of change in labor allocated to various rice farming activities among different socio-economic status groups. The three status groups experienced similar pattern changes.

(3) In Kamalsari village, there are also no big differences evident in the patterns of change in labor allocated to various rice farming activities between socio-economic classes. The upper and middle class experiences were virtually identical while the lower class experience was a bit different.

Comparing the various status groups in these three villages, we see that the experience of the upper class in Betok with regard to changes inthe pattern of labor allocation (Table 5.19) was vastly different from the upper classes in the other two villages. We noted previously that the main changes in labor allocation in Betok was toward a large decrease in rice farming activities among the upper class. This tendency is quite understandable because irrigation made farm work less backbreaking. Land became softer, weeding was easier now, and so was management of irrigation, etc. Thus, it is clear that Betok village, where farming used to be the most difficult in comparison with the other two villages, experienced the biggest changes in the patterns of labor allocated to these activities. Initially dependent solely upon rain for crop growth, the introduction of irrigation led to a major shift in farming pattern. Congruent with this, rather big changes in farming patterns among upper class farmers in Betok was especially feasible because their ricefields were larger than those of the middle and lower class.

Concerning between village comparisons of particular socio-economic groups, therefore, (Table 5.19) the following conclusions can be drawn:

(1) Upper class farmers in Kalencabang and Kamalsari experienced similar patterns of change in labor allocated to various rice farming activities. However, the pattern of changes experienced by the upper class in Betok was quite different.

(2) Village differences among middle class farmers in the patterns of change in labor allocated to various rice farming activities, although somewhat different, is not noteworthy. The relatively minor variations observed can perhaps be explained by localized conditions. In any case, the pattern does not suggest that the experiences of middle class households in the villages were very dissimilar.

(3) Among lower class farmers who own farm land the patterns of change in labor allocated to various rice farming activities were somewhat different in Kalencabang and Kamalsari. Betok, however, differed considerably. We expect, too, that this big change in Betok was brought about the irrigation of land that once was especially difficult to farm because previously working on land in Betok village was

far more difficult than in Kalencabang and in Kamalsari.

To measure the cumulative magnitude of changes in importance of rice farming activities in terms of the allocation of family labor time, the net changes in Tables 5.15, 5.16, and 5.17 were categorized (and thought of) as follows (summarized in Table 5.21):

≥ 16 "increased a great deal"
6 to 15 "increased somewhat"
5 to -5 "remained the same"
-6 to -15 "decreased somewhat"
≤ -16 "decreased a great deal"

Table 5.20 indicates the frequency distribution in the relative magnitude of changes in importance of 19 rice farming activities, categorized by socio-economic status and by village. Generally, we see that many changes were rather big, with a tendency for those changes to be in the direction of decreasing importance. This decrease tendency was greater in Betok than in the other villages. As mentioned, rice farming techniques in Betok were very difficult before Jatiluhur; Betok depended solely upon rain for crop growth. Kamalsari, the village with a relatively good irrigation system before Jatiluhur, had a more stable and consistent pattern of change in family labor utilization after the introduction of the more modern Jatiluhur system. Within villages, there was a tendency for the upper class farmers to experience bigger changes, and the lower class lesser changes. Regarding between village comparisons of particular socio-economic status group, the table shows that the upper class in Betok changed the most, followed by those in

Kalencabang, and those in Kamalsari. The same order of change occurred also among the middle class and lower class. These village and class variables in labor allocation are consistent with changes in the hydrological situation which, ceteris paribus, made rice cultivation easier.

Table 5.20. Frequency distribution of the relative magnitude of changes in importance of 19 rice farming acitivities, by socio-economic status and by village (number of activities).*

Magnitude of change in importance of rice farming activity	Betok			Kalencabang			Kamalsari		
	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
Increased a great deal	- -	- -	- -	2 2	3 3	2 2	2 2	- -	- -
Increased somewhat	1	1	-	2	-	-	-	-	2
Remained the same	-	1	2	3	5	5	10	12	9
Decreased somewhat	-	3	5	2	2	1	-	-	3
Decreased a great deal	19	14	12	10	9	11	7	7	5

*Data derived from Tables 5.16, 5.17 and 5.18.

(2) Other farming activities

Appendix Tables 5.2 through 5.5 show the percentage distribution of changes in the importance of growing second crops, farming on dry lands, production of animals and working for wages. These

changes are in terms of family labor allocation, as noted by household heads, following the introduction of Jatiluhur irrigation.

For most of these activities, the proportions of families engaged in these activities is relatively small. Many families say a particular activity is not done and hence, a detailed analysis by socio-economic status is not feasible.

Growing second crops, such as vegetables, peanuts, beans, sweet potatoes, etc. has been of minor importance in these villages (virtually non-existent in Kamalsari). The slight changes that have been experienced are noted in Appendix Table 5.2. Most of the changes are toward a decrease (except perhaps among the upper class in Kalencabang). Village informants explained that a greater decline was encouraged by the system of growing two rice crops per year. Rice growing is far more profitable than most second crops.

The patterns of dry land farming in these villages changed somewhat among all socio-economic class in each village. (See Appendix Table 5.3). Generally, the changes occurred in activities related to land preparation, planting and daily maintenance; these activities tended to decrease in importance. In part, the changes were due to the transformation of some previously dry land into ricefield. The technique of farming the remaining dry land was not influenced much by irrigation.

Data about animal production (Appendix Table 5.4) show that most changes in labor utilization for animal production tended toward a decline. Land fisheries increased somewhat in importance for upper class families, but this probably relates to the development of the

enterprise itself. Comparison within villages show that regardless of village, the upper class experienced somewhat more changes than the other two classes.

b. Activity patterns in nonfarming enterprises

Appendix Table 5.6 shows the percentage distribution of changes in the pattern of nonfarming activities by socio-economic class and by village. The breakdown of these data by socio-economic class and the fact that only a small proportion of households engaged in non-farming enterprises does not permit a detailed analysis. The number of cases falling into any one category are too small.

However, it should be recalled that income from non-farming enterprises as a whole are important to a large number of household (Table 5.21). It is especially important to the lower class, most of whom are landless.

c. Farming, farm wage work, and nonfarm enterprises: household dependency status.

Table 5.21 shows the work dependency status of farm households in the three villages, categorized by village and by socio-economic status, for before the Jatiluhur irrigation and now. Work dependency status is conceptualized in terms of three categories: farming only, working for wages on other farms, and working in a non-farm occupation. "Farming only" implies that the household is totally dependent upon family farm production: growing crops, animal production, and gathering activities. Farm wage work, by one or more persons in the household, includes doing work on others' land for wages,

Table 5.21. Work dependency status of farm households, by socio-economic status and village (percent).

Before Jatiluhur									Work Status of Farm Households*	Present Time								
Betok			Kalencabang			Kamalsari				Betok			Kalencabang			Kamalsari		
Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower		Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
60	23	0	30	23	14	30	36	5	Farming only (no household members doing any off-farm or nonfarm work)	60	23	0	40	31	5	50	36	5
10	45	90	30	64	64	50	41	95	Farm wage work (one or more household members doing some farm wage work for others)	0	41	86	0	50	81	0	9	90
30	59	41	50	50	41	60	27	36	Non-farm work (one or more household members doing some nonfarm work)	40	64	55	60	32	50	40	50	32

*"Farming only" implies that the household is totally dependent upon family farm production. This category is mutually exclusive from the the other two. Some household members may be engaged in farm wage work and some others may be doing nonfarm work; these two categories are not mutually exclusive.

either in the ricefields or on dry land. Working in a nonfarm occupation, by one or more persons in the household, includes doing handicrafts, trade, services, transportation and/or official works. The "farming only" category is mutually exclusive; the other two are not.

In Table 5.21 we observe the following situations and changes in the three categories of work dependency status of households among socio-economic status groups in the three villages. First of all, we estimate that about 20 percent of the households in each village made their living by farming only before the Jatiluhur irrigation. This situation has not changed much, if any. The majority of farm households in these three villages earn a considerable portion of their income from other outside sources (that is, from farm wage work and/or farm occupations). This is in combination with farming, except for those who are landless and therefore are totally dependent upon outside employment.

Dependency upon "farming only" in each village varied by socio-economic status: the higher the socio-economic status, the greater the proportion of farmers dependent upon rice farming, both before Jatiluhur irrigation and nowadays. Over time there were some changes in the proportion dependent upon farming. "Farming only" increased among the upper status people in Kalencabang and Kamalsari, and among the middle status group in Kalencabang. These changes were possibly caused by changes in the initial size of land holdings, changes in the general prosperity of these villages, and especially in relative changes in nonfarm job opportunities.

Farm wage work, prior to Jatiluhur irrigation, was generally practiced by these villagers, irrespective of village types and socio-economic status. There was a tendency that the lower the socio-economic status, the higher the proportion of the farmers who participated in this Kuli work.

With the introduction of Jatiluhur irrigation, farm wage work was no longer practiced by any of the upper status families (not even in Kamalsari where it had been an important source of income for half of these families prior to Jatiluhur). Also, there was some reduction in farm wage work among the middle class; but the lower class is still very much dependent upon farm wage work.

Roughly, around 40 percent of households made part of their living on one kind or another through nonfarming occupations or enterprises before the Jatiluhur irrigation. This, too, has not changed much. A slight increase in the proportion of families engaged in nonfarming occupation occurred in Betok among all three socio-economic status groups and in Kalencabang and Kamalsari among the middle class. These slight increases were balanced off by decreases among the others. The observed patterns suggest that nonfarming jobs have played and continue to play a very important role in providing these farm households in this part of rural Java with meaningful work opportunities and supplemental sources of income.

Thus, from this table, we see that with respect to the work dependency status of these villages, the Jatiluhur Irrigation Project strengthened somewhat the dependency upon farming and farm income of the upper and middle classes. But, at the same time, it did little to

decrease the dependency of the lower classes on farm wage work. Indeed, the dependency status of the lower class on Kuli labor is stronger now than before. Non-farm work opportunities have not yet created good alternatives for the landless, lower class.

5. Summary

In this chapter, the relationship between socio-economic status and changing work patterns were explored. Three main issues were discussed: villagers' perception of changes, organization of economic enterprises, and the pattern of activities associated with these economic enterprises. Two types of comparisons about changes experienced by the villagers were made: within village comparisons of different socio-economic groups, and between village comparisons of the experiences of each socio-economic status group.

Concerning perceptions of changes, three themes are considered: farm labor situation, local economic opportunities, and quality of life. In each village there were differences in pattern of perceptions of the villagers concerning: labor needs per growing season; the work of women on farms; children's work on farms; difficulties in getting hired farm laborers and the likelihood of people leaving farms. Regarding these five subthemes or issues, there is a tendency for socio-economic variabilities to be highest in Betok and lowest in Kamalsari.

Another observation about the villager's perceptions of these issues is that the higher the socio-economic status, the less the between village variabilities in perception of changes. In other words, the upper classes in these villages seem to have experienced

similar changes whereas there is more diversity in perceptions among the lower classes.

Regarding organization of economic enterprises, our analyses focussed on farm-related enterprises, for the lives of most villagers were dependent upon farming. The data showed that in farm-related enterprises there is a kind of class domination of certain economic enterprises, and this has not changed much from when the modern irrigation system was introduced. Indeed, there appears to be a tendency for these families to become more and more dependent upon rice farming. Core enterprises, namely those that were considered important income sources by more than 50 per cent of the households, decreased in number. That is, there are now not as many enterprises that meet the "core" criterion; this suggests, of course, a trend toward greater specialization (and in particular the monoculturalization of rice growing). The decrease in the number of core enterprises varied by socio-economic status of farm households: the higher the socio-economic status, the greater the decrease in core enterprises. The process of increasing specialization concentrated among the upper classes. Between villages there were no meaningful differences within each socio-economic group with regard to the decrease in the number of core enterprises.

Our analysis also explored changes in the patterns of importance of farm-related enterprises. In Betok and Kalencabang the current patterns of enterprises characteristic of the various socio-economic groups are not very different from those in the past. In Kamalsari, however, the present patterns for each socio-economic group are much

different from the old; also the magnitude of difference varied by socio-economic status.

Relevant to this, in Betok and Kalencabang, the present patterns of enterprises are rather similar to those of the past, except for some differences between the upper and lower socio-economic status groups. In Kamalsari, although the three classes were very similar in the past, currently they appear more consistently separated than in the other two villages.

Between village differences in patterns of enterprises characteristic of both the upper and middle class groups are more exaggerated today than in the past. Between village differences lower socio-economic groups remained essentially similar. Thus, with regard to the patterns of importance of farm-related enterprises, upper and middle class households experienced greater changes than lower class farmers.

Participation of households in nonfarming enterprises were also considered. Enterprise by enterprise data regarding the extent of participation in nonfarming enterprises by families in the three villages were too small to permit a detailed analysis of patterns of involvement relative to socio-economic status and village types. These nonfarming enterprises, however, are and had been important to a large number of families and regardless of socio-economic status. But considering the needs of lower class families for outside income sources (most of them are landless) their participation in, and opportunities for nonfarm employment, are much more critical and far too little.

The analysis of changes in the farming system focussed on rice farming, an enterprise practiced by the largest majority of farm

families. In each village, the magnitude of changes in the importance of rice farming activities, in terms of family labor allocation were big: Betok, the biggest, Kamalsari, the least. Within village comparisons revealed that in every village upper class farmers changed the most, and lower class the least. Comparisons between villages of any particular socio-economic status groups showed that each status group in Betok experienced the greatest changes; those in Kamalsari the least.

Comparisons about patterns of changes in importance of rice farming activities within villages showed that in Betok there were large differences between status groups, especially between upper class and the other two classes. Whereas in Kalencabang and Kamalsari, the between class differences were minor.

Between village comparisons about patterns of changes in importance of rice farming activities for each particular socio-economic class, showed that for upper status group Betok varied a great deal from the other two villages; in Kalencabang and Kamalsari those patterns of changes were almost similar. A similar situation occurred among the lower class. The middle class's patterns of changes in this matter are minor.

Other farm-related enterprises also were considered, but the participation of farm families in other farm-related enterprises, such as dry land farming and second crop farming, was too small to permit a detailed analyses of patterns of changes in importance relative to socio-economic status and village variabilities. Therefore, the magnitude and the patterns of changes in these areas, especially as they

related to the socio-economic status groups, were not clearly identified.

In relation to nonfarming and off-farming activities, we may conclude that nonfarming jobs play a very important role in improving farm households with meaningful work opportunities and supplemental source of income. At the same time the Jatiluhur Irrigation Project did little to decrease the dependency of lower status groups on farm wage work; but it strengthened somewhat the dependency upon farming and farm income of the upper and middle classes.

CHAPTER VI

SUMMARY, CONCLUSION AND RECOMMENDATION

This concluding chapter consists of an overview of the research project; a brief discussion of some of the main changes that have occurred in each of the three villages; an attempt to formulate a comparative perspective; a listing of generalizations deriving from the research; a note on some practical considerations; and recommendations for future research.

1. Research overview

This study was concerned with social impacts of the Jatiluhur Irrigation Project on farm family work patterns in three villages, including family economic enterprises and the various activities associated with those enterprises.

The three villages, located in Subang regency of West Java, were drawn into the modern irrigation system from quite different hydrological circumstances. Before Jatiluhur, Betok village had to rely on natural rainfall for crops; Kalencabang had the advantages as well as disadvantages of being flooded every rainy season; and Kamalsari, drawing upon local water sources, enjoyed a localized system of irrigation long before the establishment of the Jatiluhur system. Farmers in these three villages, then, experienced a more or less sudden change, depending upon initial circumstances, in environmental conditions. Most of the changes, of course, were welcomed, for a reliable water supply increased the rice growing capacity of their farms. But the

changes (for example, now being able to practice two crops of wet rice per year) required new patterns of work and adaptation of many of the old ways was inevitable.

Three key questions were addressed by the research:

1) What changes have taken place in farm family work patterns due to the introduction of the Jatiluhur irrigation?
2) Do the patterns of changes vary by village types?
3) Do the patterns of changes vary among different socio-economic status groups?

A field study was carried out during the first half of 1981. Data were derived from direct interviews with 162 heads of households; from a series of focussed interviews with village informants; and from official documents. A complete rice farming cycle was observed in the three villages.

The survey utilized a retrospective inquiry strategy. A sample of household heads who had been farming in the villages in 1968 was selected randomly from each of three socio-economic status groups. The status levels of households was determined by average land ownership per household member. Open ended and structured questions were utilized, and interviewers received specific instructions before undertaking direct contacts with the sampled household heads.

At the stage of data analysis and interpretation, indices were constructed, including an "index of importance" and a "directional change index". These indices were further reduced into "rank orders of importance" and "rank orders of directional change". Correlation

coefficients were calculated (Spearman's) in order to compare pattern differences.

Two types of comparisons were made:

1) Within village comparisons of the experiences and perceptions regarding changes in work patterns by different socio-economic status groups.

2) Between village comparisons of the experiences and perceptions regarding changes in work patterns by different socio-economic status groups.

The Jatiluhur Irrigation Project is a multipurposed project aimed at: increasing the production of rice to meet the needs of a rapidly expanding population; helping to improve the quality of life of rural villagers; controlling floods; generating electric power; providing the cpaital city of Jakarta with a reliable source of water; developing land fisheries; and creating employment opportunities. It replaced the variability in hydrological circumstances which characterized this northern coastal plain region of West Java with a degree of homogeneity in the availability of a reliable water supply for agriculture and other purposes. Virtually all villages in the area now are able to irrigate and, consequently, can grow two crops of rice per year. In effect, the Jatiluhur project has brought about significant changes in the structure of agriculture throughout the region and, of course, in the three villages selected for study. Farm family households shifted their farming operations more fully toward rice production and the villages, many of which had previously been more differentiated, have generally become more dependent upon rice farming. This process, which

is here referred to as the "monoculturalization process", was accompanied by the changes in family labor allocations, especially labor allocated to rice farming. The pattern of involvement by farm family households in nonfarming enterprises, however, did not change very much. The most significant change also seemed to have occurred with respect to: labor situations, local economic opportunities, and quality of lives.

The following outlines come of the more significant changes experienced by each of the three villages:

a. Betok village: initially rainfed.

The Jatiluhur Irrigation Project brought about a dramatic environmental change in this village which in turn affected significant changes in the lives of the villagers. Scarcity of water during certain periods of the year, formerly one of the biggest problems both for agricultural purposes and for the daily routines of families, is now no longer a worrisome matter. Water is always available.

Starting with first order changes in rice farming activities, namely through the introduction of a double cropping system, numerous other changes were generated or introduced. Household incomes that used to be more differentiated became highly dependent upon rice growing. Irrigation made rice farming practices less backbreaking, and along with the introduction of Green Revolution varieties of rice, the various farming operations were faster and more efficient. But the two crop system means two full cycles per year. This situation contributed to an increase in farm work opportunities for wage laborers (the

landless lower class especially, and some of middle class). The price of labor increased with the increased demand and wage laborers began enjoying better pay. Upper class farmers, on the other hand, began experiencing periodical difficulties in getting hired (irregular) labor, especially during the land preparation phase of rice production. This tight labor situation and the development of modern technology for small farms led to the introduction of tractors into the once traditional farming economy.

Farmers and their families changed their patterns of farm labor allocation. The patterned change varied by socio-economic status. Upper class farmers experienced a greater reduction of family labor in the ricefields but labor allocated to other enterprises did not change much.

The continuation of roof tile factories (home industries), which was facilitated by the improvement of roads and transportation, helped the middle and lower class villagers, especially males, by providing jobs during slack periods in the rice growing cycle. For this and other reasons, many rice farming activities were turned over to women, and women found themselves doing more and more work on the farms. But the increased participation of women in field works did not apply equally to those from upper class households for they tended to place more attention to managing their homes.

In general, Betok villagers have been enjoying the improved quality of their lives. Upper class people send their children to the cities for higher education and nonfarm jobs after they graduate. Children from lower class families, however, must be satisfied with

minimal educational opportunities and less attractive job prospects. But in many ways, even for them, things are better now in Betok village than they once were.

b. Kalencabang village: regularly flooded.

Prior to Jatiluhur, Kalencabang faced much trouble due to crop damages caused by floods every rainy season. It was often the case that to get one harvest of rice they had to plant two or three times on the same piece of land. During dry seasons some of the farmers grew second crops of one kind or another, but none of them were able to get a second rice crop and most ricefields were left fallow. Maintaining adequate water supply for daily needs in the home was also a problem, and conflicts over water rights were not uncommon.

The Jatiluhur Irrigation Project eliminated or reduced a great many of these difficulties and made possible a double crop system of rice farming. This in turn helped to stimulate significant changes in other aspects of village life, especially in the structure of agriculture. Farm family households became more and more dependent upon rice farming. Irrigation made rice farming easier and the labor inputs per planting are now less than before irrigation. However, double crop system and the cultivation of new varieties of rice caused a significant increase in job opportunities in this village.

As in Betok, farm laborers are now enjoying a wider labor market and better pay, while upper class farmers are experiencing difficulties in acquiring an adequate labor force during the planting and harvesting seasons. This situation, along with the development of machine

technology, has encouraged the increased use of tractors and associated implements.

Along with these changes in economic enterprises and farming technologies, the pattern of labor allocation by farm families also changed. These changes varied by socio-economic status. Upper class farmers experienced a greater reduction in use of family labor on the farm.

Unlike the situation in and around Betok, however, in the Kalencabang area there were few nonfarming job opportunities for men during slack periods in the rice growing cycle. Hence, the men continue to share with women in the farming duties. That is, the work roles of farm women in Kalencabang did not change a great deal (as they had in Betok), except among upper class women who now are less inclined to do field work.

As throughout the region, farmers here appreciate the improved quality of their lives. It seems, however, that the lower class did not gain as much relative to the upper and middle classes from the obvious economic improvements that occurred in Kalencabang village.

c. Kamalsari: irrigated locally before Jatiluhur.

Farmers in Kamalsari village enjoyed a double crop system of rice farming for some years before the Jatiluhur Irrigation Project was constructed. Prior to the development of localized irrigation system they, too, were often plagued with problems relating to insufficient water resources for farming, especially during long dry seasons. But the localized irrigation system had changed all that and the

introduction of Jatiluhur irrigation did not disturb the hydrological situation very much; rather, it tended to improve a system that already was in place and in use. Strangely, however, the introduction of Jatiluhur irrigation was associated with great changes in the structure of agriculture in Kamalsari. The process of monoculturalization, for example, was encouraged. This emphasis upon rice as the single main crop varied by socio-economic status, in that the higher status households, the greater the change in the patterns of importance of economic enterprise. On the other hand, in this village in general, changes in the pattern of allocation of family labor were not significant, and between classes differences in this matter were small. This was probably because all farmers, irrespective of their socio-economic class (and size of landholdings) were already practicing a farming technology based upon irrigation and two rice crops per year.

In Kamalsari, despite the fact that there was a decrease in labor force needs per rice planting, part of which was caused by the extensive utilization of tractors during land preparation, job opportunities (farm wage work or nonfarm) are more numerous now. There is a scarcity of labor, especially for seasonal work. Nevertheless, women from all socio-economic classes are devoting more attention to home matters rather than to hard work on the farms. Children also appear to be less involved with work on the farms now.

In general, as elsewhere in the region, Kamalsari villagers now enjoy a higher standard of living than did before Jatiluhur. Landless laborers get higher wages and have less trouble finding adequate work. Indeed, our informants believe that all families in the village have

done well over the years. But there is a clear tendency for more people to be leaving farms now for other jobs than before Jatiluhur irrigation.

2. Comparative perspectives

Thus far we have discussed changes which occurred in each of the three villages during the period since introduction of the Jatiluhur Irrigation Project. In an attempt to formulate a comparative perspective, several issues must be taken into consideration.

First, there is the issue of changes in the patterns of economic enterprises. In general, the trend toward monoculturalization has been strong in all three villages. That is, farm households have become more and more dependent upon rice farming and wet ricefield cultivation. Betok village, where economic enterprises were previously very diverse, experienced the greatest degree of change in farming pattern and in a direction toward increased monoculturalization. In all three villages, however, upper class farmers (who by definition had "more land") manifested the biggest change toward monoculturalization.

But despite this obvious trend to specialize in rice production, numerous other farm and non-farm enterprises continue to provide supplemental income for farm households in the three villages. The patterns of relative importance of these enterprises also is changing and differences were observed between villages and between socio-economic status groups within the villages.

Kamalsari, which was irrigated earlier and was assumed to be more ready to adapt to the Jatiluhur system, experienced the biggest changes

in patterns of importance of farm-related enterprises. Comparisons of the experiences of each particular socio-economic class in different villages revealed that there was a relationship between socio-economic status and the magnitude of between village variations in this matter. The higher the socio-economic status, the greater the between village variabilities in changing patterns of importance of enterprises.

The second big issue of concern in this study was changes in the importance of farm family activities associated with the various enterprises, and especially in terms of rice growing. The data suggested that farmers in Betok village experienced the biggest changes in patterns of farming activities since Jatiluhur; Kamalsari changed the least. Within villages, changes in the patterns of labor allocation varied by socio-economic class: the higher the socio-economic class the greater the changes. Between village comparisons showed that for all classes Betok experienced the greater changes, and Kamalsari the least. In general, direction of change was toward a decline in the amount of labor allocated to rice farming activities. (Note: rice farming is now a very intensive two-crop per year system throughout the region.)

The third important set of issues which this study focussed on had to do with changes in farm labor situation, local economic opportunities and quality of life, as noted by household heads in the three villages. Although changes in these themes were observed in all villages, there were some noteworthy variabilities between villages in labor needs per rice planting, roles of women on the farms, and the likelihood of people leaving farms. In addition, some within village

differences were observed between socio-economic class groups in each village in the perception of children's work roles on the farms, difficulties in getting farm labor to hire, as well as for the three themes relating to role of women, labor needs, and migration likelihood. The nature of these variabilities and the kinds of qualitative differences observed among the three villages will be outlined in a following section.

In conclusion, then, we see that the introduction of the Jatiluhur irrigation system replaced a variability in hydrological circumstances with a degree of homogeneity in the availability of reliable water supply necessary for rice cultivation in wet ricefields. This project, in turn, established the conditions for significant changes in family work patterns, namely in the structure of agriculture and in the allocation of family labor to the various farmers and other economic activities.

Some of the specific changes in farm family work patterns revealed by the study can be outlined as follows:

1) Throughout the Jatiluhur irrigation area and in the three villages, over the years, there was an increasing emphasis upon rice cultivation. This process of monoculturalization dominated the pattern of changes in agriculture in this area.

2) The village where the farming was dependent solely on rain water (Betok) experienced the biggest change in farming system. It, like the other villages, placed an increasing emphasis upon rice production, but this

monoculturalization process, because of the earlier greater diversity, proceeded here at a more rapid rate. The situation today in this village, however, is not very different from that of the village which previously had irrigation (Kamalsari). In effect, then, there is greater homogeneity among villages in the region now than before Jatiluhur.

3) Upper class farm families regardless of village, experienced the greater change in farming system. They seemed to be more flexible in adapting to the new environment and in taking advantage of the new opportunities. Lower class farm families, who were and still are essentially "landless", have continued to maintain their old patterns of economic survival through farm wage work. Although they have prospered, too, over the years, they seem to have been less flexible in taking advantage of the new opportunities.

4) The magnitude of (or trend toward) becoming dependent upon rice production among farmers of a particular socio-economic status did not differ by village type. But the higher the socio-economic status, regardless of village type, the greater the changes in patterns of importance of farm-related enterprises.

5) Throughout the Jatiluhur irrigation area, and in the three villages, over the years, there was a general decrease in family labor allocated to the various

farming activities associated with rice production. The changes varied directly with the extent to which a village expressed environmental disturbances as a result of the Jatiluhur project.

6) Despite the fact that all socio-economic status groups experienced a reduction in family labor allocated to the various rice farming activities, the magnitude and patterns of change in this regard varied by socio-economic status. The greater reduction in effort, of course, was among the upper class.

7) For a given socio-economic status group, the pattern of change in farming activities associated with rice production varied by village. The village formerly rainfed only experienced the greatest change.

3. Theoretical contributions

Irrigation systems, such as Jatiluhur project, are generally designed to change the hydrological environment in order to improve the quality of life of a population. Following the planned environmental transformation, changes (anticipated and unanticipated) normally occur in the structure of agriculture and in the general farming system. This is invariably followed by disturbances of the normative system, the pattern of social relationships and the organization of village communities. Findings from the present study illustrate this process. Here we observed that a change in one sector generated corresponding changes in other parts of the societal system, including,

for example, changes in the roles of women and children on the farms. The "new" environment to which villagers were adapting, it is important to note, was created by men using their technological know-how. The environmental disturbances resulting from the application of this technology was by and large predictable and deliberate. But the consequent social impacts on the lives of villagers, while it is also predictable to some extent (with a lot of effort and foresight), was not (and is rarely if ever) taken into account.

One of the direct goals of irrigation in agriculture is to increase land productivity and farming efficiency. Sociologists, alalthough also concerned with improving the economic foundations of rural life, are more inclined to focus their attention on the distribution of benefits from irrigation among farmers and farm families, on questions of equity, and on the resulting character of social stratification. Most sociologists agree that variabilities in the distribution of benefits, such as those that occur in a newly irrgation region, create and increase the disparity between large and small farmers, and between land owners and farm laborers. Large farmers, in addition to getting greater direct beneftis from their lands, also draw "fringe benefits" from being acquired better socio-economic position in the society; for example, they are now able to send their children to better schools and to pursue better education. In the long run, then, this means that introduction of a regional irrigation system may rigidify the system of social stratification (Adam, 1968; Farrington, 1974). Findings from the present study tend to confirm that proposition; there is evidence that the gulf between the landed and landless

classes in Betok village, for example, had become greater as a result of irrigation.

With the coming of irrigation, farmers in the Jatiluhur Irrigation Area quickly began to concentrate their farming activities on rice production. This specialization has locked the region into a wider marketing system in order to exchange its surplus rice production with other products from different regions of the country. The large scale irrigation system may be affecting regional interdependency through regional specialization. On the other hand, the increasing specialization also seems to pose some problems.

In the adjustment of agriculture to the opportunities brought about by the new environment, many old enterprises were abandoned. At the same time it was difficult to discover and introduce new enterprises, other than rice, more suitable to the new environment. The process of reorganizing completely the traditional farming system was not advanced. Thus, the region has become far more vulnerable to market fluctuation and to the possibilities of harvest failures due to diseases and pests.

In order to manage irrigation systems efficiently, a particular kind of social organization is needed. In this regard, Wittfogel suggests that irrigation necessitated centralized control, administered by a bureaucracy and clear cut lines of authority. His opponents, such as Millon and Vijeyewardhene, argue (and their research confirms) that a centralized authority and the practice of irrigation are not necessarily compatible. The present study noted that the multi-purposed Jatiluhur Irrigation Project had been and continues to be organized

quite effectively by a central authority together with autonomous water user associations (Mitra cai) established across villages (one for each tertiary block of 75 to 150 hectares of ricefield). In other words, the Jatiluhur Project, as we have observed, demonstrates that administering a large regional irrigation system via a combination of local and central control is reasonable.

Finding from the present study also supports another theoretical position regarding social organizational questions, namely that participation in an irrigation system enhances the articulation of the relatively isolated community with the outside world (Bacdayan, 1974).

There is a growing literature relating to questions of appropriate technology and whether huge projects of environmental change, such as the Jatiluhur Project, are effective in resolving some of the problems confronting people in rural sectors of the Third World. It is clear that the Jatiluhur Project was an enormously expensive and extremely sophisticated project that required much expertise and high technology to develop. It was and continued to be managed by a large and complex organization. But we have observed that it improved the utility of natural resources (water and water power), helped to preserve environmental quality (flood control), increased agricultural production, reduced rural poverty, reduced environmental risks, increased satisfaction of life among the villagers, increased employment opportunities, etc. Thus the study findings tended to show that a combination of high and soft technology could effect an improvement in the quality of village life; to be sure, there are still some difficult problems to be overcome. Put another way, the present study failed to

show that the socio-economic disturbances resulting from this huge complex project were, at the village level, contrary to the needs and interests of those who live and work in those villages.

4. Practical considerations

From this and other studies about the impacts of irrigation on the socio-economic situations of farm families, especially those dependent upon rice farming, several things should be considered and several questions can be raised.

A huge irrigation project, such as the Jatiluhur, uses a large amount of land to impound water and to create the irrigation channels. Villagers are obliged to sell their land, including farms and home yards (plus houses), that will be used by the project. Some people are very happy when they get such payments because the project often pays more for the land than the regular market price. Some others, even those who are at first pleased, encounter difficulties in finding a new home; many spend the money without investing it or replacing the land they sold, so that after a while they find themselves without either land or money.

Irrigation provides a reliable and controlled access to the water necessary for increasing agricultural production and for making farming more profitable. It is also essential for the development of a two crop per year cycle of rice cultivation (i.e., in wet ricefields). It changes the environmental circumstances that affect various kinds of economic opportunities and these call for adjustments in family enterprises, farming practices, the organization of households,

the interrelationship of status groups within the villages, and the like.

Three important economic enterprises were abandoned by a considerable number of farm families in the Jatiluhur area when the modern irrigation was introduced. Big animal and small ruminant production dropped rather significantly, because facilities for grazing declined. Ricefields were no longer fallowed during dry seasons and many dry (grazing) lands were transformed into ricefields, while grazing big animals on the dikes of irrigation channels was not allowed. It is worth noting that animal production has several socio-economic functions in an agricultural village. For the farmer, animals represent saving or capital investment (equity) that can be used by the family during crises or for expanding the operation. Animals also produce fertilizer (nitrogen and humus); are an important source of work power and a symbol of social status; and they provide a means whereby children can contribute to the economy of their family.

Growing second crops (corn, beans, sweet potatoes, vegetables, and other seasonal plants) in the ricefields during dry seasons was also abandoned by many villages. This may have been the result of land becoming too wet for second crops or because the farmers are satisfied with a double harvest of rice. More than likely, however, it probably has to do with farmers not understanding how to manage second crop farming.

A decline in the importance of firewood collection came about following the transformation of some dry and forest lands into ricefields. This caused an increasing dependency of families on kerosene

for fuel, followed by several related problems such as a decline in the contribution of women and children to the economy of their households and to a lack of cash money to buy kerosene.

On the other hand, it is not easy to introduce new enterprises that are relevant to the new environmental circumstances. Raising fish in ricefields and fishponds, dike planting, home yard gardening and duck farming are among the enterprises that are relevant to these new conditions and agricultural extension workers are struggling to introduce and develop them among farm families.

Establishing a large scale irrigation system such as the Jatiluhur affects regional interdependency; with the coming of irrigation, farmers very quickly begin to concentrate their farming activities on rice production. In addition, the increasing specialization also poses some problems because the region becomes far more vulnerable to market fluctuations and to the possibilities of harvest failures from pests and diseases.

Changing farming systems and farming techniques tended to stir up employment opportunities in the Jatiluhur area. An increase in job opportunities for the laboring class was observed in the three villages. Many laborers from other regions got jobs in the Jatiluhur area. But the increase in labor force needs among more land farmers accompanied by developments in agricultural technology led to the increasing use of tractors even on small farms and tractorized agriculture competes and threatens the security of landless farm laborers. The roles of women and children on the farms changed considerably; the women became more directly involved and children have been channeled

toward education and eventual non-farm jobs.

As in other areas of the world, the benefits of irrigation from the Jatiluhur Irrigation Project, in this case relative to labor allocation in rice farming were not equally distributed among farmers; the benefits varied by socio-economic status of the farm family household and according to the farming system of the village prior to Jatiluhur. Upper status farmers who owned land before the irrigation system was introduced got the most benefits; lower status farmers, especially those who had been landless, got the least. The villages in Betok, who had been dependent upon rain for crop production, now have an easier time of farming their lands. In effect, their patterns of labor utilization and farming activities now is not too different from farmers in Kamalsari, who had engaged the advantages of irrigation even before Jatiluhur.

Changes in the labor situation and economic opportunities in these villages, stimulated in part by the Jatiluhur Project, but also supported by other factors such as better communication/transportation facilities seemed to have increased the likelihood of villagers leaving their farms and migrating to urban areas for jobs.

In general, then, people needed help to rearrange their lives in order to take better advantage of the opportunities that were generated by the Jatiluhur Irrigation Project. The following suggestions might contribute to the development of policy planning that is perhaps more sensitive to the human impacts inherent in such projects:

1) Irrigation is an effort which successfully increases and stabilizes land productivity and farm production, makes

farming more profitable and facilitates further development of agriculture. It increases the carrying capacity of an area, and along with the application of family planning activities, is a powerful means to overcome one aspect of the population problem, namely food supply.

2) Irrigation is not only a technological and agricultural business, it involves many and all aspects of the life of people in the area impacted. The introduction of irrigation changes the hydrological condition of the environment which in turn, disturbs the traditional economic enterprises and economic practices of the farmers, their social relationships and social organizations, etc. The adaptation process to new environmental conditions does not always go on smoothly; many problems come about in many areas of living; and not all the changes are for the good. Solving one problem may lead to the emergence of other problems that might be more serious.

3) Planning for an irrigation project should be integrated, covering programs of development of related aspects of living of the people in the impacted area. Thus, at the same time, effective planning must be regional in scope.

4) In this regional planning, local variations need attention, since the same project may lead to different impacts on people and families living in different

places and under different conditions.

5) The fact that people from different socio-economic status levels experience different changes and problems, means that planning should take such variabilities into account.

6) Finally, the order of execution of several related programs should consider the coordinated regional impacts. Developmental actions and management of large scale change projects, such as the Jatiluhur irrigation system, should be synchronized with other programs of change.

5. Limitations and future research

This study explored certain impacts of the Jatiluhur Irrigation Project on farm family work patterns in three village communities in Subang regency, West Java, Indonesia. During the course of this research, a number of methodological limitations were encountered:

a) Generally, to explore impacts (in this case the impacts of an irrigation project) one aims to compare or to contrast information about the problematic variable or event at two different points in time; i.e., before and after the treatment (in this case, irrigation) was introduced. Ideally, comparable information, which here deals with family work patterns, is collected twice, at a time not too long before the disturbance is manifested and again at a time not too long after the effects have had a chance to work their way through the system. For this study, there was no base-line

information available. Indeed, we did not even have a population census of the three village communities prior to the establishment of Jatiluhur irrigation system. This, of course, was a major limitation for the purposes at hand and represented a great frustration to the researcher.

b) To compensate for the above limitation and to establish a reasonable base-line from which to assess changes, a "retrospective approach" was formulated. Household heads were asked to recall their farm enterprises and work patterns before the Jatiluhur Irrigation Project was established. This base information was compared with comparable information obtained about the present. Further, a number of questioning procedures used the technique of getting the household informants estimate the nature and direction of change. In both cases, however, there were problems of recall and, of course, even now we cannot be certain about the accuracy of our informant's memories.

c) Because of financial constraints, the field survey was limited to three villages (each representing a village type) from which a relatively small sample was drawn. This hampered the analysis. For instance, the proportion of sampled households from each status group who engaged in nonfarm enterprises or in farming enterprises other than rice production was very small. A

detailed analysis, therefore, could not be made.

d) As a case study of three villages, it is difficult to generalize findings for the whole Jatiluhur irrigation area.

e) This study is based upon a sample of heads of households (and their families) who have been self-employed and involved in farming prior to the Jatiluhur irrigation project and are currently residing in one or the other of these three villages. Those that migrated away to other places and those who established new households since 1968 (whether from the village or elsewhere), were excluded. The work patterns and experiences of these excluded households, of course, are in many respects relevant to the problem. Hence, these omissions, necessary because of financial constraints represent a study limitation.

f) Information about the sampled households was obtained from the heads of households, who served as informants. Except in the cases where household heads were women, women members of the sampled households were not represented directly. It is true that at least one or two village informants per village were interviewed. The same thing occurred with respect to the children. Thus, inherent in this procedure, certain biases may have crept into the information obtained about these households.

In light of the above limitations, and in view of our experiences in the field, insights gained during the analysis process, and in considering how we might elaborate on the findings and generalizations, the following suggestions are posed for future research:

1) It is essential that the impacts of such a huge project, affecting the lives of millions of people, be carefully documented, studied, and monitored. This is especially important for Indonesia, because the government has decided to establish similar projects elsewhere in the country. We need to understand the problems of adaptation of farm families and rural localities and how those problems can best be resolved. We also need to know something about the social consequences over time from such development projects. Planners and decision-makers require feedback about projects that have been completed in order for them to be able to create better designs in the future. The goal, of course, is to make such projects even more beneficial to society and to as many people as possible; in the process, those who are in the most need should not be ignored.

2) In relation to the problem of applicability of the findings of this study to the whole Jatiluhur Irrigation Area, a broader-based survey research covering the Jatiluhur Irrigation Area is recommended. Those segments excluded from the present study must be included, and certainly women and adult children should be

interviewed directly. In order to overcome the methodological limitation due to the unavailability of base information, a "matching pair comparison" design is suggested. This model would compare information collected at the impacted site with information collected from another comparable site.

3) Longitudinal design is perhaps the more appropriate approach for studying the impacts of a project such as the Jatiluhur irrigation project or the Cimanuk irrigation project, now being planned. This type of study can establish base information about the area that will be impacted, and this information will be useful for planning purposes.

The changing situation is then monitored during the process of development and then, after the project is completed, a second major comparable survey is done. Such a design, of course, requires considerable time, money, and foresight.

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APPENDICES

Appendix Table 4.1. Direction of change perceived by household heads, by village, in percent.

Character of change	Betok			Kalencabang			Kamalsari		
	more now	about same	Less now	more now	about same	less now	more now	about same	less now
Labor force needs per planting*	26	24	50	32	17	52	6	20	74
Women work on farm*	46	28	26	26	54	20	11	28	61
Children work on farm	11	28	61	15	33	52	9	19	72
Difficulty to hire farm laborer	35	11	54	33	17	50	43	11	56
Cost of farm labor	93	7	0	93	6	2	91	2	7
Landless laborer's prosperity	80	17	4	82	15	4	89	11	0
Availability of employment opportunity	82	15	4	82	9	9	82	9	9
Likelihood of people leaving farms*	35	39	26	46	26	28	48	43	9
General satisfaction from life	100	0	0	91	9	0	98	2	0
Own satisfaction	83	15	2	81	17	2	78	11	11
(n)	(54)			(54)			(54)		

*In these three cases the observed differences between villages are significant at p>.99

Appendix Table 4.2. Perception of changes by household heads from before Jatiluhur Irrigation Project to now, by village and by socio-economic status, in percent.

Character of Change	Level of expansion	Betok			Kalencabang			Kamalsari		
		Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
Labor force needs per planting	More	10	18	41	20	27	41	0	0	14
	Same	10	32	23	10	9	27	20	23	18
	Less	80	50	36	70	64	32	80	77	68
Women work on farm	More	20	50	55	20	14	41	20	0	18
	Same	30	23	32	40	59	55	20	32	27
	Less	50	27	14	40	27	5	60	68	55
Children work on farm	More	10	9	14	10	23	9	20	5	9
	Same	0	32	36	20	18	55	0	14	32
	Less	90	59	50	70	59	36	80	82	59
Difficulty to hire farm laborer	More	70	59	41	80	41	46	60	46	41
	Same	20	9	9	0	9	32	10	5	18
	Less	10	32	50	20	50	23	30	50	41
Cost of farm labor	More	100	91	91	100	96	86	90	86	96
	Same	0	9	9	0	5	9	0	0	5
	Less	0	0	0	0	0	5	10	14	0
Landless laborers' prosperity	More	80	77	82	80	96	68	100	96	77
	Same	10	18	18	20	5	23	0	5	23
	Less	10	5	0	0	0	9	0	0	0
Availability of employment opportunity	More	80	82	82	80	86	77	90	86	73
	Same	20	14	14	0	5	18	10	9	9
	Less	0	5	5	20	9	5	0	5	18
Likelihood of people leaving farms	More	20	36	41	50	59	32	50	68	27
	Same	40	46	32	30	14	36	20	32	64
	Less	40	18	27	20	27	32	30	0	9
General satisfaction from life	More	100	100	100	80	100	86	100	96	100
	Same	0	0	0	20	0	14	0	5	0
	Less	0	0	0	0	0	0	0	0	0
Own satisfaction	More	80	86	82	70	95	73	100	82	64
	Same	20	14	14	30	0	27	0	9	18
	Less	0	0	5	0	5	0	0	9	18

Appendix Table 4.3. Changes in importance of rice farming activities as noted by household heads, by village

Rice farming	Betok				Kalencabang				Kamalsari			
Activities	Increase	Same	Decrease	Not done	Increase	Same	Decrease	Not done	Increase	Same	Decrease	Not done
Prepare land	11.1	24.1	48.1	16.7	5.6	9.3	63.0	22.2	0	7.4	72.2	20.4
Make seedbed	3.7	51.9	27.8	16.7	3.7	50.0	24.1	22.2	0	64.8	14.8	20.4
Pull out seedling	1.9	44.4	37.0	16.7	1.9	29.6	46.3	22.2	0	57.4	22.2	20.4
Distribute young plant	3.7	51.9	27.8	16.7	1.9	66.7	9.3	22.2	0	79.6	0	20.4
Make lines	11.1	38.9	31.5	18.5	9.3	55.6	13.0	22.2	0	79.6	0	20.4
Transplant young plant	13	18.5	51.9	16.7	3.7	11.1	63.0	22.2	0	5.6	74.1	20.4
Weed	11.1	20.4	51.9	16.7	5.6	11.1	61.1	22.2	1.9	3.7	74.1	20.4
Apply fertilizer	13.0	33.3	37.0	16.7	55.6	9.3	13.0	22.2	9.3	70.4	0	20.4
Maintain water	0	20.4	63.0	16.7	3.7	5.6	68.5	22.2	0	1.9	77.8	20.4
Apply pesticides	24.1	22.2	37.0	16.7	57.4	11.1	9.3	22.2	11.1	68.5	0	20.4
Daily care/ inspection	5.6	40.7	37.0	16.7	18.5	25.9	33.3	22.2	1.9	9.3	68.5	20.4
Harvest	11.1	27.8	44.4	16.7	3.7	35.2	38.9	22.2	0	74.1	5.6	20.4
Dry the harvest	1.9	40.7	40.7	16.7	3.7	40.7	33.3	22.2	0	77.8	1.9	20.4
Storage	0	40.7	42.6	16.7	1.9	51.9	24.1	22.2	0	77.8	1.9	20.4
Take out of storage	0	44.4	38.9	16.7	0	63.0	14.8	22.2	0	79.6	0	20.4
Mill/decide to mill	3.7	33.3	46.3	16.7	5.6	53.7	18.5	22.2	0	77.8	1.9	20.4
Sell/decide to sell	1.9	44.4	37.0	16.7	1.9	74.1	1.9	22.2	0	79.6	0	20.4
Buy farm eq.	1.9	51.9	29.6	16.7	5.6	66.7	5.6	22.2	0	79.6	0	20.4
Pay bills	3.7	53.7	24.1	18.5	0	75.9	1.9	22.2	1.9	75.9	0	22.2

Appendix Table 4.4. Changes in importance of second crop farming activities as noted by household heads, by village.

Second crop activities	Betok				Kalencabang				Kamalsari			
	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done
Prepare land	0	7.4	3.7	88.9	5.6	0	5.6	88.9	0	1.9	0	98.1
Prepare seed/ seedbed	0	5.6	5.6	88.9	3.7	3.7	3.7	88.9	0	1.9	0	98.1
Plant/transpl.	0	7.4	3.7	88.9	5.6	1.9	3.7	88.9	0	1.9	0	98.1
Water	0	3.7	7.4	88.9	3.7	0	7.4	88.9	0	0	1.9	98.1
Weed	0	7.4	3.7	88.9	1.9	1.9	7.4	88.9	0	1.9	0	98.1
Apply fertil.	0	7.4	3.7	88.9	5.6	1.9	1.9	90.7	0	1.9	0	98.1
Apply pestic.	0	3.7	5.6	90.7	5.6	1.9	1.9	90.7	0	1.9	0	98.1
Daily care	0	7.4	3.7	88.9	3.7	3.7	3.7	88.9	0	1.9	0	98.1
Harvest	0	7.4	3.7	88.9	3.7	5.6	1.9	88.9	0	1.9	0	98.1
Process the harvest	0	0	1.9	98.1	1.9	0	0	98.1	0	0	0	100
Storage	0	3.7	1.9	94.4	0	3.7	0	96.3	0	0	0	100
Sell	0	3.7	5.6	90.7	3.7	5.6	1.9	88.9	0	1.9	0	98.1

Appendix Table 4.5. Changes in importance of dry land farming activities as noted by household heads, by village.

Dry farming activities	Betok				Kalencabang				Kamalsari			
	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done
Prepare land	9.3	18.5	18.5	53.7	1.9	18.5	16.7	63.0	0	38.9	1.9	59.3
Prepare seed/ seedbed	9.3	18.5	18.5	53.7	1.9	18.5	16.7	63.0	0	38.9	1.9	59.3
Plant/transpl.	7.4	20.4	18.5	53.7	1.9	16.7	18.5	63.0	1.9	37.0	1.9	59.3
Water	1.9	0	13.0	85.2	1.9	1.9	16.7	79.6	0	3.7	31.5	64.8
Weed	7.4	9.3	13.0	70.4	1.9	27.8	5.6	64.8	0	35.2	3.7	61.1
Apply fertil.	1.9	1.9	9.3	87.0	1.9	7.4	5.6	85.2	0	31.5	0	68.5
Apply pestic.	1.9	1.9	3.7	92.6	0	0	3.7	96.3	0	11.1	0	88.9
Daily care	7.4	24.1	14.8	53.7	1.9	27.8	7.4	63.0	0	31.5	9.3	59.3
Harvest	18.5	20.4	7.4	53.7	11.1	24.1	1.9	63.0	0	35.2	1.9	63.0
Process the harvest	5.6	5.6	3.7	85.2	5.6	7.4	1.9	85.2	0	3.7	0	96.3
Storage	1.9	9.3	1.9	87.0	0	18.5	1.9	79.6	0	0	0	100.0
Sell	9.3	16.7	7.4	66.7	0	24.1	1.9	74.1	0	24.1	0	75.9

Appendix Table 4.6. Changes in importance of animal production activities as noted by household heads, by village.

Animal production activities	Betok				Kalancabang				Kamalsari			
	Increase	Same	Decrease	Not done	Increase	Same	Decrease	Not done	Increase	Same	Decrease	Not done
Feed/tend big animals	9.3	13.0	9.3	68.5	0	1.9	3.7	94.4	0	3.7	0	96.3
Cleaning and handling dung	3.7	18.5	9.3	68.5	0	1.9	3.7	94.4	0	3.7	0	96.3
Use animal power	9.3	13.0	9.3	68.5	0	1.9	3.7	94.4	0	3.7	0	96.3
Feed/tend small ruminants	7.4	1.9	7.4	83.3	3.7	3.7	0	92.6	1.9	11.1	0	87.0
Clean and handling dung	5.6	3.7	7.4	83.3	1.9	5.6	0	92.6	0	13.0	0	87.0
Feed/tend ducks	0	5.6	5.6	88.9	3.7	1.9	5.6	88.9	3.7	13.0	1.9	81.5
Breed ducks	0	3.7	3.7	92.6	3.7	1.9	3.7	90.7	3.7	3.7	0	92.6
Collect eggs	0	5.6	3.7	90.7	1.9	3.7	3.7	90.7	1.9	13.0	0	85.2
Sell eggs	0	5.6	1.9	92.6	1.9	3.7	1.9	92.6	1.9	9.3	0	88.9
Salt eggs	0	0	0	100	1.9	0	1.9	96.3	0	1.9	0	98.1
Feed chickens	3.7	40.7	27.8	27.8	20.4	22.2	11.1	46.3	20.4	42.6	16.7	20.4
Breed chickens	5.6	42.6	22.2	29.6	20.4	24.1	9.3	46.3	20.4	42.6	16.7	20.4
Process slaughtered fowl	1.9	51.9	18.5	27.8	0	44.4	9.3	46.3	7.4	55.6	16.7	20.4
Breed/stock fish	1.9	0	0	98.1	0	0	0	100	0	0	0	100
Manage water	5.6	5.6	0	88.9	0	0	1.9	98.1	0	1.9	1.9	96.3
Feed, inspection	5.6	5.6	0	88.9	0	0	1.9	98.1	0	1.9	1.9	96.3
Catch	5.6	5.6	0	88.9	0	0	1.9	98.1	0	1.9	1.9	96.3
Sell	3.7	7.4	0	88.9	0	0	1.9	98.1	0	1.9	0	98.1

Appendix Table 4.7. Changes in importance of wage working activities as noted by household heads, by village.

Coolie activities	Betok				Kalencabang				Kamalsari			
	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done
Prepare land	25.9	9.3	9.3	55.6	22.2	9.3	13.0	55.6	25.9	3.7	7.4	63.0
Plant/transpl.	24.1	11.1	9.3	55.6	25.9	11.1	16.7	46.3	25.9	3.7	5.6	64.8
Weed	24.1	11.1	9.3	55.6	24.1	9.3	16.7	50.0	25.9	5.6	5.6	63.0
Apply fertil.	22.2	3.7	3.7	70.4	18.5	7.4	3.7	70.4	18.5	5.6	0	75.9
Apply pestic.	22.2	3.7	3.7	70.4	16.7	5.6	3.7	74.1	13.0	3.7	0	83.3
Harvest	31.5	9.3	9.3	50.0	22.2	16.7	16.7	44.4	29.6	7.4	3.7	59.3
Process the harvest	0	0	0	100	3.7	1.9	5.6	88.9	9.3	0	0	90.7
Feed animal	0	0	0	100	1.9	1.9	0	96.3	0	0	0	100
Work with animal power	1.9	0	0	98.1	0	0	0	100	0	0	0	100
Any other	9.3	1.9	0	88.9	11.1	3.7	7.4	77.8	3.7	3.7	1.9	90.7

Appendix Table 4.8. Changes in importance of nonfarming activities as noted by household heads, by village.

Nonfarming activities	Betok				Kalencabang				Kamalsari			
	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done
Prepare raw material	14.8	3.7	3.7	77.8	1.9	5.6	3.7	88.9	1.9	0	3.7	94.4
Produce new things	13.0	5.6	3.7	77.8	1.9	5.6	3.7	88.9	1.9	0	3.7	94.4
Sell the products	9.3	11.1	1.9	77.8	1.9	3.7	5.6	88.9	1.9	0	3.7	94.4
"Book keeping"	3.7	16.7	1.9	77.8	1.9	5.6	3.7	88.9	1.9	3.7	0	94.4
Purchase merchandise	5.6	13.0	1.9	79.6	7.4	9.3	5.6	77.8	9.3	3.7	3.7	83.3
Organize shop/ place	1.9	11.1	0	87.0	5.6	11.1	0	83.3	7.4	1.9	1.9	88.9
Sale	5.6	13.0	1.9	79.6	11.1	11.1	0	79.6	9.3	3.7	3.7	83.3
"Book keeping"	5.6	13.0	1.9	79.6	7.4	14.8	0	77.8	9.3	3.7	3.7	83.3
Prepare tools/ place	5.6	3.7	0	90.7	0	1.9	0	98.1	3.7	1.9	1.9	92.6
Sell skill	7.4	5.6	3.7	83.3	0	1.9	0	98.1	5.6	1.9	1.9	90.7
"Book keeping"	5.6	7.4	3.7	83.3	0	1.9	0	98.1	3.7	3.7	1.9	90.7
Care means of transporation	0	0	1.9	98.1	0	9.3	0	90.7	0	0	1.9	98.1
Do the service	0	0	1.9	98.1	1.9	7.4	0	90.7	0	0	1.9	98.1
"Book keeping"	0	0	1.9	98.1	1.9	7.4	0	90.7	0	0	1.9	98.1
Do office work	0	5.6	0	94.4	0	1.9	0	98.1	0	9.3	1.9	88.9
"Manage salary"	0	3.7	1.9	94.4	0	1.9	0	98.1	0	9.3	1.9	88.9

Appendix Table E.1. Percentage distribution in the patterns of changes in importance of rice farming activities, by socio-economic status and by village.

Village	Rice farming activities	Upper				Middle				Lower			
		In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done
BETOK	Prepare land	10	10	80	0	14	36	50	0	9	18	32	41
	Make seedbed	0	30	70	0	5	77	18	0	5	36	18	41
	Pull out seedling	0	20	80	0	5	68	27	0	0	32	27	41
	Distribute young plant	0	20	80	0	0	82	18	0	9	36	14	41
	Make lines	0	20	80	0	23	55	23	0	5	32	18	46
	Transplant young plant	0	10	90	0	18	27	55	0	14	14	32	41
	Weed	10	20	70	0	9	32	59	0	14	9	36	41
	Apply fertilizer	10	0	90	0	18	50	32	0	9	32	18	41
	Maintain water	0	10	90	0	0	23	77	0	0	23	36	41
	Apply pesticides	0	0	100	0	41	19	27	0	18	23	18	41
	Daily care/inspection	10	10	80	0	5	73	23	0	5	23	32	41
	Harvest	10	0	90	0	9	50	41	0	14	18	27	41
	Dry the harvest	0	0	100	0	5	64	32	0	0	36	23	41
	Storage	0	0	100	0	0	68	32	0	0	32	27	41
	Take out of storage	0	0	100	0	0	73	27	0	0	36	23	41
	Thresh/decide to thresh	0	0	100	0	9	55	36	0	0	27	32	41
	Sell/decide to sell	0	10	90	0	5	68	27	0	0	36	23	41
	Buy farm equipment	10	30	60	0	0	77	23	0	0	36	23	41
	Pay bills	0	50	50	0	5	77	18	0	5	32	18	46
VALENCIA-BANG	Prepare land	0	0	100	0	14	9	68	9	0	14	41	46
	Make seedbed	0	50	50	0	9	55	27	9	0	46	9	46
	Pull out seedling	0	50	50	0	5	32	55	9	0	18	36	46
	Distribute young plant	0	100	0	0	5	68	18	9	0	50	5	46
	Make lines	0	90	10	0	18	50	23	9	5	46	5	46
	Transplant young plant	0	10	90	0	9	18	64	9	0	5	50	46
	Weed	0	20	80	0	14	14	64	9	0	5	50	46
	Apply fertilizer	60	30	10	0	73	5	14	9	36	5	14	46
	Maintain water	0	10	90	0	9	5	77	9	0	5	50	46
	Apply pesticides	70	20	10	0	73	5	14	9	36	14	5	46
	Daily care	0	50	50	0	46	23	23	9	0	18	36	46
	Harvest	0	70	30	0	9	32	50	9	0	23	32	46
	Dry the harvest	0	70	30	0	9	46	36	9	0	23	32	46
	Storage	0	80	20	0	5	64	23	9	0	27	27	46
	Take out of storage	0	90	10	0	0	86	5	9	0	27	27	46
	Mill/decide to mill	10	80	10	0	9	64	18	9	0	32	23	46
	Sell/decide to sell	10	90	0	0	0	91	0	9	0	50	5	46
	Buy farm equipment	10	90	0	0	9	73	9	9	0	50	5	46
	Pay bills	0	100	0	0	0	91	0	9	0	50	5	46

Appendix Table 5.1 (continued)

	Rice farming activities	Upper				Middle				Lower			
		In-cresse	Same	De-crease	Not done	In-cresse	Same	De-crease	Not done	In-cresse	Same	De-crease	Not Done
	Prepare land	0	10	80	10	0	9	32	9	0	5	59	36
	Make seedbed	0	70	20	10	0	73	18	9	0	55	9	36
	Pull out seedling	0	40	50	10	0	68	23	9	0	55	9	36
	Distribute young plant	0	90	0	10	0	91	0	9	0	64	0	36
	Make lines	0	90	0	10	0	91	0	9	0	64	0	36
	Transplant young plant	0	20	70	10	0	0	91	9	0	5	59	36
	Weed	0	10	80	10	0	0	91	9	5	5	55	36
	Apply fertilizer	20	70	0	10	5	86	0	9	9	55	0	36
KAMAL-	Maintain water	0	0	90	10	0	0	91	9	0	5	59	36
SARI	Apply pesticides	30	60	0	10	5	86	0	9	9	55	0	36
	Daily care	0	10	80	10	0	9	82	9	5	9	50	36
	Harvest	0	90	0	10	0	86	5	9	0	55	9	36
	Dry the harvest	0	90	0	10	0	91	0	9	0	59	5	36
	Storage	0	90	0	10	0	91	0	9	0	59	5	36
	Take out of storage	0	90	0	10	0	91	0	9	0	64	0	36
	Mill/decide to mill	0	90	0	10	0	86	5	9	0	64	0	36
	Sell/decide to sell	0	90	0	10	0	91	0	9	0	64	0	36
	Buy farm equipment	0	90	0	10	0	91	0	9	0	64	0	36
	Pay bills	0	90	0	10	5	86	0	9	0	50	5	45

Appendix Table 5.2. Percentage distribution in the patterns of changes in importance of second crop farming by socio-economic status and by village.

Village	Second crop farming activities	Upper				Middle				Lower			
		In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done
BETOK	Prepare land	0	10	0	90	0	9	9	82	0	5	0	96
	Prepare seed/seedbed	0	0	10	90	0	14	5	82	0	0	5	96
	Plant/transplant	0	10	0	90	0	14	5	82	0	0	5	96
	Water	0	10	0	90	0	5	14	82	0	0	5	96
	Weed	0	10	0	90	0	14	5	82	0	0	5	96
	Apply fertilizer	0	0	10	90	0	14	5	82	0	5	0	96
	Apply pesticide	0	0	10	90	0	9	5	86	0	0	5	96
	Daily care	0	10	0	90	0	14	5	82	0	0	5	96
	Harvest	0	10	0	90	0	14	5	82	0	0	5	96
	Process the harvest	0	0	0	100	0	0	0	100	0	0	5	96
	Storage	0	10	0	90	0	5	0	95	0	0	5	96
	Sell	0	0	10	90	0	9	5	86	0	0	5	96
KALENGA-BANG	Prepare land	20	0	10	70	5	0	9	86	0	0	0	100
	Prepare seed/seedbed	10	10	10	70	5	5	5	86	0	0	0	100
	Plant/transplant	20	10	0	70	5	0	9	86	0	0	0	100
	Water	10	0	20	70	5	0	9	86	0	0	0	100
	Weed	0	10	20	70	5	0	9	86	0	0	0	100
	Apply fertilizer	20	10	0	70	5	0	5	86	0	0	0	100
	Apply pesticide	20	10	0	70	5	0	5	91	0	0	0	100
	Daily care	10	20	0	70	5	0	9	86	0	0	0	100
	Harvest	10	20	0	70	5	5	5	86	0	0	0	100
	Process the harvest	10	0	0	90	0	0	0	100	0	0	0	100
	Storage	0	10	0	90	0	5	0	95	0	0	0	100
	Sell	10	20	0	70	5	5	5	86	0	0	0	100
KAMAL-SARI	Prepare land	0	0	0	100	0	0	0	100	0	5	0	96
	Prepare seed/seedbed	0	0	0	100	0	0	0	100	0	5	0	96
	Plant/transplant	0	0	0	100	0	0	0	100	0	5	0	96
	Water	0	0	0	100	0	0	0	100	0	0	5	96
	Weed	0	0	0	100	0	0	0	100	0	5	0	96
	Apply fertilizer	0	0	0	100	0	0	0	100	0	5	0	96
	Apply pesticide	0	0	0	100	0	0	0	100	0	5	0	96
	Daily care	0	0	0	100	0	0	0	100	0	5	0	96
	Harvest	0	0	0	100	0	0	0	100	0	5	0	96
	Process the harvest	0	0	0	100	0	0	0	100	0	0	0	100
	Storage	0	0	0	100	0	0	0	100	0	0	0	100
	Sell	0	0	0	100	0	0	0	100	0	5	0	96

Appendix Table 5.3. Percentage distribution in the patterns of changes in importance of dry farming, by socio-economic status and by village.

Village	Dry land farming activities	Upper				Middle				Lower			
		In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done
BETOK	Prepare land	10	20	20	50	9	32	27	32	9	5	9	77
	Prepare seed/seedbed	10	20	20	50	9	32	27	32	9	5	9	77
	Plant/transplant	0	30	20	50	9	32	27	32	9	5	9	77
	Water	0	0	0	100	0	0	23	77	5	0	9	86
	Weed	0	10	0	90	9	14	23	55	9	5	9	77
	Apply fertilizer	0	0	0	100	0	0	18	82	5	5	5	86
	Apply pesticide	0	0	0	100	0	0	9	91	5	5	0	91
	Daily care	0	20	30	50	9	41	18	32	9	9	5	77
	Harvest	10	10	30	50	27	36	5	32	14	9	0	77
	Process the harvest	0	20	10	70	14	5	5	77	0	0	0	100
	Storage	0	20	0	80	5	5	5	86	0	9	0	91
	Sell												
KALENGA-BANG	Prepare land	0	40	20	40	0	14	14	73	5	14	18	64
	Prepare seed/seedbed	0	40	20	40	0	14	14	73	5	14	18	64
	Plant/transplant	0	40	20	40	0	14	14	73	5	9	23	64
	Water	0	10	10	80	0	0	14	86	5	0	23	73
	Weed	0	50	0	50	0	27	0	73	5	18	14	64
	Apply fertilizer	0	20	0	80	0	5	5	91	5	5	9	82
	Apply pesticide	0	0	0	100	0	0	0	100	0	0	9	91
	Daily care	0	50	10	40	0	27	0	73	5	18	14	64
	Harvest	20	40	0	40	5	23	0	73	14	18	5	64
	Process the harvest	20	10	0	70	0	14	0	86	5	0	5	91
	Storage	0	30	0	70	0	14	0	86	0	18	5	77
	Sell												
KAMAL-SARI	Prepare land	0	70	10	20	0	41	0	59	0	23	0	77
	Prepare seed/seedbed	0	70	10	20	0	41	0	59	0	23	0	77
	Plant/transplant	0	70	10	20	5	36	0	59	0	23	0	77
	Water	0	0	70	30	0	5	32	64	0	5	14	82
	Weed	0	70	10	20	0	36	5	59	0	18	0	82
	Apply fertilizer	0	60	0	40	0	32	0	68	0	18	0	82
	Apply pesticide	0	20	0	80	0	9	0	91	0	9	0	91
	Daily care	0	70	10	20	0	23	18	59	0	23	0	77
	Harvest	0	60	10	30	0	41	0	59	0	18	0	82
	Process the harvest	0	0	0	100	0	5	0	96	0	5	0	96
	Storage	0	0	0	100	0	0	0	100	0	0	0	100
	Sell												

Appendix Table 5.4. Percentage distribution in the patterns of changes in importance of animal production activities, by socio-economic status and by village.

	SETOK Animal production activities	Upper				Middle				Lower			
		In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done
Big animal	Feed/tend	20	10	30	40	9	18	9	64	5	9	0	86
	Handle dung	0	30	30	40	5	23	9	64	5	9	0	86
	Utilize animal power	0	40	20	40	14	9	14	64	9	5	0	86
Small animal	Feed/tend	0	0	30	70	5	0	5	91	14	5	0	82
	Handle dung	0	0	30	70	5	0	5	91	9	9	0	82
Ducks	Feed/tend	0	0	10	90	0	0	5	96	0	14	5	82
	Breed	0	0	0	100	0	0	5	96	0	9	5	86
	Egg collecting	0	0	10	90	0	0	5	96	0	14	0	86
	Egg sale	0	0	10	90	0	0	0	100	0	14	0	86
	Egg salting	0	0	0	100	0	0	0	100	0	0	0	100
Chickens	Feed	0	30	40	30	9	46	23	23	0	41	27	32
	Breed	0	50	20	30	9	41	23	27	5	41	23	32
Land Fisheries	Stock/breed	0	0	0	100	5	0	0	96	0	0	0	100
	Manage water	10	20	0	70	9	5	0	86	0	0	0	100
	Feed/inspection	10	20	0	70	9	5	0	86	0	0	0	100
	Catch	10	20	0	70	9	5	0	86	0	0	0	100
	Sale	10	20	0	70	5	9	0	86	0	0	0	100
	KALENCABANG												
Big animals	Feed/tend	0	10	0	90	0	5	0	96	0	0	0	100
	Handle dung	0	10	0	90	0	5	0	96	0	0	0	100
	Utilize animal power	0	10	0	90	0	5	0	96	0	0	0	100
Small ruminant	Feed/tend	0	10	0	90	5	9	0	86	0	14	0	86
	Handle dung	0	10	0	90	0	14	0	86	0	14	0	86
Ducks	Feed/tend	0	20	0	80	0	18	0	82	9	5	5	82
	Breed	0	0	0	100	0	5	0	96	9	5	0	86
	Egg collecting	0	20	0	80	0	18	0	82	5	5	0	91
	Egg sale	0	10	0	90	0	14	0	86	5	5	0	91
	Egg salting	0	0	0	100	0	5	0	96	0	0	0	100
Chickens	Feed	40	30	30	0	9	41	18	32	23	50	9	18
	Breed	40	30	30	0	9	41	18	32	23	50	9	18
Land Fisheries	Stock/breed	0	0	0	100	0	0	0	100	0	0	0	100
	Manage water	0	10	0	90	0	0	5	96	0	0	0	100
	Feed/inspection	0	10	0	90	0	0	5	96	0	0	0	100
	Catch	0	10	0	90	0	0	5	96	0	0	0	100
	Sale	0	10	0	90	0	0	0	100	0	0	0	100

Appendix Table 5.4 (continued)

KAMALSARI		Upper				Middle				Lower			
	Animal production activities	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done
Big animal	Feed/tend	0	10	10	80	0	0	5	96	0	0	0	100
	Handle dung	0	10	10	80	0	0	5	96	0	0	0	100
	Utilize animal power	0	10	10	80	0	0	5	96	0	0	0	100
Small ruminant	Feed/tend	10	0	0	90	0	5	0	96	5	5	0	91
	Handle dung	10	0	0	90	0	5	0	96	0	9	0	91
Ducks	Feed/tend	0	0	20	80	9	0	0	91	0	5	5	91
	Breed	0	0	10	90	9	0	0	91	0	5	5	91
	Egg collecting	0	0	20	80	5	5	0	91	0	5	0	96
	Egg sale	0	0	10	90	5	5	0	91	0	5	0	96
	Egg salting	0	0	10	90	5	0	0	96	0	0	0	100
Chickens	Feed	10	20	20	50	27	14	0	59	18	32	18	32
	Breed	10	20	20	50	27	14	0	59	18	36	14	32
Land Fisheries	Stock/Breed	0	0	0	100	0	0	0	100	0	0	0	100
	Manage water	0	0	10	90	0	0	0	100	0	0	0	100
	Feed/inspection	0	0	10	90	0	0	0	100	0	0	0	100
	Catch	0	0	10	90	0	0	0	100	0	0	0	100
	Sale	0	0	10	90	0	0	0	100	0	0	0	100

Appendix Table 5.5. Percentage distribution in the patterns of changes in importance of wage work activities, by socio-economic status and by village.

Village	Village wagework activities	Upper				Middle				Lower			
		Increase	Same	Decrease	Not done	Increase	Same	Decrease	Not done	Increase	Same	Decrease	Not done
BETOK	Prepare land	0	0	0	100	14	9	9	68	50	14	14	23
	Plant/transplant	0	0	0	100	5	9	9	77	55	18	14	14
	Weed	0	0	0	100	5	9	9	77	55	18	14	14
	Apply fertilizer	0	0	0	100	9	0	5	86	46	9	5	41
	Apply pesticide	0	0	0	100	9	0	5	86	46	9	5	41
	Harvest	0	0	0	100	9	9	14	68	68	14	9	9
	Process the harvest	0	0	0	100	0	0	0	100	0	0	0	100
	Feed animals	0	0	0	100	0	0	0	100	0	0	0	100
	Work with animal power	0	0	0	100	0	0	0	100	0	0	5	96
	Any other	0	0	0	100	0	0	0	100	23	5	0	73
KALENGA-BANG	KALENGABANG												
	Prepare land	0	0	0	100	9	23	18	50	46	0	14	50
	Plant/transplant	0	0	0	100	9	27	14	50	55	0	27	18
	Weed	0	0	0	100	9	23	14	55	50	0	27	23
	Apply fertilizer	0	0	0	100	9	9	0	82	26	9	9	46
	Apply pesticide	0	0	0	100	9	5	0	86	22	9	9	50
	Harvest	0	0	0	100	9	32	14	46	46	9	27	18
	Process the harvest	0	0	0	100	0	0	5	96	9	5	9	77
	Feed animals	0	0	0	100	0	5	0	96	5	0	0	96
	Work with animal power	0	0	0	100	0	0	0	100	0	0	0	100
	Any other	0	0	0	100	5	0	5	91	23	9	14	55
KAMAL-SARI	KAMALSARI												
	Prepare land	0	0	0	100	5	0	5	91	59	9	14	18
	Plant/transplant	0	0	0	100	5	0	5	91	59	9	9	23
	Weed	0	0	0	100	9	0	0	91	55	14	14	18
	Apply fertilizer	0	0	0	100	5	0	0	96	41	14	0	46
	Apply pesticide	0	0	0	100	0	0	0	100	32	9	0	59
	Harvest	0	0	0	100	9	0	0	91	64	18	9	9
	Process the harvest	0	0	0	100	0	0	0	100	23	0	0	77
	Feed animal	0	0	0	100	0	0	0	100	0	0	0	100
	Work with animal power	0	0	0	100	0	0	0	100	0	0	0	100
	Any other	0	0	0	100	0	0	5	96	9	9	0	82

Appendix Table 5.6. Percentage distribution in the patterns of changes in importance of nonfarming activities by socio-economic status and by village.

	BETOK Nonfarming enterprises and activities	Upper				Middle				Lower			
		In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done
Handi-craft	Prepare raw materials	10	0	0	90	9	0	9	82	23	9	0	68
	Produce new things	10	0	0	90	5	5	9	82	23	9	0	68
	Sell products	0	10	0	90	5	9	5	82	18	14	0	68
	"Book keeping"	0	10	0	90	5	9	5	82	5	27	0	68
Trade	Purchase merchandise	0	0	10	90	9	18	0	73	5	14	0	82
	Organize shop/place	0	0	0	100	0	18	0	82	5	9	0	86
	Sell merchandise	0	0	10	90	9	18	0	73	5	14	0	82
	"Book keeping"	0	0	10	90	9	18	0	73	5	14	0	82
Services	Prepare place/tools	10	0	0	90	5	5	0	91	5	5	0	91
	Do services	10	0	10	80	9	14	0	77	5	0	5	91
	"Book keeping"	0	10	10	80	9	14	0	77	5	0	5	91
Transpor-tation	Care means of transportation	0	0	0	100	0	0	0	100	0	0	5	96
	Do the services	0	0	0	100	0	0	0	100	0	0	5	96
	"Book keeping"	0	0	0	100	0	0	0	100	0	0	5	96
Official Works	Do official works	0	20	0	80	0	5	0	96	0	0	0	100
	Manage salary	0	10	10	80	0	5	0	96	0	0	0	100
	KALENCABANG												
Handi-craft	Prepare raw materials	0	0	0	100	0	9	5	86	5	5	5	86
	Produce new things	0	0	0	100	0	9	5	86	5	5	5	86
	Sell products	0	0	0	100	0	5	9	95	5	5	5	86
	"Book keeping"	0	0	0	100	0	9	5	86	5	5	5	86
Trade	Purchase merchandise	0	0	20	80	9	18	0	73	5	14	0	82
	Organize place/shop	0	20	0	80	0	14	0	86	14	5	0	82
	Sell merchandise	0	20	0	80	14	5	0	82	14	14	0	73
	"Book keeping"	0	20	0	80	5	14	0	82	14	14	0	73
Services	Prepare tools/place	0	0	0	100	0	0	0	100	0	5	0	96
	Do services	0	0	0	100	0	0	0	100	0	5	0	96
	"Book keeping"	0	0	0	100	0	0	0	100	0	5	0	96
Transpor-tation	Care means of transportation	0	30	0	70	0	5	0	96	0	5	0	96
	Do the services	0	30	0	70	0	5	0	96	0	5	0	96
	"Book keeping"	0	30	0	70	0	5	0	96	0	5	0	96
Official Works	Do official works	0	10	0	90	0	0	0	100	0	0	0	100
	Manage salary	0	10	0	90	0	0	0	100	0	0	0	100

Appendix Table 5.6 (continued)

KAMALSARI

Nonfarming enterprises and activities		Upper				Middle				Lower			
		In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done	In-crease	Same	De-crease	Not done
Handi-craft	Prepare raw materials	0	0	10	90	5	0	0	96	0	0	5	96
	Produce new things	10	0	0	90	5	0	0	96	0	0	5	96
	Sell products	0	0	10	90	5	0	0	96	0	0	5	96
	"Book keeping"	0	10	0	90	5	0	0	96	0	5	0	96
Trade	Purchase merchandise	20	0	10	70	9	9	0	82	5	0	5	91
	Organize shop/place	20	0	10	70	9	9	0	82	5	0	5	91
	Sell merchandise	20	0	10	70	9	9	0	82	5	0	5	91
	"Book keeping"	20	0	10	70	9	9	0	82	5	0	5	91
Services	Prepare place/tools	0	0	0	100	9	0	5	86	0	5	0	96
	Do services	0	0	0	100	9	0	5	86	5	5	0	91
	"Book keeping"	0	0	0	100	9	0	5	86	0	9	0	91
Transpor-tion	Care means of transportation	0	0	0	100	0	0	5	96	0	0	0	100
	Do the services	0	0	0	100	0	0	5	96	0	0	0	100
	"Book keeping"	0	0	0	100	0	0	5	96	0	0	0	100
Official Works	Do official work	0	10	0	90	0	9	0	91	0	9	5	86
	Manage salary	0	10	0	90	0	9	0	91	0	9	5	86