1991

Rural income and employment in Indonesia: a case study of the Cimanuk River basin in Java

Sandra Mark
University of Wollongong

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RURAL INCOME AND EMPLOYMENT IN INDONESIA:

A Case Study of the Cimanuk River Basin in Java

A thesis submitted in fulfillment of the requirements for the award of the degree

MASTER OF COMMERCE (Hons)

from

THE UNIVERSITY OF WOLLONGONG

by

SANDRA MARK, M.A. (Cantab)

DEPARTMENT OF ECONOMICS

1991
DECLARATION

This thesis is my own work
except where otherwise stated,
and has not been submitted for a degree
to any other University or institution.
ACKNOWLEDGEMENTS

I would like to thank the many people without whose help this thesis would not have been completed.

I am greatly indebted to my Supervisor, Dennis O'Brien, whose support, guidance, criticisms and encouragement were invaluable throughout my toils; without his advice and efforts I could not have enjoyed the memorable experience of field work in Indonesia.

The academic and administrative staff at the Economics Department all helped in their own way; I could not have hoped for a more encouraging work environment. My deepest gratitude to Linda Granzier for her unstinting assistance and support. My special thanks also to Dudley Jackson for encouraging me to come to Australia in the first place, to Robert Castle and Donald Lewis for their perspicacious advice, to Wolfgang Brodesser for lessons in driving computers, to colleagues Phiri Maleka and Husein Sawit for their comments and to Di Kelly and Sophie Abercrombie for guiding me through the administrative maze.

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To the Research School of Pacific Studies at the Australian National University, my recognition of their generosity in allowing me to roam through all their bookshelves at will.

No acknowledgements could be complete without appreciation of my family, who supported me throughout at long-distance and at close quarters. My parents' unparalleled encouragement and advice leads me to dedicate this work to them.

Despite all this help, errors may abound: these I claim as my own.
SUMMARY

The literature on rural employment and incomes in Java generally uses either the literary or the econometric approach. This thesis attempts to bridge the gap, by using data from a survey of six villages in West Java in 1982/83 and reveals some interesting features not hitherto brought out.

Differences in location (agro-climatic zone and accessibility) can affect rural life patterns more than modern rice technology or tenurial status. Location also determines whether rural households are "pushed" or "pulled" into non-agriculture.

The area of rice sawah land cultivated is also crucial in rural activity: this alone can explain 40 percent of variations in household total income. Nevertheless, only 60 percent of rice farmers earn enough to live off rice. Whilst agricultural wage labour is a leading source of employment and income, other farming and non-agriculture account for two-thirds of remunerated labour time and almost half of income; these activities deserve more study than formerly. Although the households are rural, twenty percent of income is directly urban-derived.

Although adults average only 17 hours remunerative work per week, few households remain below the poverty line. Of those that do, many are landless, but not all landless are necessarily poor.

Conclusions are that the importance of some rural activities has been greatly underestimated, whilst the interaction of so many factors creates an intricate pattern of rural life impossible to capture in a single definition.
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GLOSSARY OF TERMS

INDONESIAN WORDS:

Ani-ani  Hand-knife used for harvesting rice
Bakul  Petty trader
Bawon  Harvest labourer's share ("wage")
Becak  Trishaw
Bengkok  Sawah given as use-right to local Government officials in lieu of salary
Beras  Rice which has been hulled and milled
Borongan  An agricultural labour contract, wherein labour is paid in kind
Ceblokan  An agricultural labour contract, wherein pre-harvest labour is not paid wages
Cukupan  At or above the poverty line (see below)
Desa  Village
Harian  Daily wage labour contract
Gabah  Rice which has been harvested, but not yet hulled or milled
Kampung  Hamlet
Miskin  Below the poverty line (see below)
Padi  Rice which still in the field
Palawija  Non-rice crops grown in fields
Paling miskin  Below subsistence level (see below)
Sambatan  Unpaid exchange agricultural labour contract
Sawah  Wet rice field
Tegal  Dry land which is never flooded for rice

OTHER TERMS USED:

Poverty line  Income equivalent to 240 kg of milled rice equivalents (m.r.e.) per household member
Subsistence level  Income equivalent to 180 kg of milled rice equivalents (m.r.e.) per household member
Pure owner  A rice farmer who owns all the sawah he/she cultivates
Pure tenant  A rice farmer who rents all the sawah he/she cultivates
Owner-Tenant  A rice farmer who is at the same time both owner-operator and tenant for the sawah he/she cultivates
CHAPTER 1

INTRODUCTION

Indonesia, with its 170 million inhabitants, is the world's fifth largest nation and has the third largest rural population after China and India [World Bank 1988, Table 1]. Its population is still growing rapidly, having increased by 3.5 million or 2.1% during 1986 alone (Table 1.1) ¹.

The Indonesian population is young, with a large actual and potential labour force. In 1986, slightly more than half the population was of working age (15-64 years) and forty percent were aged 14 years or less [Glassburner and Poffenberger 1983, p.25]. The Indonesian labour force was growing rapidly at 2.4% per annum in the early 1980s and it is anticipated to continue to grow at this rate or more over the next decade. Three-quarters of the labour force is rural, which underlines the importance of studying the employment prospects for the rural population, including the fate of future entrants. (Comparisons with other countries listed in Table 1.1 should be treated with some caution, since they depend on the individual countries' definition of what constitutes an urban area).

¹ The countries shown in the Tables were selected for their relevance as being either
- neighbours (The Philippines, Thailand and Malaysia), or
- for having similarly large populations and high rural population densities (Bangladesh and India), or
- for being similarly large developing non-Middle East oil exporters (Mexico and Nigeria).
### Table 1.1

**Indonesia and Selected Other Countries: Area, Population & the Labour Force, 1986**

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<td>2.2</td>
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<td>75</td>
<td>56</td>
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<td>16</td>
<td>2.7</td>
<td>50</td>
<td>50</td>
<td>62</td>
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<td>2.5</td>
<td>190</td>
<td>61</td>
<td>56</td>
<td>2.5</td>
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<td>Thailand</td>
<td>510</td>
<td>53</td>
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<td>100</td>
<td>82</td>
<td>59</td>
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<td>240</td>
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<td>720</td>
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<td>53</td>
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<td>70</td>
<td>49</td>
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<td>40</td>
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<td>40</td>
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* Java only: population 107 million; population density 800 /km².

Notes:
1. Countries selected for the following reasons:
   - Malaysia, Philippines, Thailand: neighbouring South-East Asian, non-NICs;
   - India, Bangladesh: large population and densely populated
   - Nigeria, Mexico: large, non-Middle East, LDC oil exporters.
2. Population: mid-year projections based on the most recent censuses.
3. Rural Population: based on national definitions of urban areas.
5. Labour Force: economically active persons aged 10 years and over:
   - includes the armed forces and the (officially) unemployed, but
   - excludes "economically inactive" persons, e.g. housewives.

### TABLE 1.2

**INDONESIA AND SELECTED OTHER COUNTRIES:**

**NATIONAL & SECTORAL GROSS DOMESTIC PRODUCT (GDP) AND SECTORAL SHARES OF THE NATIONAL LABOUR FORCE, 1986**

<table>
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<th>Country</th>
<th>NATIONAL GDP (Growth % p.a.)</th>
<th>AGRICULTURE</th>
<th>INDUSTRY</th>
<th>SERVICES</th>
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<td>n.a. 3.0</td>
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<td>19 n.a.</td>
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<td>52 32 -3.5</td>
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<td>32 1.9</td>
<td>70 29 7.1</td>
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<td>47 2.7</td>
<td>75 14 4.6</td>
<td>6 39 4.7</td>
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<tr>
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<td>41 1.4</td>
<td>68 29 -5.1</td>
<td>12 30 -4.0</td>
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<tr>
<td>Mexico</td>
<td>6.5 0.4</td>
<td>9 2.1</td>
<td>37 39 0.0</td>
<td>29 52 .04</td>
</tr>
<tr>
<td>All LDCs</td>
<td>6.1 1.8</td>
<td>19 3.6</td>
<td>62 36 4.6</td>
<td>16 46 3.4</td>
</tr>
<tr>
<td>OECD</td>
<td>3.6 2.5</td>
<td>3 2.5</td>
<td>7 35 2.5</td>
<td>35 61 2.6</td>
</tr>
</tbody>
</table>

Notes: (1) Countries selected for the following reasons:
- Malaysia, Philippines, Thailand: neighbouring South-East Asian, non-NICs.
- India, Bangladesh: large population and densely populated.
- Nigeria, Mexico: large, non-Middle East, LDC oil exporters.
- Indonesia, Malaysia, Philippines, Thailand, Mexico: GDP at purchaser values (market prices).
- India, Bangladesh, Nigeria: GDP at producer prices (factor cost).

(2) GDP: Growth rates calculated at constant prices. Indonesia, Malaysia, Philippines, Thailand, Mexico: GDP at purchaser values (market prices).
- Includes the armed forces and the (officially) unemployed.
- Excludes "economically inactive" persons, e.g. housewives.


(5) Services: all other economic activities, and statistical discrepancies.

(6) Labour Force: economically active persons aged 10 years and over.

Within this framework, this thesis is an analysis of rural employment and incomes in the Cimanuk River Basin of Java, the island which alone accounts for two-thirds of Indonesia's population. Before going into the specific analysis and in order to put this theme into context, this chapter starts with an overview of recent developments in the Indonesian economy.

1.1 INDICATORS OF ECONOMIC DEVELOPMENT

1.1.1 National Gross Domestic Product

Indonesian Gross Domestic Product (GDP) grew at an average annual rate of almost 8% between 1965 and 1980 (Table 1.2). Factors behind the high growth rate include the increased political stability since 1965, the curbing of the high inflation of the mid-1960s and the exploitation of natural resources.

Indonesia is rich in natural resources. Whilst it exports large volumes of liquified natural gas, petroleum, minerals and metals, its agricultural exports remain very important. The country is the world's leading exporter of plywood, the second largest of rubber, fourth of tea and fifth of coffee. Other exports include copra, flowers and quinine (eighty percent of the world's natural supply).

Prices of Indonesia's main commodity exports were high during the 1970s. When oil revenues were at their peak in 1981, they accounted for three-quarters of total export value and 14% of Indonesian GDP - this compares with 12.5% in Mexico and 30% in Nigeria, all three countries being similarly large, non-Middle East, LDC oil exporters [Scherr 1989, p.544]. Fuelled by the oil boom, Government expenditure rose fourfold during the 1970s and contributed greatly
to the rapid growth of GDP [id., p.545]. In particular, Government pricing policies and infrastructure development expenditure encouraged increases in rice production, which doubled between 1965 and 1980. From being the world's largest importer of rice, Indonesia became self-sufficient in this vital foodstuff for the first time this century in 1984 [Booth 1984, p.19].

With the drop in oil prices from early 1982, Indonesian GDP growth slackened considerably: GDP grew at 3.4% per annum between 1980 and 1986, somewhat less than other Asian countries such as India, Thailand and Malaysia (Table 1.2) 2. These dramatic changes in the national economy are reflected in the analysis of the household data conducted in this thesis, which covers the period from November 1982 to October 1983.

1.1.2 Sectoral Gross Domestic Product

Since different sectors of the economy grow at different rates, overall GDP needs to be broken down into its components, especially as rural incomes are derived from both agriculture and non-agriculture. Calculation of sectoral GDP is difficult in countries characterised by subsistence agriculture, small-scale manufacturing, and much activity in the urban informal sector. This difficulty applies particularly to the service sector as calculated by the World Bank, since it is simply the difference between estimates of overall national GDP and the sum of agriculture and industry.

The service sector was in fact the largest in the Indonesian economy in 1986, accounting for over 40 percent of national GDP (Table 1.2).

2. The lower growth rate of The Philippines was due to the internal conflict there in the 1980s.
It was also the fastest-growing sector at 5.6% per annum during the early 1980s, a fact held to be a symptom of "Dutch Disease" in the Indonesian economy.

Agriculture accounted for one-quarter of Indonesian GDP in 1986 (Table 1.2). Not only had total Government expenditure risen fourfold over the 1970s due to the oil boom, but agriculture's share of total Government expenditure rose from 16 to 22 percent during that decade [Scherr 1989, p.547]. During the 1970s, agricultural GDP grew at an average of almost 4% per annum, and in per capita terms at 1.5% per annum (Table 1.2). Although agricultural growth slowed down thereafter, sectoral output still grew at 3% per annum between 1980 and 1986. Thus Indonesian agriculture performed well over the 1970s and early 1980s, due to deliberate encouragement by the Government.

Indonesian industrial GDP grew at an average annual rate of less than 2% in the 1980s (Table 1.2). Not only was this slower than that of either services or agriculture over the same period, it was also much less than its own (12% p.a.) growth rate over the preceding decade. This was essentially due to the fall in the value of petroleum products in the 1980s.

1.1.3 Sectoral Employment

Crucial to any study of the development of a country is the extent to which the agricultural sector can absorb the growing labour force. National censuses record only primary occupations or sources of income, so in countries with high levels of subsistence agriculture such as Indonesia, the proportion of the labour force in the agricultural sector tends to be overestimated. In fact, many
agricultural households spend much of their time working in non-agricultural activities such as cottage handicrafts and urban informal activities. On the other hand, some (unskilled) workers in industry and services return to the countryside for harvesting, thus working in agriculture for a short period. The diverse range of economic activities in which rural households participate will be analysed in detail in this thesis.

In Indonesia, similarly to other developing countries, about 60 percent of the labour force was classified as agricultural, compared with only 7 percent in the industrial market economies. The Indonesian industrial sector employed 13 percent of the national labour force but accounted for as much as one-third of Indonesian GDP in 1986. The figures for agriculture and industry show the contrast in labour productivity between the two sectors, as elaborated further in the review of literature in Chapter 2.

The second largest sector in terms of employment in Indonesia was services, with 30 percent of the Indonesian labour force. Given their differing labour markets and labour absorptive capacities, it is important to establish which of the diverse service activities such as transport, public administration, trade, tourism, etc. were the dominant activities (see Chapter 10).

1.1.4 Other Macroeconomic Indicators of Development

The indicators discussed so far have dealt with the contribution of agriculture, industry and services to Indonesian national GDP and employment, but national GDP growth alone gives an incomplete indication of the standards of living.
TABLE 1.3

INDONESIA AND SELECTED OTHER COUNTRIES:

SOME INDICATORS OF STANDARDS OF LIVING, 1986

<table>
<thead>
<tr>
<th>PER CAPITA GNP</th>
<th>SHARE OF TOTAL HOUSEHOLD INCOME BY HOUSEHOLD GROUP</th>
<th>SHARE OF FOOD IN HOUSEHOLD EXPENDITURE</th>
<th>LIFE EXPECTANCY AT BIRTH</th>
<th>RATE OF INFLATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1986 Bottom 20%</td>
<td>Top 20%</td>
<td>1986</td>
<td>1980-85</td>
</tr>
<tr>
<td>(USS)</td>
<td>(% of Income)</td>
<td>(% of Exp.)</td>
<td>(years)</td>
<td>(% p.a.)</td>
</tr>
<tr>
<td>Indonesia</td>
<td>490</td>
<td>6.6</td>
<td>49.4</td>
<td>48</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1,830</td>
<td>3.5</td>
<td>56.1</td>
<td>30</td>
</tr>
<tr>
<td>The Philippines</td>
<td>560</td>
<td>5.2</td>
<td>52.5</td>
<td>47</td>
</tr>
<tr>
<td>Thailand</td>
<td>810</td>
<td>5.6</td>
<td>49.8</td>
<td>34</td>
</tr>
<tr>
<td>India</td>
<td>290</td>
<td>7.0</td>
<td>49.4</td>
<td>52</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>160</td>
<td>6.6</td>
<td>45.3</td>
<td>n.a.</td>
</tr>
<tr>
<td>Nigeria</td>
<td>640</td>
<td>n.a.</td>
<td>n.a.</td>
<td>52</td>
</tr>
<tr>
<td>Mexico</td>
<td>1,860</td>
<td>2.9</td>
<td>57.7</td>
<td>35*</td>
</tr>
<tr>
<td>All LDCs</td>
<td>610</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>OECD</td>
<td>12,960</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* includes beverages and tobacco

Notes: (1) Countries selected for the following reasons:
- Malaysia, Philippines, Thailand: neighbouring South-East Asian, non-NICs;
- India, Bangladesh: large population and densely populated
- Nigeria, Mexico: large, non-Middle East, LDC oil exporters.
(2) Per Capita GNP: GNP = GDP plus net factor income from abroad less net factor payments to non-residents. GNP valued in USS, converted using mean 1986 exchange rates, and exchange rates for 1984 and 1985 adjusted for inflation differences between each country and the U.S.A.
(4) Household Expenditure: note that sampling techniques were biased in favour of urban areas, with consequently lower shares for food.
In addition, many Governments control consumer prices.
(5) Rate of Inflation: growth rate of GDP implicit deflator = GDP at current values/GDP at constant prices.

Indonesia in the mid-1960s was regarded as "the number one failure among the major underdeveloped countries" [Higgins 1968, p.678], but by 1986, Indonesian per capita GNP was only slightly less than the mean for all developing countries (Table 1.3). Between 1965 and 1986, per capita GNP grew at an average annual rate of 4.6%, faster than all the countries listed in Table 1.3.

Growth in per capita GNP cannot reveal changes in the distribution of the benefits of growth. Figures presented in Table 1.3 show that in the mid-1970s, income distribution in Indonesia was slightly more equitable than in most of the Asian countries listed in the Table (excluding Asian developed economies and NICs).

The proportion of household income spent on food captures the effects of both per capita income and income distribution, since this proportion tends to fall with rising income (Engel's Law). Table 1.3 shows that the average Indonesian household spent just under half of its income on food in general (excluding drink and tobacco); indeed as much as one-fifth of income was spent on staples only. The average Indonesian household therefore spent about as much or a little more on food than households in the other Asian economies listed in Table 1.3.

In the light of the above, it is noteworthy that life expectancy at birth in Indonesia was lower at 57 years than in all other developing countries listed, except in Bangladesh and Nigeria, where life expectancy was still lower.
1.1.5 Summary of Economic Indicators

In conclusion, the Indonesian economy grew during the 1970s and 1980s with a sustained rise in per capita income due to the Government's use of some of the oil revenues. The economy suffered the effects of the fall in oil prices in the 1980s as well as the general slowdown in world economic growth, although by comparison with the two other largest non-Middle East LDC oil exporters, Indonesia's GDP weathered the oil price collapse relatively well. That it did so was due to the continued growth of the non-oil sectors of the economy.

When compared with its non-MIC South East Asian neighbours, the distribution of income in Indonesia is slightly less inequitable, but mean per capita income and life expectancy at birth are lower and a greater proportion of income is spent on subsistence (food).

1.2 OBJECTIVES OF ANALYSIS

Having looked at the broad shape of the Indonesian economy, it is time to state the objectives of the specific analysis carried out in this thesis.

A major goal of economic development is to alleviate poverty and raise the standard of living of the poor. Some of the questions which arise are:

- What have been the effects of Indonesian growth on the employment and incomes of the poor?
- What have been the contributing factors to economic growth?
- What does this mean for the future?
Macro-economic approaches as presented in Chapter 2 give general descriptions of the processes at work but cannot explain sufficiently the specific phenomena underlying macro-economic changes. Micro-economic approaches are therefore necessary and this thesis develops in detail one such approach to economic development. It attempts to answer the above questions by looking at the rural Javanese in particular, and in doing so to shed new light on the debates regarding the survival strategies of households in densely populated rural areas of developing countries.

Java has been selected because although it accounts for only 7 percent of Indonesian territory, it houses two-thirds of the Indonesian population. In the 1890s there were about 170 Javanese per km² [Scidmore 1899, p.176]. By the mid-1980s, 107 million people lived on an island half the size of Italy and Javanese population density had leapt to 790 persons per km² (Table 1.1)³. Rural densities have reached 3,000 persons per km² on the north coast, which comes close to European urban population density, such as West Berlin (3,800 persons per km²) [Collier et al. 1977, p.29; Eurostat 1988, p.102]. Java therefore has the dubious distinction of supporting one of the highest rural population densities in the world and one which is still growing at 2% per annum [Strout 1985, p.67].

These circumstances explain why many micro-economic studies of Indonesian economic growth have focussed on households in rural Java, as reviewed in Chapter 3. Most of these have concentrated on

³. By contrast, Belgian population density, the highest known in the late 19th century at 200 persons per km², had risen to only 350 per km² in the mid-1980s.
the rice farmer and the hired rice labourer, analysing the factors and effects of the Indonesian rice production successes of the 1980s. In so doing, however, these studies have usually neglected other rural income-earning activities, both of farmers and of the rural landless. Other micro-level studies which have taken non-rice employment and income into account have tended to focus on heads of household only. A few studies of rural Java [e.g. Kasryno 1986] have identified all household income-earning activities, but have not attempted to analyse them in detail. Finally, the studies which survey households in more than one village have rarely taken into explicit account differences in location.

This thesis contains a micro-level analysis of rural income and employment in an area of Java. The objective is to identify and measure factors affecting rural households' employment and income, using a holistic approach and carrying out econometric analysis. The data used is taken from a survey of six villages in West Java in 1982/83, which covers both rice farmers and landless households. Geographical location, accessibility and the income-earning activities of all household members are explicitly taken into account. These findings will provide a comprehensive set of information on conditions of households in rural Java and should be a useful basis for formulating policies that directly affect over half of Indonesia's population. It would seem reasonable that their findings could be extended to other countries in similar circumstances.
1.3 THESIS CHAPTER LAYOUT

The following chapters (2-4) introduce the central part of this thesis in which the analysis of rural households is carried out. After a review of the relevant economic literature (Chapter 2), the island of Java and the study area of the Cimanuk River Basin in Java are introduced (Chapters 3 and 4). Chapter 4 also contains a description of the selection procedure for the households analysed.

Characteristics of the households are surveyed in the middle chapters (5-10), starting with population and land distribution (Chapter 5). Following this, the various labour activities available to rural households - classified as on-farm agriculture (Chapters 6-8), off-farm agriculture (Chapter 9) or non-agriculture (Chapter 10) - are presented and the degree and characteristics of rural household participation in these activities are analysed in turn.

Chapter 11 deals with the relative importance of each activity in accounting for labour time and as a source of household total income. This includes econometric estimation of the major determinants of rural incomes. In the light of the above, areas requiring further research are identified and some policy options with respect to rural employment and income are presented (Chapter 12).
One of the goals of economic development is to reduce rural poverty and raise the standard of living of the rural poor. The Government can redistribute national income in favour of the poor through taxation or subsidies, but these can retard economic growth by distorting the allocation of resources. Another way of reducing rural poverty can be to create employment for rural households, especially activities with high labour productivity and returns per hour.

In order to provide a background to the specific analysis of conditions in rural Java, poverty and unemployment in developing countries in general and the difficulties in measuring them are considered in this chapter. Macro-economic theories of development in these countries, in particular the "dualistic" approaches, are discussed, as well as micro (including household) level analyses of development.

2.1 POVERTY AND UNEMPLOYMENT IN DEVELOPING COUNTRIES

In industrial market economies, poverty is often related to the lack of employment opportunities and is therefore assumed to be caused by unemployment. In the absence of rental income, the lack of labour income can certainly lead to a low standard of living. However, in developing countries, poverty can persist even where there is full-
time employment; without national social security benefits, workers are often engaged in low wage activities. Thus a discussion of employment or unemployment measured according to time is inadequate in explaining the persistence of poverty.

Alternative definitions of employment have been sought which are not merely "full-time" work, such as eight hours per day or 250 days per year. Thakur [1987] suggested additional measurements of unemployment in developing countries, such as: "poverty unemployment", where even if household members work full-time all year, income earned is insufficient for subsistence; and "willingness unemployment", where even if employed full-time and earning sufficient for subsistence, some household members wish to work more hours per day in order to supplement income. On a broader note, Binswanger and Rosenzweig [1981] pointed out that failure in any other rural market, such as credit, land or crops, would also affect the rural labour market, and therefore rural poverty.

The extent to which different forms of unemployment or underemployment characterise rural Java is explored in this thesis. It is found that these depend on the composition of the households, access to land, agro-climatic conditions and geographical accessibility (access to product and labour markets).

2.2 DUALISTIC THEORIES OF DEVELOPMENT

In common with much of rural South-East Asia, rural Java is characterised by smallholder rather than plantation agriculture. Javanese farmers cultivate extremely small plots of land and supplement household income by working in off-farm activities, both agricultural and non-agricultural. Many theories of economic
development in developing countries are based on moving less productive labour in agriculture to more productive work in non-agriculture. This is especially so of approaches assuming labour market dualism in the economy.

Boeke [1942] was the first to note dualism when he observed, in his study of the Indonesian economy, the parallel development of a foreign capital-intensive sector and an indigenous labour-intensive sector, neither of which was affecting the other. Boeke felt that this was due to fundamental and permanent differences in the economic behaviour of the two sectors; Geertz [1963, p.62] argued that it arose from colonial policy.

The concept of dualism was appealing to economists trying to explain the patterns of development in developing countries which differed so markedly from the experiences of the industrialising nations of the nineteenth century. Dualism was defined as the co-existence of a stagnant traditional sector and a modern capitalist sector sharing a particular market, without any market forces smoothing the inequality between the two sectors. Links between the two dualistic sectors explained the low overall growth rate of the economy. More specifically, the prolonged presence of low wage, low productivity employment in some areas of agriculture and higher wage employment in some non-agricultural sectors could be defined as labour market dualism. For example, it has been argued that one reason for the continuing labour market dualism in Indonesia was subsidies to domestic manufacturing industries ¹ [Dove 1986]. In time, the concept of dualism acquired a wider meaning of socio-economic

¹. These subsidies and other forms of Government intervention in the (urban) labour markets have affected rural labour markets, particularly through rural-urban migration (Chapter 9).
duality due to differential phasing of development among population groups in the same region or country [Breman 1980].

Lewis [1954] adapted Boeke's concept of dualism to explain the pattern of development of a labour-surplus economy. With a labour-surplus agricultural sector and a capital-intensive urban sector, low productivity agricultural labour would be attracted by higher wages in the capitalist sector, which would supply the capital required for investment. This assumed that capitalists' profits were neither passed on as higher wages nor spent on conspicuous consumption.

Following Nurkse [1953], Lewis assumed that the marginal product of labour in agriculture was zero for an elastic supply of labour from agriculture. This ensured that real agricultural wages did not rise and that labour therefore continuously flowed out of agriculture into the urban sector. The assumption of zero marginal product of labour was controversial and subsequently much discussed in the literature, by Viner [1957], Fei and Ranis [1964], Sen [1966], Todaro [1969], Desai and Mazumdar [1970] and others. Fei and Ranis [1964] extended Lewis' [1954] ideas, allowing for rises in the marginal product of labour once surplus labour had been transferred out of agriculture. Eventually the opportunity cost of loss of labour from agriculture would be balanced by the gain in returns to labour in non-agriculture.

At the macro-economic level, Lewis [1954] and Fei and Ranis [1964] emphasized the need for an agricultural "revolution" prior to an industrial one. Much depended on the presence of dynamic farmers or landlords to institute improvements which would raise agricultural
productivity and create the necessary agricultural labour surplus. However, neither approach differentiated between labour-supplementing and labour-displacing improvements in agriculture, by failing to recognise that the precise nature of agricultural mechanisation or technological change is crucial to the rural labour market (Chapters 6 and 9).

Whilst Lewis [1954] did not explicitly discuss the factors underlying the existence of dualism, Leibenstein's [1957] "efficiency wage" theory did. He observed that nutrition determined labour effort and productivity at low incomes. Employers would hire workers only above a certain efficiency wage, which would be above the intersection of the demand and supply curves for a labour-surplus economy. Unemployment would result without any of the wage rate adjustments predicted by classical economics and surplus labour would become available for transfer outside agriculture. However, the efficiency wage theory could not explain how the unemployed were to survive in the meantime. Rodgers [1975] pointed out that in many cases the efficiency wage theory was applicable to rural labour markets only during agricultural slack seasons, when wages might not decline with the fall in demand for labour.

Following Leibenstein [1957], Fei-Ranis [1964] proposed that agricultural wage rates were "institutionally" determined by average consumption, that is, by humanitarian reasoning rather than by the forces of demand for and supply of labour. On the other hand, wages in the small but expanding commercialised sector were competitively determined. This explained the initial persistence of agricultural wages greater than the marginal product of labour and hence the labour-surplus in the agricultural sector. Testing this
empirically, Sahn and Alderman [1988] concluded that wages in rural Sri Lanka were institutionally determined, as Fei-Ranis predicted. They noted that agricultural workers were paid wages in accordance with their previous experience of such work rather than in accordance with their educational levels. They therefore found that the demand for agricultural labour was quite inelastic and agricultural labour supply only slightly elastic with respect to wages.

Equally important to agricultural employment and labour surplus are the variations in the productivity of labour over time during the year, being higher at peak agricultural periods than at slack ones. Binswanger and Rosenzweig [1980] noted that this was particularly so in regions and markets where rural wages were sticky for institutional reasons. Falls in demand for labour in slack seasons would entail a small decline in wage rates and a large decline in the number of workers employed. If these unemployed were members of a household with some land of their own, they were likely to do extra work on their own farms, thus reducing the marginal product of labour in agriculture. The extent to which more time would be spent on farm work would depend on the workers' valuation of leisure: "when people are working twenty hours a week, 'leisure' is really unemployment and rather boring" [Higgins 1973, p.253].

The authors mentioned so far based their analysis of employment in developing countries on the labour-intensity of economic sectors. Morley and Kumar [1989] disagreed with this, arguing that the existence of surplus labour in the economy implied the existence of capital constraints, in the form of savings and/or foreign exchange constraints. They concluded that labour per unit of capital was
more important in evaluating employment policy alternatives than output per unit of labour.

Another criticism levelled at the earlier dualistic development approaches is that by concentrating on the links between agriculture and industry, they ignored the service sector. Park [1989] found that the "employment absorptive capacity of the urban industrial sector" had been hitherto "seriously underestimated" [p.373]. He suggested that an increase in industrial production could generate significant additional employment in the service sector through demand for communications, transport, marketing, and so on. In addition, increased industrial employment would generate demand for services by the newly employed industrial workers (Chapter 10).

It is difficult to comment on the relevance of the macroeconomic dualistic approaches discussed so far without also analysing what is happening at the micro, particularly the household, level.

2.3 HOUSEHOLD THEORIES OF DEVELOPMENT

Chayanov [1925] was a pioneer in the study of the peasant household and the factors governing the allocation of household labour to farm production. Chayanov argued that classical and even Marxian economics were irrelevant to subsistence peasant family farms which did not normally hire wage labour. Households could work more hours or more intensively on their farms without opportunity cost, but would do so only up to the point of satisfying household consumption needs - which is the essence of subsistence agriculture.

The absence of hired labour was crucial to Chayanov's analysis. Chayanov himself conceded that his theory therefore applied more to
thinly populated countries, such as his native Russia, than densely populated ones. Booth and Sundrum [1984, p.32] showed that the use of hired labour in six Asian countries was highest where population density was high and farm size small. This certainly applies to the Javanese farmers surveyed, where hired labour put in more hours in rice farming than household members (Chapter 6).

The literature review developed therefore now looks at only those authors who explicitly allowed for farmers hiring and selling labour. Most of these approaches have based their analysis on Becker [1966].

Becker's [1966] article on the analysis of household behaviour introduced the idea that a household was both a producer and a consumer. He argued that households combined inputs of time and goods to produce a range of utility commodities which Becker called \( z \)-commodities, examples being sleeping, working, theatre-going and so on. Households could spend money either directly on goods or indirectly by foregoing income from work and consuming time, subject to the usual income budget constraint. Leisure could be plotted on a scale ranging from activities close to remunerated work all the way to pure consumption. The more the activity was like work, the less the income foregone, that is, the lower the opportunity cost of leisure.

Becker used his model incorporating time to explain the allocation of labour within a household: the relative efficiencies of household members determined the allocation of activities, with adults "producing" more work and children "producing" more leisure. It
followed that the allocation of one member's labour was affected by the opportunities open to other members.

On a more macroeconomic note, Becker's approach used the increase in the relative cost of time with increased household income to explain why inhabitants of industrialised nations are so conscious of time and yet wasteful of goods, while inhabitants of developing countries are careful about goods consumed and treat time as almost immaterial.

Huffman [1979] developed a model based on Becker [1966], with time, income and farm production constraints, and used this to analyse the effects of U.S. Government policies on off-farm labour supply. He found that Government farmer extension services, which provided improved techniques, training, management and so on, significantly increased off-farm labour supply by farmer households. Huffman also emphasized that the net effect of a wage increase on labour supply can be ambiguous: the substitution effect leads to an increase in the supply of labour, but the income effect is negative if leisure is a normal good. Where individuals had off-farm as well as on-farm work, there would be trade-offs between different activities to take into account.

Bollman [1979] also looked at the effects of Government policies on off-farm labour supply, analysing those which aimed at increasing farmer incomes. He showed that different ways of raising farmer incomes had different and sometimes conflicting, effects on the rural labour market.

Bollman differentiated between raising on-farm and off-farm farmer incomes. Looking first at on-farm incomes, higher crop prices, an
outward shift in the production function, or subsidised input prices could all raise farm incomes. However, whilst raising crop prices would lower off-farm labour supply, because farming would be more profitable, technological improvements would work in the opposite direction if less labour per unit output were required. The net effect of subsidised inputs could go either way. If they were labour-displacing they would stimulate off-farm labour supply. However, increased crop production associated with cheaper inputs might require more farm labour.

With respect to off-farm incomes, Bollman suggested that these could best be raised by Government investment in rural infrastructure and encouragement of rural industries. Increased Indonesian Government expenditure in the late 1970s and early 1980s on rural infrastructure on Java did have a major impact on rural incomes. The construction of rural infrastructure generated employment for rural labour during agricultural slack periods. Improved access encouraged the adoption of modern farm inputs. The same improved access encouraged circular migration from rural to urban areas, particularly during slack periods. The extent to which these effects on the rural economy benefitted the rural population is one of the topics of this thesis.

Barnum and Squire [1980] made a significant contribution to the study of farmer households in developing countries. They extended Becker's [1966] work, noting that rural households could be both producers and consumers at the same time and often of the same good. (Note that these were "producers" and "goods" in a different sense to Becker's). For example, the Malaysian households they surveyed both produced and consumed rice; they also both produced and
consumed labour by selling their own and hiring outside labour, and so on. Barnum and Squire introduced a "profit effect" to isolate out the net effects on household behaviour of production and consumption roles.

The authors studied the effects on farmers of Government "minimum producer price" policies, which included guaranteed purchase of crop offered. An increase in the rice price would *ceteris paribus* raise producer incomes by increasing returns per kilogramme of crop sold. However, as consumers, farmers might retain more crop in order to protect themselves against higher prices. The closer the farmers were to subsistence level, the worse off the households in terms of real income and the smaller the impact of rice price increases on the marketed surplus of rice. Should farmer incomes rise, this would increase household demand for leisure, a normal consumption good, and would reduce household labour supply.

An increase in the price of rice would also affect agricultural (landless) labourer households. These are consumers of rice without being cultivators, so the direct effects of a price increase would be entirely negative. However, farmers might demand more hired labour in order to produce a rice crop valued at higher prices. Farmers with higher incomes might also demand more hired labour to substitute for increased own leisure. The extent to which the landless would gain would depend on the proportion of total labour which was hired and on adjustments in money wages to price rises.

Increases in the price of rice would also affect the rural non-agricultural economy through changes in income for farmers and the landless. With the income-elasticity of demand for food less than
unity (Engel's Law), demand for rural non-agricultural goods and services would grow, creating employment. The net effect would depend, among other things, on the combined income-elasticities of demand for the various non-agricultural products.

Barnum and Squire also discussed the effects of changes in other major rural prices, such as wages. The *ceteris paribus* direct effect of an increase in wages would be to raise the incomes of the employed landless, whilst farmers' incomes would be falling due to increased wages paid out to hired labour. Farmers might then increase their own labour and hire in fewer labourers for fewer hours, thus offsetting wage gains to the landless.

Barnum and Squire [1980] tested their model with data from Malaysian rice farming households. Results indicated that Government policies for minimum rice prices to farmers had little impact on rice production. The policies had a large and positive impact on rural income distribution by inducing wage increases for the landless and by raising farmer incomes. This positive impact was net of losses to the landless through increased consumer prices and farmer losses through increased wage bills. Even labour-displacing agricultural innovations allowed positive net effects for the landless; higher farmer incomes induced higher consumption of leisure and hence a rise in demand for hired labour for other tasks. Indeed, Barnum and Squire found that the net gains to the landless from increased rice prices exceeded the gains to farmers. High gains to the rural landless explained the significant rise in demand for rural non-agricultural products predicted by Barnum and Squire, since poorer households have a high marginal propensity to consume.
There are, however, caveats to Barnum and Squire's [1980] results, due to the assumptions made for internal consistency. Households were assumed to be price-takers. This is acceptable for crop prices in the case of Government intervention, but wages are endogenously determined at the aggregate level. In addition, theirs was a single-period analysis, so that they could not consider either risk or long-run effects.

Soedjono et al. [1985] used the Barnum and Squire approach to analyse rural households in Central Java. Their results showed that households responded significantly to changes in both rice prices and labour wages. A ten percent rice price increase induced a five percent increase in farmers' own rice crop consumption, an eight percent rise in farmer expenditure on non-farm goods and a three percent fall in farm household labour supply (increased leisure). Rural non-farmer households benefitted by increased demand for hired agricultural labour and rural non-agricultural products. Soedjono et al. emphasized that in some cases economic analysis would have led to opposite conclusions if the fact that households were both producers and consumers had been ignored.

The Barnum and Squire model was extended by a number of authors for rural farmer households and reported in Singh, Squire and Strauss (eds) [1986]. Their studies of Asian economies had some significant common results:

- (1) Rice consumption rose with rice price increases for all farmer households surveyed (in Malaysia, South Korea, Taiwan, Thailand) except those in Japan. That is, a rise in the price of rice led to rises in household incomes, hence consumption of rice. This meant
that the prediction of a fall in consumption following a rise in own price was offset by Barnum and Squire's [1980] "profit effect";

- (2) Rural labour supply fell with rice price increases for all Asian economies: since a rise in the price of rice led to rises in household incomes, it also led to greater leisure, leisure being a normal good;

- (3) Rural household labour supply rose with rural wage increases in all Asian economies surveyed; and finally

- (4) The consumption of market-purchased (usually non-agricultural) goods rose with rice price increases. This meant that the multiplier effect from agriculture to non-agriculture was positive and even greater than unity in some cases (Malaysia and Taiwan).

In short, rice price increases in Asian countries affected farmers more as producers than as consumers. Price increases thus benefitted the rural landless too, by inducing increases in farmers' demand for hired labour.

This Chapter has looked at some general theories of economic development, with emphasis on the dualistic macroeconomic theories and the Beckerian microeconomic theories. The next Chapter turns to the study of Java in particular and reviews the literature which deals with rural employment and incomes there.
In Chapter 2, the general literature relating to rural employment and incomes in developing countries was reviewed. As this thesis focusses on selected aspects of rural life in Java, the present Chapter introduces the island and then looks at these aspects in detail. To some extent each of them has been dealt with in various other studies. It is therefore important to see to what degree the study of the Cimanuk River Basin is consistent with the predictions and findings of others and to explain any differences.

Before reviewing the literature on rural Java, it is of interest to look at Java itself and to establish the importance of rice cultivation.

3.1 JAVA AND JAVANESE RICE CULTIVATION

Java's 52 active volcanoes stretch along the island as a backbone from East to West. They are at once destructive as well as the source of Java's rich soil, making the island one of the most fertile areas in the world [Strout 1983]. To the north of this mountain chain, the hills slope in relatively gentle fashion down to the sea, ending in wide, marshy but fertile plains. South of the highlands, the land drops abruptly into the Java sea, with a rocky coastline in many places.
The name "Jawa" traditionally means the "Island of Grain" or "Island of Rice" [de Wit 1912, p.288]. Indeed, some of the earliest written records in Java pertain to wet rice field (sawah) irrigation systems, the oldest dating back to the beginning of the 9th century [van Setten van der Meer 1979, p.xiv]. At the turn of this century, a Dutch traveller noted that "the whole island is one vast rice-field. Rice on the swampy plains, rice on the rising ground, rice on the slopes, rice on the very summits of the hills" [de Wit 1912, p.288]. Even today Java alone produces about sixty percent of Indonesian rice output, almost entirely on sawah.

Water is of paramount importance in rice cultivation: it brings in nutrients, aerates the soil and checks weed growth; the water supply must above all be reliable and controllable. This explains why rice sawah cultivation was historically less prevalent in some lowland areas of Java than in the hills. The elevated areas enjoy a more constant rate of rainfall all year round and are able to let excess water be carried quickly downstream. By contrast, lowland Java without technical irrigation was and still is, particularly vulnerable to fluctuations in water supply, with flooding by descending rivers in the wet season as well as drought in non-irrigated areas in the dry season.

Since sawah cultivation requires complicated irrigation systems and therefore interdependence of rural communities, it was conducive to the establishment and increased the power of the central authority, historically the Javanese Sultans [van Setten van der Meer 1979]. Government influence on rice production has therefore always been significant. For example, in 1655 Sultan Anangkurat I prohibited
the export of rice from Java after a particularly bad harvest [Mears and Moeljono 1981, p.23].

In recent times, the Dutch Colonial Government failed to appreciate the importance of producing rice. It constructed technical irrigation networks in lowland Java in the nineteenth and early twentieth centuries, which could have been used for rice, but were built specifically for cultivating sugar for export [Booth 1977]. This led, by the beginning of the twentieth century, to Java becoming a regular importer of rice for the first time in many centuries [Reid 1984, p.153].

Following Independence, the Government's interest in rice production was re-awakened and later reinforced. The most important factor was, and is, the large extent to which the Javanese population is dependent on rice. Mears [1978, p.53] suggested that rice accounts for one half of daily carbohydrate consumption, whilst Teken and Soewardi [1982, p.76] claimed this proportion to be closer to three-quarters. Even in 1817 rice was "the principal food of all classes of the people" of Java [Raffles 1817, p.109]. More recently, Huke [in de Datta 1981, p.3] estimated that as much as 81 percent of the Indonesian total population were dependent on rice as their major food in 1980 1, and this ratio is likely to be higher for Java, since rice is not always the staple food elsewhere in the archipelago. According to Kasryno and Chong [1984, p.3], low income households in Java spend as much as forty percent of their income on rice alone, and the most common poverty line used on Java is

1. Huke's estimate of 81 percent was at least 10 percent greater than the percentages calculated for China, India, or Japan (63-70 percent), although smaller than those for Bangladesh, Sri Lanka or Thailand (90 percent).
expressed in kilogramme equivalents of milled rice [Sajogyo 1975]. Even in the capital city of Jakarta, rice had a weight of 31 percent in the 62-commodity cost-of-living index as recently as the early 1980s [Mears and Moeljono 1981, p.28].

Another reason for the Government's interest in rice production is that the strongest elements within the Suharto administration come from rural Java and have an interest in improving rural conditions. Hart [1986, p.8] explained the spread of modern rice technology in Java as coinciding with "the transformation of the entire political-economic system, the main element of which was a shift in the state's [sic] interests in and relations with the rural sector."

A primary goal of the Suharto regime has been self-sufficiency in domestic rice production and in 1984, this was achieved for the first time this century [Booth 1984, pp.19-21]. It is of interest to examine the various forms of Government intervention on the demand and supply sides of the rice economy. On the demand side, export revenues from oil and liquified natural gas were used to finance the large rice imports necessary in the late 1970s and early 1980s to satisfy domestic demand. On the supply side, Government intervention in rice production took three main forms:

- (1) the provision of irrigation;
- (2) farmer extension programmes (BIMAS); and

2. This contrasts with Lipton's [1977] urban-bias hypothesis, where rural neglect is a function of the dominance of power by an urban elite.
3. This may mean merely the absence of imports, or domestic effective demand being met by domestic supply. It does not mean every Indonesian has enough rice to eat.
- (3) buffer stock purchases with floor prices for crops by the national logistics board (BULOG).

The construction of technical irrigation networks were necessary to the growth of the rice economy, since water control is an important determinant of rice yield. Expanded irrigation has also increased total land available for cultivation and the number of crops per year.

The Government-sponsored farmer extension programmes under the name of BIMAS stressed five aspects of agricultural modernisation:

- (1) improvements in irrigation;
- (2) improvements in cultivation techniques;
- (3) the adoption of high-yielding variety seeds;
- (4) the application of inorganic fertilisers; and
- (5) the application of pesticides.

This type of extension, in conjunction with support programmes such as credit schemes, was successful in increasing rice production, particularly through increased availability of heavily subsidised fertilisers.

The buffer stock programme is administered by BULOG, a Government authority which

- (1) guarantees minimum producer prices for the major food crops, especially rice;
- (2) purchases, through village cooperatives, whatever surpluses farmers offer;
- (3) creates buffer stocks through such purchase, for sale during lean seasons; and
- (4) imports staples if necessary.
BULOG activities, in reducing fluctuations in rice prices, affect the rural economy by reducing the risks of rice cultivation. Intervention on rice prices also affects the relative returns to and risks involved in cultivating other crops (Chapter 7).

3.2. REVIEW OF THE LITERATURE ON RURAL JAVA

Rural activities can be classified into agricultural, dealing with crops and livestock, and non-agricultural, that is, any form of industry or service work. This section therefore reviews the literature on Javanese households as regards first agriculture and then non-agriculture.

3.2.1 Agriculture

The access to work and income in agriculture is varied. Households that own land may cultivate it or rent it out. Rural households may also rent land for cultivation and/or work as labourers in others' fields. A wide range of crops can be grown. However, as already shown, rice cultivation dominates Javanese agriculture and there is a corresponding wealth of literature on it, which considers both the farmer-producers' and the hired labourers' conditions.

3.2.1.a Rice Agriculture

Many of the studies of the Javanese rice economy have focussed on the effects of Government intervention there, especially the effects of high-yielding seed varieties. All agree that recent production successes and the achievement of self-sufficiency were due to technological improvements and the Governments' generous fertiliser subsidies [e.g. various "Surveys of Recent Developments", Bulletin of Indonesian Studies; Mears and Moeljono 1981].
By contrast, there is much controversy as to the effects of modern varieties on rural labour markets and rural living standards. At the beginning of the "Green Revolution", it was expected that modern varieties would lead to an increase in the demand for hired labour and thus benefit landless as well as farmer households. For example, modern varieties require more fertiliser application and weeding than traditional ones. However, it was found that family labour could be used for these and that rotary weeder became increasingly common [Wahab 1985, p.31; see also Chapter 6]. Thus modern varieties did use up some under-employed family labour but failed to affect the landless.

As far as hired harvest labour is concerned, Collier [1981, 1982b] observed innovations in harvesting arrangements when modern varieties were introduced which contrasted with the traditional open harvest, where all comers are entitled to participate and receive a proportion of the harvest as their wage. He concluded that the benefits of modern varieties were being restricted to farmers, middlemen and elite groups of agricultural labourers, which reduced the "trickle-down" effects of modern rice technology on rural incomes. On the other hand, since rice is an important consumption item among agricultural labourers, the positive effects of its availability at controlled prices (due to modern varieties' increased yields and BULOG's pricing policies) could be just as important as any negative effects on the demand for harvest labour. Indeed, Edmundson and Edmundson [1983, p.58] found that all rural classes in the village studied had enjoyed rises in real incomes
during the decade of the 1970s (1971-1981), the period when modern varieties were first introduced 4.

In summary, the extent to which modern varieties have affected the demand for labour and income of hired labourers remains unclear. The discussions in Chapters 6 and 9 seek to throw further light onto the debate by using econometric analysis of data from Java's Cimanuk River Basin and by comparing these results with other studies.

3.2.1.b Non-Rice Agriculture

Rice cultivation is not the only form of farming found on Java, even if it does account for the major part of hired agricultural labour. Most Javanese rice farmers use part of their fields to cultivate non-rice food crops, especially staple foods, either on sawah lacking water for rice or on dry land which is never flooded. In the past, these crops (maize, cassava, sweet potatoes, and so on) were often seen simply as inferior substitutes to rice, to be avoided unless rice could not be grown. More recently there has been a growing interest in such crops as additions to the rice diet, especially in view of burgeoning research into nutrition. Non-rice crops are usually discussed in the literature at the macro-economic level [various "Surveys of Recent Developments", Bulletin of Indonesian Studies] and until now only a handful of studies have dealt with them at the household level [Penny and Singarimbun 1973; Stoler 1981]. Even then, they are usually considered as part of a rice cultivation study, not on their own merits.

4. However, the authors noted that the gap between rich and poor had widened at the same time.
"Non-field" farming has also been neglected in the literature, for despite the physical dominance of rice sawah in the Javanese landscape, much farming is carried out which requires little land, such as fruit cultivation or poultry-raising.

Rural house gardens can produce most of the (non-staple) vegetables and fruits which accompany the daily rice meal, as well as domestic fuel and fodder for livestock. Clearly, the judicious cultivation of a garden can save the rural household much cash expenditure, yet the literature is again sparse: the few to study housegardens explicitly have included Terra and Ochse [1934], Stoler [1981], Strout [1983].

Farm livestock can include chickens, ducks, rabbits, goats, sheep, water-buffalo and fish ponds, the smaller livestock being more prevalent. Glassburner [1985, p.52] emphasized that the purchase of livestock is frequently a form of capital investment for rural households unable to purchase land. Knipscheer et al. [1983, p.76] estimated that 20 percent of farms in Indonesia have sheep or goats - and poultry is more common - but few studies of rural Java even mention the role of livestock. Those which do, tend to concentrate on water-buffalo as used in sawah land preparation and as contrasted with tractor power or man-hoeing.

These relative neglects of non-rice farming are addressed in Chapters 7 and 8.

3.2.2 Non-Agriculture

There are two more reasons for looking beyond rice cultivation in Java. Firstly, the seasonal swings in the demand for labour in rice
cultivation and the small amount of time required for other types of farming mean that it cannot employ all household members throughout the year [Shand 1986, p.1]. Indeed, Prabowo and Sajoqyo [1981, p.75] estimated that two-thirds of farmers are involved in non-agricultural activities during the dry season, especially the slack periods.

Secondly, most Javanese farmers cannot earn enough from rice alone, simply because most farms are too small: average size of sawah cultivated is 0.6 hectares [Manning 1987, p.55]. The significance of this low average becomes apparent when looking at two other studies: Hart [1986, p.104] estimated that the critical minimum for the average Javanese household of five members to survive is 0.575 hectares of sawah producing two rice crops a year, whilst Birowo and Hansen [1981, p.5] found that 63 percent of Javanese sawah is cultivated in farms which are smaller than 0.5 hectares. Smallholdings imply part-time farming and non-agricultural employment [Lipton 1974].

Participation in non-agriculture employment in Java has probably been underestimated, because the national census asks for only the primary occupation of the head of household. At the individual household level, some studies also go no further than the head, yet there can be a significant difference between the activities of the head of household and those of the other members. Whilst rice may be the main source of income of the head of a farming household, other members may be engaged primarily as petty traders (bakul), agricultural labourers, construction workers, becak (trishaw) drivers in cities and so on, engaging in household farming only at peak periods.
Some studies of rural Java [e.g. Kasryno (various); Hart 1986; White (various)] have included the contributions of all members to household income and discussed them in detail (see Chapter 11). Jones [1981, p.246] estimated that one-quarter of rural Javanese households were primarily dependent on non-agricultural income, mainly from trade, services and manufacturing. This led Rietveld [1986, p.114] to conclude that non-agriculture had had a "mitigating effect on income differentials resulting from differences in land endowment", that is, rural households' income from non-agriculture could at least partly offset the lack of income from agriculture.

Migration to non-agricultural employment in cities is a visible result of the influx of oil revenues into any developing country. What has been striking in the case of Indonesia is that this migration has for the most part remained circular, that is, seasonal or daily, with migrants based in villages, not the city [Hugo 1978, Speare 1981, Jones 1981, Collier 1982b, Manning 1988]. Hugo's [1978, p.281-282] innovatory study found a statistically significant difference between the average incomes of households with migrant members and those without. The reverse of rural-urban migration is also present: Jones [1981, p.247] estimated that eleven percent of urban inhabitants in Java went to the countryside for agricultural employment during the year.

While illuminating on the subject of the multiplicity of sources of income, none of these studies analysed the determinants of household total income econometrically. Soedjono et al. [1985] did, but used data from one village and looked at farmer households only. They therefore could not take into account the effects of location
(altitude and accessibility) and excluded landless households, who are, after all, just as rural as farmers.

The analysis in this thesis identifies all income-earning activities of all household members as far as possible. Since the households surveyed both include those not cultivating rice sawah and are differentiated by village, "landlessness" and location (topography, climate, accessibility) are treated explicitly.

3.2.3 The "Push versus Pull" Debate

Irrespective of their individual and specific subject matter, most studies of rural Java can be classified into two groups, according to whether they argue that rural households have been mainly:

(1) "pushed" out of agriculture into non-agricultural activities by worsening agricultural conditions; or

(2) "pulled" into non-agriculture by better conditions there.

Exponents of the "push" argument include, to different extents, authors such as Penny and Singarimbun [1973], White and Wiradi [1979], Collier [1981 and others], Jones [1981], Lingard and Bagyo [1983], Glassburner [1985] and Hardiono [1987]. These authors have observed that much of the increased participation in non-agriculture has been in jobs with low productivity and therefore low returns per hour. They deduce that the reason for households turning to such jobs is that they have exhausted other possibilities, that is, they have been "pushed out" of the agricultural sector. The lack of opportunities in agriculture is in turn believed to be due to the lack of positive trickle-down effects on incomes of the rural poor.

5. Examples include home handicrafts such as straw baskets or urban informal work such as hawking iced drinks.
of modern rice technology (for some authors) and/or the Government's expenditure of oil revenues (for others).

By contrast, other observers of rural Java, such as Montgomery [1975], Hugo [1978], Dixon [1982], Rietveld [1986], Shand [1986] and Manning [1987] argue that rural households have been enticed out of agriculture by more attractive opportunities due to Government expenditure on rural infrastructure and the increased wealth of rural areas through modern rice technology. They argue, for example, that even if farmers have been the only ones to gain from higher yields and minimum producer prices, they spend that additional income on consumer goods and services, thus generating a flow of income in rural areas. Some authors have observed the rise of small-scale rural manufacturing industries, construction work and jobs in administration, now that secondary education is increasing and rural infrastructure (especially roads and electricity supply) has improved.

A few, such as Dapice [1980], have taken a more balanced view, arguing that both pull and push factors have been present at the same time in Java, but in different places. Hart [1986] and Lluch and Mazumdar [1981] showed that segmented rural labour markets led to "pushing" in certain areas of the economy and "pulling" in others. For example, young men were attracted into the well-paid non-agricultural jobs, while old people or women tied to the home were pushed into low-productivity non-agricultural tasks (such as basket-weaving and string-making) in order to supplement falling agricultural incomes.
Indeed, it could be that rural Java is going through the turn of Kuznets' "inverted U" - a hypothesis which argues that as developing economies grow, income distribution first worsens and then improves. This could explain why there is such a conflicting mass of evidence from different parts of Java. The problem is that too many studies treat their villages studied as representative of all of Java, when in fact they are at most representative of one particular type of Javanese village (flat lowland or hilly upland, with strong links to urban areas or relatively inaccessible).

It must be acknowledged that much careful, thoughtful study of rural Java has been carried out. Since these analyses have raised almost as many (new) questions as the (old) ones they have solved, this thesis draws on them as a foundation. However, the analysis carried out here is novel in its explicit references to the effects of village accessibility and altitude on rural households, where relevant, and in its econometric estimation and discussion of the determinants of rural households' total incomes.
CHAPTER 4

THE CIMANUK RIVER BASIN AND THE 1983 SURVEY

The data used in this thesis were drawn from a survey conducted in 1983 of 313 households in six villages (desa) of the Cimanuk River Basin, West Java. The surveyed area and the method by which the individual households were selected are described in this chapter.

The data were compiled by the Agro-Economic Survey in Bogor, West Java. This had been established in 1965 as an inter-departmental research organisation for the formulation and evaluation of Government policy on the agricultural economy of Indonesia. The Agro-Economic Survey set up a Rural Dynamics Study in the 1970s to compile data at the household level for researching and forecasting trends in the agro-economy. The Study was supported primarily by the Ford Foundation, with some support also from the World Bank.

One of the Rural Dynamics Study series proposed to analyse households in different villages in the same region, such as a large river basin in Java. The Cimanuk River Basin was chosen because the Cimanuk is the longest river in Java, which would allow for a variety of situations.

4.1 THE CIMANUK RIVER BASIN

The Cimanuk River Basin lies in the north-east of the province of West Java (Figure 4.1). It contains almost 800 villages and
FIGURE 4.1 THE CIMANUK RIVER BASIN

- Roads
- Railways
- Land Over 1000 m
- Land Over 3000 m
- Sample
- Village
- Market

West Java

Central Java

Indian Ocean

Java Sea
<table>
<thead>
<tr>
<th>Land Area (of CRB)</th>
<th>Population Density (Persons/km²)</th>
<th>Sawah Area (of land)</th>
<th>Under Water All Year (% of sawah)</th>
<th>Sawah Irrigation Technical (%)</th>
<th>Sawah Irrigation Semi-Technical (%)</th>
<th>Sawah Irrigation Rainfed (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indramayu</td>
<td>29</td>
<td>617</td>
<td>72</td>
<td>45</td>
<td>33</td>
<td>31</td>
<td>36</td>
</tr>
<tr>
<td>Cirebon</td>
<td>11</td>
<td>1,358</td>
<td>62</td>
<td>67</td>
<td>39</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>Sumedang</td>
<td>18</td>
<td>453</td>
<td>30</td>
<td>63</td>
<td>7</td>
<td>20</td>
<td>73</td>
</tr>
<tr>
<td>Garut</td>
<td>19</td>
<td>623</td>
<td>32</td>
<td>71</td>
<td>19</td>
<td>21</td>
<td>60</td>
</tr>
<tr>
<td>Majalengka</td>
<td>22</td>
<td>941</td>
<td>49</td>
<td>50</td>
<td>16</td>
<td>25</td>
<td>59</td>
</tr>
</tbody>
</table>

Cimanuk River Basin 100 739 49 55 27 27 46 100

Source: Kalo 1980, pp.3,6,19
accounts for 11 percent of West Javan area, or 4 percent of all Java [Wiradi 1978, p.8]. Administratively, the Cimanuk River Basin forms part of five West Javan Districts: Indramayu (lowland), Cirebon (lowland), Sumedang (hilly), Majalenka (partially elevated) and Garut (elevated). The river itself rises in Garut in the highlands and runs northwards to its delta in Indramayu.

4.1.1 Rice Sawah in the Cimanuk River Basin

The Cimanuk River-Basin was first surveyed in 1975 1. In that year, one half of its total area, including urban areas, consisted of wet-rice fields (sawah) (Table 4.1). The proportion of area devoted to sawah was much higher in the lowlands than in the hillier and elevated areas, because the large, flat lowland fields lend themselves more easily to rice cultivation.

For reasons explained in Chapter 3, the proportion of technically irrigated sawah was highest in lowland areas whereas one half to three-quarters of sawah in the upper three Districts was rainfed or dependent on village-level irrigation techniques. Nevertheless, technical irrigation did not necessarily mean that there was sufficient water for rice in both seasons. Nor did simple irrigation necessarily mean that water supplies were inadequate: the smallest proportion of sawah under water all year round was in Indramayu (i.e. lowland) and the highest proportion was in Garut (i.e. elevated). This will be an important point to bear in mind when discussing on-farm and off-farm agricultural incomes.

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1. The first household Survey was carried out in the following year, 1976. In 1983, the same households were surveyed again.
4.1.2 The Districts of the Cimanuk River Basin

Lowland Indramayu is marshy, prone to flooding in the wet season and some of the land closest to the coast suffers from high salinity. It was therefore only sparsely populated until the nineteenth century. At that time, the Dutch colonial Government built technical irrigation networks to make it possible to cultivate sugar for export. They concentrated on lowland Java, because its flat land, humidity and heat favoured such cultivation. The forced cultivation of sugar under the Dutch in lowland Cimanuk River Basin areas allowed most farmers only one annual crop for own consumption. This was nearly always rice. Even in 1975 few other, non-rice, crops were cultivated in the lowlands as compared with further upland (see Chapters 6 and 7).

The relatively recent settlement and the infertility of some of Indramayu was still apparent in 1975, where population density remained less than in other Cimanuk River Basin Districts. Lower population density went hand in hand with a relatively large average size of sawah cultivated per farmer household. This in turn implied that such households earned a large proportion of their total incomes from own rice cultivation and from working on others' sawah (see Chapters 6 and 9).

The other lowland District, Cirebon, includes the outskirts of Cirebon City, once a capital of Sultanates. In contrast to Indramayu, rural population density was high in Cirebon and indeed the highest of the five Districts. Proximity to a large city means that off-farm non-agricultural employment is predominantly urban (Chapter 10).
Elevated areas of the Cimanuk River Basin had a different agricultural history to the sugar-cultivating lowlands. For example, during the nineteenth century, Garut became the first tourist area of Indonesia because of its agreeable climate. The cooler area with reliable rainfall grew fruits and vegetables to satisfy urban (Europeans') demand. The colonial administration of the highland Priangan region also insisted on cash crops for export, including tea, tobacco, citrus, cloves and quinine, some of which had been cultivated before the arrival of the Dutch. This geographical and historical emphasis on a wide variety of crops in the uplands was still apparent in the data analysed in this thesis (Chapters 7 and 8). Nevertheless, sawah rice remained the major single crop in all Cimanuk River Basin Districts, accounting for at least one-third of total land area in 1975.

4.2 THE DATA SELECTION PROCEDURE

Once the Cimanuk River Basin had been selected by the Rural Dynamics Study as the region to be studied, basic data were gathered for all 800 desa. From these, twenty villages were selected for more detailed study, as representing the different characteristics of the region. Sawah cultivation was important in all these twenty desa, but they varied in land type, such as irrigation quality and cropping patterns, as well as in accessibility, such as road type and distance to urban areas.

The six desa containing the households analysed in this thesis were taken from the sample of twenty desa. Within each of the six desa a "block" census of about 250 neighbouring households was conducted in a particular kampung (hamlet). Within these 250 households, a
further selection procedure took place to ensure comparability of data. Four groups of fifteen households each were selected according to cultivated sawah area from each of the six desa.

The households in the Survey were classified by size of rice sawah cultivated because, as Geertz [1963, p.9] observed, "Javanese rice terraces are closely integrated with modes of work organisation, forms of village structure, and processes of social stratification". This is confirmed by the fact that in the specific study of rural employment and income, many rural work activities relate to sawah ownership or cultivation status. For example, households cultivating larger areas of sawah may also be more likely to cultivate other types of land or own livestock. On the other hand, members of households with insufficient rice sawah to support their families must work in off-farm activities. Although income from such activities may sometimes exceed the contribution of rice farming to household income, any study of rural employment and incomes must start with the study of sawah land cultivation.

The households were therefore classified by access to land, not ownership:
- (1) 15 households not cultivating rice sawah;
- (2) 15 households cultivating less than 0.25 ha of rice sawah;
- (3) 15 households cultivating 0.25-0.49 ha of rice sawah; and
- (4) 15 households cultivating 0.50 ha or more.

60 households were thus surveyed in detail in each of the six desa in 1976, making up a total of 360 households for the Cimanuk River Basin. The same 360 households were visited in 1983 and surveyed for the 1982/3 wet season and the 1983 dry season (November 1982 to
October 1983). However, some households no longer existed or had changed substantially, so that 313 households were included in the 1983 Survey, thirteen percent fewer than in 1976. On the other hand, by 1983 the researchers had become familiar to the households, so that an atmosphere of trust helped improve the accuracy of the 1983 Survey.

4.3 THE SIX DESA: TOPOGRAPHY AND ACCESSIBILITY

Of the six desa, two were lowland, two were middle-upland, and two were high-upland:

- (1) Wargabinangun - "lowland W" - in the Cirebon District;
- (2) Lanjan - "lowland L" - in the Indramayu District;
- (3) Sukaambit - "midland S" - in the Sumedang District;
- (4) Ciwanci - "midland C" - in the Majalengka District;
- (5) Gununwangi - "upland G" - in the Garut District; and
- (6) Malausma - "upland M" - in the Majalengka District.

Note, with respect to the last two desa, that "upland" is not intended to denote "upland rice" cultivation there but is merely a reminder of the desa topography.

Access roads to both lowland desa were dirt: lowland W was accessible to transport even during the wet season, whereas access to lowland L was accessible during the wet was difficult, despite being only one kilometre from the Jakarta-Cirebon highway. Public motor transport in and out of lowland L therefore chiefly consisted of three motorbike-taxis.

The two middle desa were relatively close to their Sub-district capital and District towns. Midland S had easy year-round access by road transport on an asphalt road. Indeed, by 1987 local medium-
Scale manufacturing industry was sending out minibuses to collect and return home the workers. Midland C had only a stone-gravel access road.

Access to upland G was similar to that of midland C, with a stone-gravel road only a short distance from a town. By contrast, although upland M had a good access road, it was in distance the most inaccessible desa of the six, being fifty kilometres from the District town.
CHAPTER 5
THE HOUSEHOLDS SURVEYED: LAND AND HOUSEHOLD SIZE

The first step in analysing rural employment and income is to look at the resources of households. It is necessary to differentiate between the human and the capital endowments, since a household with many members may not earn much if most are too young or too old to work, whereas one which owns much land or other forms of capital may earn a large income, irrespective of the number or distribution of household members.

The households surveyed in the Cimanuk River Basin in 1983 are presented in this chapter, looking first at the population (household size, age distribution and so on). Access to land is then discussed, especially access to sawah and land tenure. The relationships between location, household characteristics, average sawah size and forms of tenure are established and considered.

5.1 HOUSEHOLD MEMBERSHIP AND AGE

The Survey defined a household as a group of people with one budget and one kitchen. It therefore excluded permanent migrants but included family members from outside the nuclear family as well as non-family household members such as servants. The total number of households analysed in this thesis is 309, for although data were provided on 313 households, four of these clearly did not report all
income sources. Their reported total incomes were too low for subsistence and they were therefore excluded from the analysis.

5.1.1 Age Distribution and the Role of Children

The Survey covered 1,379 persons, with an average household size of 4.5 members. In looking at ages in the households surveyed, high rural population density and lack of land explain why heads of household averaged 48 years and why one-fifth of the Survey households had grand-children living in them (the middle generation had sometimes migrated to urban areas).

Almost forty percent of the people were children under 14, which is consistent with the national figures presented in Chapter 1. Although a few children in their early teens did contribute to family income, some adults over 60 did not, so almost forty percent of the population was dependent on income earned by the remaining sixty percent.

Defining the labour force as adults between 14 and 60 does not mean that children made no contribution to the household. For example, White [1981] in his study of a desa in Central Java found that children made an economic contribution from an early age. They helped by caring for younger siblings, collecting firewood and doing light housework, thus releasing adult labour for remunerative activities. In some cases they participated in certain remunerative activities themselves, such as caring for farm animals and working in cottage handicrafts.

to test whether children entered into the production or consumption side of household decision-making. They found that children were treated by the family as consumption rather than as production units, in contrast to the more common view held by White [1981] and others.

Data from the Cimanuk River Basin Survey show that where household had farm animals, there was a high correlation between the number of children and household labour hours spent tending farm livestock (Chapter 7). This would seem to confirm the more common "production" treatment of children. However, livestock (e.g. cattle, goats, poultry, ducks) is often a form of savings for wealthy rural households in developing countries. Thus families which can afford livestock might also be able to afford more children (as consumption units), which would be consistent with Yotopoulos and Kuroda [1988]. This uncertainty suggests that children in developing countries could be simply both production and consumption units - as are adults.

5.1.2 The Roles of Women

In addition to contributing to household cash income, women contributed indirectly to household income through child- and house-care, and were the heads of 14 percent of households surveyed.

When calculating household total labour hours in a study of rural employment, it is necessary to include some measure of non-remunerated housework since these hours would otherwise be classified as "unemployment" or "leisure". As Jones [1981, p.223]

1. For example, Hull [1979, p.17] estimated that one-third of wives in a Central Javanese desa were earning at least 50 percent of total household income.
pointed out, "even in the West the separation of a housewife's work from that of a waitress in a restaurant is based as much on statistical convention as on any immutable logic". A study which sought the major determinants of housework time was that of Wales and Woodland [1977]. Following Becker [1966] and using U.S. data, they estimated labour supply as a function of work time, leisure time and housework time. Their results showed that the absence or presence of children, rather than household income, was a major determinant of housework - a rise in income led to a reduction of housework time only in the case of childless households.

The Survey offered no data on hours spent on child- or housecare, so when the author visited the Cimanuk River Basin desa in 1987, she questioned some women on the time they spent on such tasks. The answers of all who were interviewed (separately) showed similar results for total hours, although about half of those interviewed worked for off-farm income. The sum of hours spent cooking, cleaning, fetching water, collecting food from own land and caring for children was around 5 hours a day for all interviewees. Most women added that some of the cooking and childcare hours were spent on cottage handicrafts (e.g. string-making, preparation of foods for hawking), especially during the agricultural slack periods when household incomes were low. This brings in the problems associated with measuring joint production, but when allowance is made for a periodic trip to nearby markets, the estimate of five hours a day seems reasonable.

A second point about women in the Survey is that although the man is assumed to be the head of household in rural Java, 14 percent of households were in fact headed by women. These were households
where there was no husband present - the women were widows or divorced or their husbands had migrated long-term and sent back remittances to their wives. Indeed, in three of the desa (lowland W, midland C and upland G) the proportion of women-headed households reached 20 percent.

This situation clearly affected sources of household income. For example, some relatively well-paid rural jobs, such as hoeing, ploughing and construction work, are exclusive to men. Most importantly, few of the women-headed households cultivated sawah, a relatively reliable source of income. One reason was customs associated with inheritance: the land might have passed to sons only, or one son might have bought out the daughters' plots. Another, more economic, reason was that even if these households did own some sawah, certain rice tasks are done exclusively by men, and hiring-in male labour every season could prove more difficult or expensive than renting or even selling sawah. Thus most women-led households depended on off-farm income (Chapters 9 and 10).

5.2 LAND CULTIVATION IN THE CIMANUK RIVER BASIN

"Land cultivated" is defined as the total area of plots cultivated between November 1982 and October 1983. This was done because whilst the total area of land cultivated in each desa did not vary much, there was considerable variation between the surveyed households. Farmer households did not necessarily cultivate the same area of sawah in both rice seasons, either because of difficulties in water supply or because of changing tenurial status. Since this thesis is concerned with household income, to take a single measure of area cultivated from one season would be one-sided
<table>
<thead>
<tr>
<th></th>
<th>Lowland W</th>
<th>Lowland L</th>
<th>Midland S</th>
<th>Midland C</th>
<th>Upland G</th>
<th>Upland M</th>
<th>Cimanuk R.B. Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Type of Land Cultivated (as % of total land cultivated):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sawah</td>
<td>90</td>
<td>91</td>
<td>66</td>
<td>82</td>
<td>79</td>
<td>68</td>
<td>82</td>
</tr>
<tr>
<td>Non-Rice Sawah</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Dry Fields</td>
<td>2</td>
<td>--</td>
<td>19</td>
<td>16</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Gardens</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>11</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Cultivated Land</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>B. Households' Tenurial Status (as % of households):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pure Owners</td>
<td>25</td>
<td>46</td>
<td>29</td>
<td>55</td>
<td>47</td>
<td>80</td>
<td>48</td>
</tr>
<tr>
<td>Owner-Tenants</td>
<td>12</td>
<td>30</td>
<td>33</td>
<td>31</td>
<td>31</td>
<td>.20</td>
<td>26</td>
</tr>
<tr>
<td>Pure Tenants</td>
<td>31</td>
<td>15</td>
<td>.16</td>
<td>.46</td>
<td>.46</td>
<td>.67</td>
<td></td>
</tr>
<tr>
<td>Non-Cultivators</td>
<td>33</td>
<td>9</td>
<td>22</td>
<td>10</td>
<td>16</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Total Households</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>C. Average Size of Sawah Cultivated (hectares per farmer household):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Sawah</td>
<td>.99</td>
<td>1.55</td>
<td>.53</td>
<td>.73</td>
<td>.84</td>
<td>.47</td>
<td>.85</td>
</tr>
<tr>
<td>Owner-Operated</td>
<td>.58</td>
<td>1.32</td>
<td>.46</td>
<td>.61</td>
<td>.58</td>
<td>.46</td>
<td>.67</td>
</tr>
<tr>
<td>Rented</td>
<td>1.13</td>
<td>1.02</td>
<td>.32</td>
<td>.38</td>
<td>.71</td>
<td>.38</td>
<td>.69</td>
</tr>
<tr>
<td></td>
<td>- none</td>
<td>- less than 1 percent</td>
<td>- none</td>
<td>- less than 1 percent</td>
<td>- none</td>
<td>- less than 1 percent</td>
<td>- none</td>
</tr>
</tbody>
</table>

Notes: (1) a. Sawah: sawah cultivated only for rice.  
        c. Dry fields (tegal) were never flooded.  
        d. House garden area: included that on which the house stood.  
(2) Cultivated Land areas were summed across the two seasons of 1982/83.  
(3) a. Pure Owners: rice farmers cultivating their own sawah only.  
        b. Owner-Tenants: rice farmers both cultivating sawah of their own and renting sawah as tenants.  
        c. Pure Tenants: rice farmers renting all the sawah they cultivated.  
        d. Non-Cultivators: households not cultivating (rice) sawah.  

and could not give a true indication of the opportunities open to the households. To illustrate the method used, a rice sawah farmer who cultivated 0.2 hectares in the wet season and 0.35 hectares in the dry is classified in this thesis as cultivating 0.55 hectares.

Land cultivated by households in the Cimanuk River Basin Survey was divided into four types:
- (1) Rice sawah;
- (2) Sawah used for other crops;
- (3) Dry fields which were never flooded; and
- (4) Housegardens, including fish ponds.

Total land cultivated was calculated by summing these four types.

Rice sawah accounted for an overwhelming proportion (82 percent) of land cultivated by the Survey households (Table 5.1). Another five percent of cultivated land consisted of sawah cultivated for other crops and the rest was dry fields, housegardens and fish ponds. ("Sawah" in this thesis is defined as sawah land used for rice cultivation only and not for other crops, unless explicitly stated otherwise).

5.2.1 Rice Sawah Cultivation

Rice farms in the Survey averaged 0.85 hectares, compared with the all-Java mean in the 1980 Census of 0.6 hectares [Manning 1987, p.55]. In a survey of 450 padi farmers in Central Java, Soedjono et al. [1985, p.37] estimated average farm size at 0.75 hectares of land, of which 0.62 hectares was sawah. This accords with the
generally smaller rice farms in Central as compared with West Java.\(^2\)

Given the agro-climate and the history of land cultivation in the Cimanuk River Basin Districts, the proportion of land cultivated as sawah was highest in the lowlands (over ninety percent - Table 5.1). Nevertheless, even in the mid- and upland desa, sawah accounted for at least sixty-six percent of cultivated land there. Average sawah size was therefore greatest in the lowlands, whilst upland G and midland C farmers cultivated average sawah size. Relatively large plots and relative inaccessibility to urban areas (non-agricultural employment) accounted for the importance of rice incomes to households in lowland L and upland G, while easier urban access for inhabitants of lowland W and midland C meant that non-agricultural incomes could be as important as rice (Chapters 6 and 10). Sawah was small in midland S and upland M, where households were more dependent than elsewhere on non-agricultural income. The relationship between sawah size and non-rice sources of income is tested statistically in Chapter 11.

The relationship between land cultivated and size of household is also important in determining the allocation of labour. Yotopoulos and Kuroda [1988] found that households with small farms in the Philippines tended to have more children than those with large farms. They deduced that farmers with little land had more children to compensate for the smaller marginal product of child labour on small farms. By contrast, among the farmer households in the Cimanuk River Basin Survey, those with the larger sawah areas were

\(^2\) By contrast, Barnum and Squire's [1981] average rice farm size in Malaysia was much larger, about 1.6 hectares.
### TABLE 5.2
HOUSEHOLD LOCATION, COMPOSITION AND TENURIAL STATUS, by sawah size

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>Sawah Cultivated, in hectares</th>
<th>Cimanuk R.B. Survey</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>&lt;0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Households (% of total)</th>
<th>15</th>
<th>16</th>
<th>47</th>
<th>22</th>
<th>100</th>
</tr>
</thead>
</table>

**A. Topographical Distribution of Households (% of households):**

<table>
<thead>
<tr>
<th>Lowland</th>
<th>48</th>
<th>20</th>
<th>26</th>
<th>51</th>
<th>34</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midland</td>
<td>35</td>
<td>36</td>
<td>36</td>
<td>21</td>
<td>32</td>
</tr>
<tr>
<td>Upland</td>
<td>17</td>
<td>44</td>
<td>38</td>
<td>28</td>
<td>34</td>
</tr>
<tr>
<td>Total Households</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

**B. Household Composition:**

<table>
<thead>
<tr>
<th>Adults (Aged 14+)</th>
<th>2.5</th>
<th>2.4</th>
<th>2.8</th>
<th>3.2</th>
<th>2.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children (under 14)</td>
<td>1.2</td>
<td>1.5</td>
<td>1.8</td>
<td>1.9</td>
<td>1.7</td>
</tr>
<tr>
<td>Members per Household</td>
<td>3.7</td>
<td>3.9</td>
<td>4.6</td>
<td>5.1</td>
<td>4.5</td>
</tr>
<tr>
<td>Av. Age of Head of Household</td>
<td>53</td>
<td>47</td>
<td>48</td>
<td>47</td>
<td>48</td>
</tr>
<tr>
<td>% of Households Headed by Women</td>
<td>35</td>
<td>24</td>
<td>9</td>
<td>1</td>
<td>14</td>
</tr>
</tbody>
</table>

**C. Tenurial Status (as % of households):**

| Pure Owners | 84 | 57 | 33 | 48 |
| Owner-Tenants | 8 | 25 | 60 | 26 |
| Pure Tenants | 8 | 18 | 7 | 11 |
| Rice Farmers | 100 | 100 | 100 | 85 |

Notes: (1) a. Pure Owners: rice farmers cultivating their own sawah only.  
b. Owner-Tenants: rice farmers both cultivating sawah of their own and renting sawah as tenants.  
c. Pure Tenants: rice farmers renting all the sawah they cultivated.

Source: 1983 Cimanuk River Basin Survey, 309 households
<table>
<thead>
<tr>
<th>Desa</th>
<th>Main Sawah Crops</th>
<th>Main Dry Field Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowland W</td>
<td>rice; rice; chillies/pulses/maize</td>
<td>(negligible)</td>
</tr>
<tr>
<td>Lowland L</td>
<td>rice; rice; pulses/green vegs</td>
<td>(negligible)</td>
</tr>
<tr>
<td>Midland S</td>
<td>rice; rice or peanuts</td>
<td>maize/cassava/peanuts</td>
</tr>
<tr>
<td>Midland C</td>
<td>rice; rice</td>
<td>pulses/maize/cassava</td>
</tr>
<tr>
<td>Upland G</td>
<td>rice; rice</td>
<td>chillies/cassava</td>
</tr>
<tr>
<td>Upland M</td>
<td>rice; rice or sweet potatoes</td>
<td>maize/cassava</td>
</tr>
</tbody>
</table>

Source: 1983 Cimanuk River Basin Survey, 272 households cultivating crops
also those with the larger number of members (Table 5.2). Such greater household size was usually due to additional children rather than adults, partly because of the social status attached to bringing up children from outside the family nucleus in addition to one's own. Households with greater land resources to support their families could afford to increase the number of their dependents. Landless households in the Cimanuk River Basin Survey therefore tended to be smaller and older than farmer households.

5.2.2 Sawah Cultivated for Non-Rice Crops

Non-rice crops can also be grown on sawah, either along the edges of the sawah field, or between rice growing seasons, or when there is insufficient water for rice. They are usually vegetables which accompany rice meals, such as beans, peanuts and chillies, or other staples such as maize, cassava and sweet potatoes. Area of non-rice sawah cultivation accounted for merely five percent of land cultivated among the households surveyed (Table 5.1).

Some lowland rice farmers grew non-rice crops on sawah land, mostly between their dry season rice crop and their following wet season crop (Table 5.3). In midland C and upland G, there was insufficient turn-around time between the dry and wet season rice crops to grow non-rice crops (because of slower-growing rice varieties) and so the latter were cultivated only on dry land. Midland S and upland M suffered from a lack of water for rice production in the 1983 dry season and so a significant amount of sawah was used for non-rice crops.
5.2.3 Dry Land

Thirteen percent of land cultivated by respondents in the Cimanuk River Basin Survey was dry land, either dry fields (tegal) or house gardens (Table 5.1). Tegal was most important in the midlands, accounting for over fifteen percent of land cultivated. This was because sawah needs a reliable supply of water: in the uplands rainfall can often be controlled through simple irrigation whilst most of the lowlands use technical irrigation. The midlands often lack the facilities for controlling water and thus tend to have more tegal. Tegal crops were a mixture of staples (maize, cassava) and non-staples (beans, peanuts, chillies), except in upland M where only staples were grown (Table 5.3).

As is the case throughout most of Java [Stoler 1981], house gardens were intensively cultivated in the Cimanuk River Basin. These gardens were used not just for fruits and vegetables (for home consumption as well as providing occasional cash income), but also for animal fodder and building materials. The cooler upland climate and a history of producing fruits and vegetables for urban markets, especially in the Garut District, explain why gardens were most important in the uplands, accounting for more land there than tegal.

Clearly, rice was not the only form of land cultivation in the Cimanuk River Basin. How much household labour did these other crops require? How important were these crops to farmer incomes? Did farm size affect this? How did the value of non-rice crops compare with rice on a per hectare basis? These are some of the issues discussed in Chapter 7.
5.3 RICE SAWAH CULTIVATORS: OWNERS AND TENANTS

Since this thesis is concerned with the sources of household income and not with land distribution per se, the discussion needs to differentiate between those households which cultivated sawah (whether through ownership or tenancy) and those who did not (whether by being landless or owner-non-cultivator landlords). These issues are discussed in turn in the sections which follow.

5.3.1 Owner-Tenants and Pure Tenants

Eighty-five percent of households surveyed in 1983 were rice farmers. Almost half of rice farmers obtained some sawah through tenancy. This high figure is consistent with other observations concerning rural Java; Wiradi [1986, p.311] noted that concentration of land ownership had led to tenancy rather than larger farm size. Wiradi therefore argued that formal ownership of land does not necessarily indicate effective control, although it does influence the degree of control.

Tenancy is particularly pertinent to the discussion of household income in the light of the controversy concerning its effects on the allocation of resources and hence the distribution and sources of household incomes. Whilst the details of the various tenancy contracts and their effects on rice cultivation are left to Chapter 6, the overall distribution between owners and tenants is discussed here.

Javanese peasants cannot be divided simply into landowners and tenants-operators. In the Cimanuk River Basin Survey, there were many overlaps between tenants and owner-operators since 31 percent
TABLE 5.4

HOUSEHOLD CHARACTERISTICS, by tenurial status
Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th></th>
<th>Pure Owners</th>
<th>Owner-Tenants</th>
<th>Pure Tenants</th>
<th>Rice Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households (% of rice farmers)</td>
<td>56</td>
<td>31</td>
<td>13</td>
<td>100</td>
</tr>
<tr>
<td>Sawah per Household (hectares)</td>
<td>0.61</td>
<td>1.29</td>
<td>0.83</td>
<td>0.85</td>
</tr>
<tr>
<td>Number of Members:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Adults (Aged 14+)</td>
<td>2.7</td>
<td>3.1</td>
<td>2.6</td>
<td>2.8</td>
</tr>
<tr>
<td>- Children (Under 14)</td>
<td>1.5</td>
<td>1.9</td>
<td>2.4</td>
<td>1.7</td>
</tr>
<tr>
<td>Members per Household</td>
<td>4.2</td>
<td>5.0</td>
<td>5.0</td>
<td>4.6</td>
</tr>
<tr>
<td>Av. Age of Head of Household</td>
<td>50</td>
<td>45</td>
<td>43</td>
<td>47</td>
</tr>
</tbody>
</table>

Notes: (1) a. Pure Owners: rice farmers cultivating their own sawah only.
       b. Owner-Tenants: rice farmers both cultivating sawah of their own and renting sawah as tenants.
       c. Pure Tenants: rice farmers renting all the sawah they cultivated.

Source: 1983 Cimanuk River Basin Survey, 263 households cultivating rice
of rice farmers were "owner-tenants" - farmers who both operated some sawah of their own and leased some in as tenants in the same season (Table 5.4). Only 13 percent of farmers were "pure tenants" - farmers who were entirely dependent on tenancy for access to sawah. 56 percent of rice farmers were "pure owners" - owner-operators who did not also lease in sawah land.

Two percent of farmers appeared to be pure tenants but were in fact owners who had let out all their own sawah and leased in from someone else. The main reasons for this was lack of cash for inputs; by letting out their own sawah and sharecropping another's the farmers could share the cost of inputs with their new landlords, as is the custom under sharecropping. For example, one lowland farmer received first quality sawah land as bengkok \(^3\) and let out all of it; he himself sharecropped sawah of the same size but of secondary quality.

It is interesting to look at why one-third of owner-operators were also tenant-operators on part of the sawah land that they cultivated, especially since owner-tenants in the Cimanuk River Basin Survey cultivated on average twice as much as pure owners, 1.3 and 0.6 hectares respectively (Table 5.4). From the tenants' point of view, the answer lies in the relative security of income from and high returns to labour in sawah cultivation as compared with other rural activities (Chapter 11). Given the generally small size of sawah cultivated, it is not surprising that households wish to increase their access to land through tenancy.

\(^3\) Bengkok is an (traditional) institution whereby desa administration officials are given user-rights to sawah as salary in kind.
Landlords are more inclined to lease land to farmers that already own land than to landless tenants, because:

- (1) The owner-tenants are generally able to offer more experience and management skills in sawah cultivation than the landless;
- (2) They are less likely to default on rent payment. In this respect, Shetty's [1988] model predicted that landlords not surprisingly preferred wealthier tenants to poorer ones, particularly where sharecropping contracts were unenforceable (Chapter 6); and
- (3) Since rice cultivation does not use much family labour per year even on large farms (500 hours on 2 hectares of sawah land in the Cimanuk River Basin Survey), most landlords are interested in obtaining off-farm employment for members of their households. A landlord will therefore be inclined to favour tenants who already have sawah of their own and will need to hire labour for rice cultivation - preferably members of the landlords' family.

Owners are therefore in a better position than the landless in bargaining for tenanted land. It is therefore not surprising that owner-tenants outnumbered pure tenants in one of the most densely populated rural areas in the world, where competition for land is fierce.

5.3.2 Tenancy and Location

Tenancy conditions varied considerably between desa in the Cimanuk River Basin Survey (Table 5.1). The percentage of tenant farmers was highest in lowland W and midland S (63 percent) and least in

---

4. Nevertheless, owners often become sharecroppers in order to share the costs of capital inputs, then using these inputs on both the sharecropped and own sawah.
upland M (20 percent). High tenancy, especially pure tenancy, in lowland W could be explained as resulting from Government expenditure of oil revenues in the late 1970s [White and Wiradi 1983].

- (1) Newly wealthy urban dwellers could afford to buy land (sawah) in nearby rural areas - and lowland W is only four kilometres from Cirebon city.

- (2) Lowland farmers had to pay increasingly higher real wages for hired labour, because Government expenditure on rural infrastructure had raised rural wages and because of time constraints of rice cultivation [Kasryno 1983].

For these reasons, a number of lowland W farmers had sold their sawah and become tenants, landless labourers or migrants to cities. Thus rice cultivation in lowland W was characterised by higher pure tenancy and higher proportion of absentee landlords than in the other desa surveyed in the Cimanuk River Basin. It should be noted that lowland L was not similarly affected, because the pressure on demand for land was lower: population density was lower, average sawah size was high and the desa was not close to urban areas.

The other desa with high tenancy was midland S, but in contrast to the situation in lowland W, average sawah size cultivated was smaller and owner-tenancy was more common (Table 5.1). High owner-tenancy here implied that farmers had been able to add to the small sawah plots they already owned.

Small average size of sawah was not necessarily associated with high tenancy: in upland M, where average sawah size was smallest of the six desa surveyed, all farmers already owned some sawah and only twenty percent were tenants. The major difference between midland S
and upland M lay in their accessibility to urban areas: easy access for the former meant that households in midland S could work as circular migrants in nearby Sumedang, whereas difficult access in upland M meant that households were generally less mobile (Chapter 10). Since farmers hardly left upland M, even in agricultural slack seasons, there was no spare sawah for rent.

5.3.3 Tenancy and Sawah Size

It is not enough to look at the number of households in terms of tenurial status; it is equally important to look at the size of land involved. The average pure tenant household cultivated 36 percent more sawah land than the average pure owner-operator household. In lowland W in particular, where average size of pure owner-operated sawah was 0.58 hectares per household, pure tenanted areas were almost twice as large, at 1.13 hectares per household. This suggests that tenants were not always the marginal cultivators so often referred to in the literature (Chapter 6).

5.3.4 Tenancy and Household Characteristics

Some household characteristics, such as household size and the proportion of children showed clear patterns by tenurial status (Table 5.4). Pure owner households were smaller, cultivated less sawah and their heads of household were older than tenant households. Owner-tenant households cultivated on average more sawah and had a higher ratio of adult men to women than pure owners or tenants. Having more men was useful, since some rice cultivation tasks are performed by men only and male labour is paid higher wages than female. Pure tenant households tended to be younger and to have more children than pure owners or owner-tenants. This was
partly due to the fact that older households had already benefitted from inheritance of land. Young landless households had had to choose between becoming pure tenants or earning their living as hired labourers in agriculture or elsewhere. Since land was a comparatively more secure form of income (Chapter 11) and since they were physically stronger, the relative youth of pure tenants makes sense.

5.4 HOUSEHOLDS NOT FARMING RICE SAWAH

Fifteen percent of households surveyed did not cultivate rice. Since this percentage had been originally 25 percent in the first Survey in 1976, it is possible that some of the poor landless households of 1976 had left the desa in search of income elsewhere in the intervening years.

However, before attempting to draw any conclusions, it is important to distinguish between the two different types of households not cultivating rice:

- (1) those who were so by choice, that is, owners who did not cultivate their own sawah (landlords); and
- (2) those who were so by force of circumstance, that is, the landless.

Those households which neither owned any sawah nor obtained any to cultivate through tenancy are referred to here as the "absolute landless" and those which did not cultivate any of their own sawah are referred to as "pure landlords". The discussion considers these in turn.
<table>
<thead>
<tr>
<th>Classes of Non-Cultivators, as percentage of total:</th>
<th>Lowland</th>
<th>Midland</th>
<th>Upland</th>
<th>Cimanuk River Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute Landless</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Pure Landlords</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Total Non-Cultivators</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Notes: (1) a. Absolute Landless: households neither owning nor cultivating any sawah.
        b. Pure Landlords: households owning sawah but not cultivating any.

5.4.1 The Absolute Landless

Landlessness and the activities of the landless are clearly an important component of any study of rural income and employment. With regard to the "push" versus "pull" debate concerning recent developments in rural Java (Chapter 3), it is important to determine the extent to which the landless in the Cimanuk River Basin Survey were pushed out of the agricultural sector into low-wage employment elsewhere and the extent to which they were attracted out by increased job opportunities in non-agriculture due to the effects of Government expenditure of the oil revenues. It is also important to note that whilst there were landless who were the traditional landless labourers (Chapter 9), there were also some who were earning good incomes in rural but non-agricultural occupations such as teaching and administration (Chapter 10).

Seventy percent of households not cultivating rice sawah (ten percent of all households) in the Cimanuk River Basin Survey were absolutely landless. Table 5.5 shows that absolute landlessness varied greatly from desa to desa, both in numbers and as a percentage of households surveyed. It was highest in lowland W, where 28 percent of households neither owned nor cultivated any sawah. This is consistent with similar observations made above concerning the high proportion of farmers who were pure tenants in a lowland desa close to a major city (section 5.3.2.).

By contrast, none of the 55 households surveyed in upland M were landless, although fifteen of the original sixty 1976 households had been so. Since the proportion of farmers who were tenants was also lowest there, this suggests an evening out in the distribution of
land in this desa. One contributing factor could be that upland M was the most remote of the six desa - it is possible that this desa underwent a form of Geertzian [1963] "involution", but will be discussed only in the final chapter.

5.4.2. Landlords

17 percent of households surveyed which reported owning sawah land leased out at least some of it to tenants, but only 6 percent leased out all of their sawah. There were therefore three types of landlords among the households surveyed in the Cimanuk River Basin: those which did not cultivate any sawah, those which cultivated some of their sawah and leased out the rest, and those which cultivated some and leased some out and leased some in.

Almost five percent of households surveyed were pure landlords (households owning but not cultivating any rice sawah land). These accounted for thirty percent of households not cultivating rice sawah. Pure landlords were most common in midland S, where 14 percent of households surveyed owned some sawah without cultivating it themselves. This is consistent with the high rate of owner-tenancy in midland S and the importance of non-agricultural income there (Chapter 10).

Of the remaining landlords - who cultivated some sawah themselves and leased out the rest - half (almost five percent of all households surveyed) were also tenants as well as owner operators and landlords in 1982/83. The most common reason for simultaneous landlord-tenancy was a lack of cash for cultivating rice, costs which can be shared by sharecropping another's sawah while letting out one's own.
Cimanuk River Basin Survey landlords were mostly smallholders deriving additional income from sawah rent; their economic status was not necessarily much higher than that of their tenants and were therefore rarely the wealthy absentee landowners referred to in much of the development literature.

Having reviewed the composition of households and their access to land, the time has come to look at the specific remunerative activities of these households, starting with rice cultivation.
CHAPTER 6

RICE CULTIVATION IN THE CIMANUK RIVER BASIN

Rice cultivation is a major economic activity of rural households surveyed in the Cimanuk River Basin. As seen in Chapter 5, rice sawah area accounted for over four-fifths of cultivated land area and 85 percent of all households cultivated sawah for rice. Rice cultivation was the most important single source of household income (35 percent) and second in terms of remunerated hours worked (15 percent), after trading activities.

In this chapter, certain aspects of rice cultivation in the Cimanuk River Basin will be discussed in order to assess their effects on farmer income and labour use. The first section of this chapter is introductory, containing a general explanation of how rice is cultivated and its labour requirements. Then follows a description of rice cultivation in the Cimanuk River Basin: the various rice cultivation inputs, costs of production, crop yields, sales and returns are described, and terms used and estimates calculated are defined.

Later sections of this chapter deal with these aspects of rice cultivation. Regression analysis is used to test the effects of seed variety, sawah size, tenurial status and location on resource allocation, crop production and crop returns. This is the first time that location (agro-climatic zone and accessibility) has been included explicitly in this type of analysis and the results show
### TABLE 6.1

**RICE CULTIVATION: INPUTS, YIELDS & RETURNS, by Desa**

_Cimanuk River Basin, 1982/83_

<table>
<thead>
<tr>
<th></th>
<th>Lowland</th>
<th>Midland</th>
<th>Upland</th>
<th>C.R.B. Rice Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td><strong>% of Rice Farmers Cultivating Rice in:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both Seasons</td>
<td>89</td>
<td>88</td>
<td>87</td>
<td>100</td>
</tr>
<tr>
<td>Wet Season Only</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Dry Season Only</td>
<td>3</td>
<td>8</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Total Rice Farmers</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Average Farm Size (ha)</strong></td>
<td>.99</td>
<td>1.55</td>
<td>.53</td>
<td>.73</td>
</tr>
<tr>
<td><strong>% of Rice Farmers Planting:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVs Only</td>
<td>100</td>
<td>100</td>
<td>45</td>
<td>4</td>
</tr>
<tr>
<td>MVs and TVs</td>
<td>-</td>
<td>-</td>
<td>37</td>
<td>7</td>
</tr>
<tr>
<td>TVs Only</td>
<td>-</td>
<td>-</td>
<td>18</td>
<td>89</td>
</tr>
<tr>
<td>Total Rice Farmers</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Bimas Participation (% of rice farmers)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>17</td>
<td>13</td>
<td>37</td>
</tr>
<tr>
<td><strong>Fertiliser Application (kg/ha):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urea</td>
<td>320</td>
<td>280</td>
<td>330</td>
<td>270</td>
</tr>
<tr>
<td>TSP</td>
<td>150</td>
<td>110</td>
<td>190</td>
<td>130</td>
</tr>
<tr>
<td><strong>Labour Hours per farm</strong></td>
<td>850</td>
<td>1,560</td>
<td>730</td>
<td>1,020</td>
</tr>
<tr>
<td>Of which (%):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>42</td>
<td>33</td>
<td>51</td>
<td>39</td>
</tr>
<tr>
<td>Hired Pre-harvest</td>
<td>31</td>
<td>33</td>
<td>31</td>
<td>44</td>
</tr>
<tr>
<td>Hired Harvest</td>
<td>27</td>
<td>34</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>Total Hired</td>
<td>58</td>
<td>67</td>
<td>49</td>
<td>61</td>
</tr>
<tr>
<td>Total Labour (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Labour Intensity (hours/ha):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>550</td>
<td>390</td>
<td>740</td>
<td>590</td>
</tr>
<tr>
<td>Hired Pre-harvest</td>
<td>330</td>
<td>380</td>
<td>430</td>
<td>640</td>
</tr>
<tr>
<td>Hired Harvest</td>
<td>280</td>
<td>390</td>
<td>250</td>
<td>240</td>
</tr>
<tr>
<td>Total Hired</td>
<td>610</td>
<td>770</td>
<td>680</td>
<td>880</td>
</tr>
<tr>
<td>Total Labour/ha</td>
<td>1,160</td>
<td>1,160</td>
<td>1,420</td>
<td>1,470</td>
</tr>
</tbody>
</table>

*contd.*
TABLE 6.1 contd.

<table>
<thead>
<tr>
<th>Material Inputs</th>
<th>Lowland</th>
<th>Midland</th>
<th>Upland</th>
<th>C.R.B. Rice Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs of Production ('000 Rp/ha)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Material Inputs</td>
<td>50</td>
<td>45</td>
<td>55</td>
<td>40</td>
</tr>
<tr>
<td>- Hired Labour</td>
<td>145</td>
<td>125</td>
<td>145</td>
<td>150</td>
</tr>
<tr>
<td>- Taxes</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>- Rent</td>
<td>95</td>
<td>40</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>Total Costs/ha</td>
<td>300</td>
<td>220</td>
<td>270</td>
<td>250</td>
</tr>
</tbody>
</table>

Bawon: Hired Harvesters' Wage
(% of gross crop in kg) 16

Yields, by rice farm size (tonnes/ha):
| Small Farms | 5.2 | 6.6 | 4.3 | 4.3 | 2.7 | 3.5 | 4.1 |
| Medium Farms | 4.9 | 3.6 | 4.3 | 4.3 | 3.2 | 3.4 | 3.9 |
| Large Farms | 4.6 | 3.9 | 4.2 | 4.4 | 3.2 | 3.0 | 3.9 |
| Average All Farms | 4.9 | 3.9 | 4.3 | 4.3 | 3.1 | 3.4 | 3.9 |

Rice Crop Marketing:

| % Farmers Marketing | 54 | 92 | 63 | 78 | 81 | 56 | 71 |
| % of Crop Marketed by Sellers | 25 | 33 | 20 | 25 | 35 | 32 | 29 |

Returns ('000 Rp/ha)

| Gross Returns/ha | 920 | 650 | 830 | 840 | 600 | 600 | 730 |
| Net Returns/ha | 620 | 430 | 560 | 590 | 390 | 430 | 500 |

Net Returns, in milled rice equivalents (kg):

| per farm | 1,900 | 2,320 | 1,010 | 1,465 | 1,100 | 670 | 1,390 |
| per hhld member | 440 | 575 | 265 | 290 | 345 | 160 | 340 |
| % of farms earning < 240 kg m.r.e. per member from rice | 54 | 31 | 63 | 67 | 46 | 82 | 58 |

Notes: (1) Sawah size: sum of area cultivated in both seasons.
(2) Bimas: Government-sponsored farmer extension programmes (Chapter 3).
(3) a. MVs: modern rice varieties - based on those developed at the International Rice Research Institute in The Philippines.
   b. TVs: traditional rice varieties from native javonica seeds.
(4) a. Material Inputs: seeds, fertilisers and pesticides. Costs = less landlord's contribution, where applicable.
(5) a. Small Farms: less than 0.25 hectares total of sawah cultivated.
   b. Medium Farms: 0.25 to 0.99 hectares inclusive.
   c. Large Farms: 1 hectare or more.
   b. Net Returns: gross returns less costs.
(7) Net Returns in kg m.r.e. (milled rice equivalents): returns in Rp divided by average consumer price paid in 1982/83 by that household for milled rice (beras). 240 kg m.r.e. per member = poverty line.

its great and sometimes overriding importance as compared with the more usual factors of land size and tenure.

6.1 BACKGROUND AND OVERVIEW

6.1.1 Overview of Rice Cultivation

Java's climate has two seasons a year: the wet season, from about November to April, and the dry season, from about May to October. Since Java is only 7° south of the equator, the variations between the two seasons are small: the wet season is slightly wetter, more cloudy and less hot than the dry season.

The availability of water permitting, usually two rice crops are harvested per year, corresponding to the two seasons. In some parts of Java, farmers can grow five crops in two years. In the 1983 Survey, ninety percent of rice farmers grew rice in both seasons (Table 6.1). The remaining farmers cultivated rice for one season only, either because they lacked adequate water supply in the dry season or because they obtained access to sawah through tenancy for only one of the two seasons of 1982/83.

The cultivation of rice can be divided into four main stages in a season.

(1) The first stage is sawah land preparation, starting with the removal of the stubble from the previous harvest. The soil is then turned over, levelled and puddled, either manually, with small rotartillers or draft animals. In the meantime, a seedbed is planted.
- (2) In the second stage, the seedlings are transplanted to the now flooded sawah.
- (3) The third stage consists of maintenance tasks, such as fertilising, weeding and pest control.
- (4) Finally, the crop is harvested.

Peak periods for labour are therefore during hoeing/ploughing, transplanting and harvesting. These peak periods are caused by time constraints: land preparation must be done over a few days according to the (planned) variations in water supply to the sawah in the area, and planting and harvesting are generally each accomplished in one day per field.

6.1.2 Rice Production Inputs and Costs of Production

Capital inputs into rice production are either plant and equipment, such as land, machinery, animal draught power and tools, or variable material inputs, such as seeds, fertilisers and pesticides. Labour is supplied either by the household ("family" labour) or was brought in from outside the household ("hired" labour). The 1983 Survey quantified all these inputs for households cultivating rice in 1982/83. Rice production costs were calculated as far as possible in these terms and, for the purposes of analysis, were allocated to the following four categories:
- (1) costs of material inputs;
- (2) costs of hired labour, including hired equipment;
- (3) rent payments for sawah; and
- (4) tax payments (Table 6.1).

Total costs of production were the sum of these, and it is important to note that these include only paid-out costs and exclude the
opportunity cost of family labour, family equipment and owner-operated land, for the following reasons: firstly, discussion of the opportunity cost of family labour is postponed until Chapter 11 for comparison with other household activities. Secondly, whilst the Survey could indicate whether family equipment was used, there was no quantifiable data on such use. Finally, it was felt that the value of land was not relevant to a single period analysis of current household employment and income.

These inputs are briefly reviewed in turn.

6.1.2.a Sawah

Ninety percent of farmers cultivated rice in both the wet and the dry seasons of 1982/83 (Table 6.1). All farmers in midland C and upland G who cultivated rice did so in both seasons, but there were a few farmers in the other four desa who did so for only one season that year, due to either lack of water or changing tenurial status.

Sawah land cultivated for rice was summed across the two seasons of 1982/83 in order to allow for double-cropping, which meant that average sawah size per farmer was 0.85 hectares (Table 6.1). Twenty percent of farmers cultivated less than 0.25 hectares, over half cultivated between 0.25 and 0.99 hectares and one quarter cultivated 1 hectares or more. These are referred to as small, medium and large farmers respectively in this thesis.

The cost of sawah as calculated excludes the opportunity cost of owner-operated land. However, as much as 44 percent of farmers were tenants - two-thirds of tenants were already cultivating some sawah
### TABLE 6.2

**RICE CULTIVATION: INPUTS, YIELDS & RETURNS, by Tenurial Status**

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th></th>
<th>Pure Owners</th>
<th>Owner-Tenants</th>
<th>Pure Tenants</th>
<th>Rice Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Rice Farmers</td>
<td>56</td>
<td>31</td>
<td>13</td>
<td>100</td>
</tr>
<tr>
<td>Average Farm Size (ha)</td>
<td>.61</td>
<td>1.29</td>
<td>.83</td>
<td>.85</td>
</tr>
<tr>
<td>Fertiliser Application (kg/ha):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Urea</td>
<td>290</td>
<td>280</td>
<td>290</td>
<td>290</td>
</tr>
<tr>
<td>- TSP</td>
<td>140</td>
<td>120</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>Labour (hours/ha):</td>
<td>1,530</td>
<td>1,260</td>
<td>1,170</td>
<td>1,400</td>
</tr>
<tr>
<td>Of Which (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Family</td>
<td>49</td>
<td>40</td>
<td>42</td>
<td>45</td>
</tr>
<tr>
<td>- Hired Pre-Harvest</td>
<td>34</td>
<td>38</td>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td>- Hired Harvest</td>
<td>17</td>
<td>22</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>Costs of Production (’000 Rp/ha)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Material Inputs</td>
<td>50</td>
<td>40</td>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>- Hired Labour</td>
<td>125</td>
<td>135</td>
<td>135</td>
<td>130</td>
</tr>
<tr>
<td>- Taxes</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>- Total Non-Rent</td>
<td>185</td>
<td>185</td>
<td>180</td>
<td>185</td>
</tr>
<tr>
<td>- Land Rent</td>
<td>-</td>
<td>70</td>
<td>180</td>
<td>45</td>
</tr>
<tr>
<td>Total Costs/ha</td>
<td>185</td>
<td>255</td>
<td>360</td>
<td>230</td>
</tr>
<tr>
<td>Of Which (% of total costs):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Material Inputs</td>
<td>31</td>
<td>19</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>- Hired Labour</td>
<td>63</td>
<td>52</td>
<td>39</td>
<td>56</td>
</tr>
<tr>
<td>- Taxes</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>- Land Rent</td>
<td>-</td>
<td>25</td>
<td>48</td>
<td>15</td>
</tr>
<tr>
<td>Total Costs (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

*contd.*
TABLE 6.2 contd.

<table>
<thead>
<tr>
<th>Pure Owners</th>
<th>Owner-Tenants</th>
<th>Pure Tenants</th>
<th>Rice Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yields, by location (tonnes/ha):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowland</td>
<td>4.3</td>
<td>4.1</td>
<td>4.6</td>
</tr>
<tr>
<td>Midland</td>
<td>4.4</td>
<td>4.2</td>
<td>4.2</td>
</tr>
<tr>
<td>Upland</td>
<td>3.2</td>
<td>3.4</td>
<td>3.7</td>
</tr>
<tr>
<td>Average All Farms</td>
<td>3.8</td>
<td>3.9</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Rice Crop Marketing:

<table>
<thead>
<tr>
<th></th>
<th>% Farmers Marketing</th>
<th>% of Crop Marketed by Sellers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Farmers Marketing</td>
<td>of Crop Marketed by Sellers</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>54</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>29</td>
</tr>
</tbody>
</table>

Returns ('000 Rp/ha):

<table>
<thead>
<tr>
<th></th>
<th>Gross Returns/ha</th>
<th>Net Returns/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>710</td>
<td>520</td>
</tr>
<tr>
<td></td>
<td>720</td>
<td>460</td>
</tr>
<tr>
<td></td>
<td>830</td>
<td>480</td>
</tr>
<tr>
<td></td>
<td>730</td>
<td>500</td>
</tr>
</tbody>
</table>

Net Returns, in milled rice equivalents (kg):

<table>
<thead>
<tr>
<th></th>
<th>per farm</th>
<th>per hhld member</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,030</td>
<td>270</td>
</tr>
<tr>
<td></td>
<td>2,040</td>
<td>480</td>
</tr>
<tr>
<td></td>
<td>1,410</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>1,390</td>
<td>340</td>
</tr>
</tbody>
</table>

% of farms earning < 240 kg m.r.e. per member from rice:

<table>
<thead>
<tr>
<th></th>
<th>65</th>
<th>43</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63</td>
<td>58</td>
</tr>
</tbody>
</table>

Notes: (1) a. Pure Owners: rice farmers cultivating their own sawah only.
b. Owner-Tenants: rice farmers both cultivating sawah of their own
and renting sawah as tenants.
c. Pure Tenants: rice farmers renting all the sawah they cultivated.
(2) Sawah size: sum of area cultivated in both seasons.
(3) a. Material Input Costs: expenditure on seeds, fertilisers and
pesticides (less landlord's contribution, where applicable).
b. Hired Labour Costs: wages plus value of meals provided to
labourers.
b. Net Returns: gross returns less costs.
(5) Net Returns in kg m.r.e. (milled rice equivalents): returns in Rp
divided by average consumer price paid in 1982/83 by that household
for milled rice (beras). 240 kg m.r.e. per member = poverty line.

of their own - and rent payments accounted for forty percent of tenants' calculated total costs of production (Table 6.2).

6.1.2.b Equipment and Material Inputs

The Survey recorded the cost of hiring capital equipment together with the cost of hiring the labour which worked it. This means that hired equipment costs were included under labour costs and their use is discussed together with hired labour. Unfortunately, there was no data for calculating the cost of own equipment use.

Material inputs consisted of seed, fertilisers and pesticides. Farmers used both modern, high-yielding and traditional rice seed varieties, but lowland farmers used only the modern ones whilst traditional varieties dominated in the midland and upland areas. All farmers applied urea (nitrogen) and 97 percent of them applied TSP (phosphorus), while almost two-thirds also used organic fertilisers (mainly manure). Forty percent applied pesticides to their crops.

The calculation of material input costs excluded the contributions made by landlords under sharecropping agreements, while discussion of quantities always included total amounts applied, irrespective of whether the farmer paid for them.

6.1.2.c Labour

Javanese rice cultivation is said to be the most labour intensive in Asia. In comparing the labour absorption of rice cultivation in different Asian countries, Barker [1982, Table 13] found that Java had the highest labour per hectare and the highest labour intensity per kilogramme of crop (lowest labour productivity), as well as the
highest proportion of hired labour in total labour. Javanese rice cultivation contrasts even with elsewhere in Indonesia, using twice as much family labour and five times more hired labour per hectare than the Outer Islands [Booth et al. 1981, p.43].

There are also differences in labour use within Java. A mean 1,400 labour hours per hectare were spent in rice cultivation by the farmers in the Cimanuk River Basin Survey (Table 6.1). This is similar to results of studies elsewhere in West Java (1,500 hours per hectare [Kasrnyo et al. 1980, p.68]). Other studies, of Central and East Java, suggest that these employed significantly less labour per hectare (950 hours [Montgomery 1981, p.103] and 1,150 hours [Collier et al. 1982, p.15]). These could be accounted for by social and/or cultivation differences, but the articles did not sufficiently detail research methods to allow a direct comparison to be made with the Survey.

Hired labour accounted for 55 percent of total rice labour and was therefore more important than family labour (Table 6.1). The main reasons for hiring labour in from outside the household are the major three time constraints in rice cultivation (land preparation, transplanting and harvesting), but many farmers also hired for tasks at other periods; only 3 percent of farmers did not hire any labour at all. This figure is comparable with other studies in Java, such as 61 percent in West Java [Kasrnyo et al. 1980, p.68] and 55 percent in East Java [Collier et al. 1982, p.16].

Labour costs calculated were those paid to hired labour. These were the sum of:

- (1) Wages paid in cash;
- (2) Value of meals provided to workers, including tobacco allowances to men; and

- (3) Harvesters' crop shares, valued at harvest-time rice prices.

Indeed, almost all harvest labour was hired, the family usually playing a supervisory role. The converse is that over 90 percent of family labour was used in pre-harvest work. From the farmer households' point of view, there was a significant difference in the composition of pre-harvest and harvest labour.¹

Pre-harvest labour was hired by virtually all, 97 percent, of farmers and it accounted for two-thirds of total hired labour, similar to the estimates of Kikuchi et al. [1979, p.39] elsewhere in West Java. This meant that one rice task alone, harvesting, accounted for one-third of hired labour, 90 percent of farmers hiring labour for harvest work. The farmers who did not hire labour for harvesting cultivated small plots of less than 0.25 hectares of sawah and had moderately large families.

6.1.2.d Taxes

The two main taxes paid to Government by rice farmers were IPEDA, the agricultural land tax, and irrigation charges:

- (1) two-thirds of farmers paid IPEDA, officially calculated as five percent of net annual income from land; and

- (2) less than half of farmers paid water supply charges, since these were levied only for technical irrigation laid on by the Government.

¹ From the labourers point of view, the various types of agricultural labour contracts are discussed and compared in Chapter 9.
6.1.2.e Costs of Production

Table 6.2 shows the relative importance of the four types of costs - material inputs, hired labour, taxes and land rent - in total costs of rice production.

Hired labour costs, which include the costs of hired equipment where relevant, accounted for 56 percent of total costs on average. Thus labour costs were by far the largest single component of total costs for most farmers. The exceptions were tenants: rent payments accounted for almost 50 percent of pure tenants' total costs (farmers renting all the sawah they cultivated).

The second most important component of total costs (on average) were those for material inputs, which, after deductions for landlord sharecroppers' contributions, accounted for 25 percent of total costs. Taxes were by far the smallest component of total costs, accounting for less than 5 percent.

6.1.3 Yields and Returns to Rice Cultivation

Having briefly looked at inputs, this section briefly reviews rice crop output.

Mean rice yield in the Cimanuk River Basin for the two 1982/83 seasons was almost four (3.9) tonnes per hectare of unmilled rice (gabah). This was somewhat less than the all-Indonesia wet-rice mean for the same year, 4.2 tonnes per hectare [Biro Pusat Statistik 1984, p.21], which is high compared to most Asian countries except Japan [de Datta 1981, p.2].
A corollary of subsistence farming is the low proportion of crop marketed. In the Cimanuk River Basin, merely one-fifth of the rice crop produced was marketed. (Note, however, that on average 11 percent of crop produced had already gone as harvesters' shares). Only 70 percent of rice farmers sold a portion of their crop - the proportion of farmers participating in the rice sellers' market was smaller than the proportion in the labour input buyers' market (97 percent). In addition, the sellers sold on average only 30 percent of crop.

Gross returns were calculated as sales plus crop retained for own consumption valued at consumer prices. Since only two percent of farmers sold any of their rice in milled (beras) rather than unmilled (gabah) form, beras consumer prices were converted into gabah equivalents.

6.2 RICE VARIETIES AND RICE CULTIVATION

The different rice varieties planted by farmers have often been associated with other changes in rural Java:

- (1) The spread of modern varieties is often assumed to be due to the Government sponsored BIMAS programmes;
- (2) Mubyarto et al. [1982, p.203] have pointed out that purchase of modern varieties and necessary attendant material inputs have led to increasing commercialisation of rural areas in general;

2. Gabah price = beras price x 0.68.
- (3) Prabowo and Sajogyo [1981, p.74] and others have noted falls in demand for pre-harvest labour concomitant with the introduction of modern rice varieties;

- (4) Pinnaduwage [1976, p.9] found that the higher yields of modern varieties have led to falling crop shares to harvesters; and so on.

This section looks at these arguments in greater detail and tests the extent to which they applied to the Cimanuk River Basin.

6.2.1 Modern and Traditional Rice Varieties

The modern varieties reported by the Cimanuk River Basin farmers were either "IR" varieties or such varieties adapted to Javanese conditions through crossing with local traditional ones. With shorter stems and shorter growing periods, modern varieties are more dependent on well-controlled water, so that they would be expected to be more common in the technically irrigated lowlands.

As already mentioned, all lowland rice farmers planted modern varieties in both seasons (Table 6.1). By contrast, traditional varieties dominated in the midland and upland areas, albeit with considerable variation between the desa: 75 percent of midland S farmers planted modern varieties at least once in 1982/83, but less than 10 percent of midland C farmers did so. Farmers in the two upland desa also contrasted in the seed varieties they planted: almost one-third of upland M planted modern varieties at least once, but upland G farmers planted only traditional ones.

3. From the International Rice Research Institute in the Philippines, and therefore not based on Javanese native javonica seeds.
### TABLE 6.3

**RICE CULTIVATION: DETERMINANTS OF HIRED LABOUR**

(Regression Analysis)

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>Independent Variables:</th>
<th>Farm Sawah Size (ha)</th>
<th>Lowland Location (dummy: 1=lowland 0=not)</th>
<th>Constant</th>
</tr>
</thead>
</table>

#### A. Dependent Variable: Pre-Harvest Hired Labour (hours).

Average = 430 hours.

- **Regression Coefficients:** 480 -144 99
- **t-values:** (18.510) (-2.768)
- **Adjusted R²:** 0.57
- **F ratio:** 175.42

#### B. Dependent Variable: Pre-Harvest Hired Male Labour (hours).

Average = 220 hours.

- **Regression Coefficients:** 215 -182 98
- **t-values:** (14.225) (-5.566)
- **Adjusted R²:** 0.44
- **F ratio:** 101.84

#### C. Dependent Variable: Pre-Harvest Hired Female Labour (hours).

Average = 210 hours.

- **Regression Coefficient:** 279
- **t-value:** (19.114)
- **Adjusted R²:** 0.58
- **F ratio:** 365.34

**Note:** Variables tested but found not to be statistically significant:
- rice variety
- household size (number of adults, children:adults ratio, etc)
- tenurial status

**Source:** 1983 Cimanuk River Basin Survey, 263 households growing rice.
6.2.2 Rice Varieties and BIMAS participation

The dominance of modern varieties in the lowlands would suggest high lowland participation in BIMAS (Chapter 3), since one of its principle aims was to diffuse their use. In fact, only 14 percent of lowland farmers were participants, as compared with almost 40 percent of midland C farmers (Table 6.1). However, in general very few midland C farmers planted modern varieties at all (id.) and only 6 percent of BIMAS participants did so. As far as the Cimanuk River Basin in 1982/83 is concerned, the link between BIMAS participation and the planting of modern varieties was tenuous.

6.2.3 Modern Varieties and Pre-Harvest Labour

Data from the Survey showed that lowland hired pre-harvest labour was 30 percent less on a per hectare basis than elsewhere (Table 6.1). This smaller demand for hired pre-harvest labour has been noted by a number of authors in other lowland areas of Java and some have associated this with the planting of modern varieties there [e.g. Collier 1981, 1982; Kasrnyo 1982, 1984; Montgomery 1981]. It was therefore thought useful to check whether the use of modern varieties had affected demand for pre-harvest hired labour in the Cimanuk River Basin.

In testing these effects through regression analysis, it was found (Table 6.3) that modern varieties were not statistically significant in determining variations in pre-harvest hired labour hours, as long as the dummy variable for the lowlands was included. Thus specific reference to agro-climatic zone apparently overrode the effects of rice variety. This can be explained with reference to mechanisation in land preparation and weeding in lowland Java, as follows.
6.2.3.a Modern Varieties and Land Preparation

The 1970s saw the introduction and the rapid increase of 5 h.p. tractors in lowland Java. Tractor owners undertake contract work for farmers in the knowledge that water controlled by technical irrigation networks flows downhill in a pre-planned schedule. Tractors have a major effect on the demand for labour: a tractor can prepare a sawah field for planting in 15 percent of the time it takes by hand-hoeing and 40 percent of the time it takes with cattle and plough [Sinaga 1976, p.3].

The popularity of tractors in lowland Java has been traced by different authors to a number of causes.

- (1) Sinaga [1976, p.4] felt that tractors became common because Government policies encouraged those with some spare cash to obtain credit for buying agricultural machinery.

- (2) Others, such as Lingard and Bagyo [1983, p.60], argued that the adoption of tractors was due more directly to seasonal labour shortages in lowland Java at peak periods.

- (3) Due partly to these shortages, the rise of real wages by 32 percent between 1971 and 1981 in lowland Java was another reason for adopting tractors [Kasryno 1983, quoted in Mazumdar and Sawit 1986, p.95].

- (4) It could also be argued that tractors are particularly attractive to larger farmers, who are more common in the lowlands, since hiring tractors involves little supervision or cooking compared with the three meals a day traditionally offered to a necessarily large group of manual labourers.

- (5) Finally, as far as the Cimanuk River Basin specifically was concerned, the building of a major dam in the 1970s had made the
arrival of water during the dry season more reliable, but simultaneously reduced the turn-around time between crops in the lowlands, so that land preparation needed to be accomplished more quickly than previously necessary. Indeed, when the author visited the lowland areas of the Cimanuk River Basin in 1987, tractors were ploughing the fields throughout the night.

None of the Survey farmers owned a tractor. When hired, the tractors were driven by their owners and the farmer paid a total rent for both machine and man. 20 percent of lowland and 18 percent of midland S farmers hired tractors, but none in midland C or either upland desa. This meant that less labour was hired for hoeing in the lowlands and midland S. The tightness of the water schedule is shown by the fact that three-quarters of the farmers who hired tractors did so only in the dry season, which is the shorter of the two.

6.2.3.b Modern Varieties and Weeding

Another way modern varieties may affect pre-harvest labour is through greater weed growth. This is stronger with modern varieties since these have less vegetation (more sunlight reaches the soil) and require more fertilisers, which further encourage weeds. This would, ceteris paribus, lead to a higher demand for weeding labour. However, if herbicides and/or mechanical weeders are used, these will reduce weeding labour. The use of pesticides (herbicides and insecticides) was highest in the lowlands, where the intensity of pre-harvest labour was smallest (Table 6.1). However, the Survey data did not differentiate between herbicides and insecticides, so
the specific effect of herbicide use on weeding labour cannot be estimated.

Rotary weeders have become increasingly common in lowland Java, where straight-row planting is usual. Their effect on labour is considerable: they have been estimated to cut handweeding time by 70 percent [Collier 1981, p.32]. Collier attributed their use to modern varieties, but as Sinaga [1977, p.6] pointed out, they could be used equally well for the traditional varieties. The only condition is that the rice should be planted in straight rows, which is less common in hilly areas. This again points to the importance of location in explaining variations in demand for labour.

Thus the Cimanuk River Basin data suggests that lower levels of pre-harvest hired labour intensity in the lowlands were due not so directly to the planting of modern varieties but more to mechanisation, in turn caused by
- (1) lowland irrigation time constraints,
- (2) labour shortages in peak periods, and
- (3) Government subsidised credit programmes.

These same factors were associated with the use of modern varieties, hence the link between modern varieties and less hiring of pre-harvest labour. The Cimanuk River Basin data suggests, however, that this link was not necessarily direct nor causal.

6.2.4 Rice Varieties and Yields

It is generally held that modern varieties produce higher yields per hectare than traditional ones. However, modern varieties are unable to achieve their potentially high yields without high rates of fertiliser [Vergara 1979]. At low input levels, traditional
TABLE 6.4
RICE CULTIVATION : DETERMINANTS OF RICE CROP YIELDS
(REGRESSION ANALYSIS)
Cimanuk River Basin, 1982/83

A. Dependent Variable : Yields from Modern Rice Varieties (kg/ha).
   Average = 4,243 kg/ha.

<table>
<thead>
<tr>
<th>Independent Variables:</th>
<th>Urea (kg/ha)</th>
<th>TSP (kg/ha)</th>
<th>Pure Tenancy (dummy: 1=pure tenant, 0=not)</th>
<th>Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression Coefficients:</td>
<td>6.1</td>
<td>3.1</td>
<td>690</td>
<td>2,548</td>
</tr>
<tr>
<td>t-values:</td>
<td>(3.414)</td>
<td>(5.502)</td>
<td>(2.341)</td>
<td></td>
</tr>
<tr>
<td>Adjusted $R^2$:</td>
<td>0.47</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-ratio:</td>
<td>28.73</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Dependent Variable: Yields from Traditional Varieties (kg/ha).
   Average = 3,642 kg/ha.

<table>
<thead>
<tr>
<th>Independent Variables:</th>
<th>TSP (kg/ha)</th>
<th>Midland Location (dummy: 1=midland, 0=not)</th>
<th>Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression Coefficients:</td>
<td>2.0</td>
<td>729</td>
<td>2,868</td>
</tr>
<tr>
<td>t-values:</td>
<td>(3.414)</td>
<td>(5.502)</td>
<td></td>
</tr>
<tr>
<td>Adjusted $R^2$:</td>
<td>0.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-ratio:</td>
<td>9.14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: (1) Pure Tenants: rice farmers renting all the sawah they cultivated.
(2) Variables tested but found not to be statistically significant: - farm size - irrigation quality - quantity of seed - pesticide use - pre-harvest labour (per hectare, family, hired...)

varieties can produce more per hectare than modern ones. This perhaps explains why Booth [1979, p.60-61], using data from the national Agricultural Surveys, found that fertilisers explained only fifteen percent of yield differences in rice crops.

In the Cimanuk River Basin, farmers planting modern varieties indeed achieved average yields per hectare 17 percent higher than those planting traditional varieties. In addition, farmers using modern varieties
- (1) were mostly lowlanders (73 percent).
- (2) cultivated twice as much sawah, and
- (3) used 8-14 percent more fertilisers per hectare than farmers using traditional varieties.

Thus crop yields could be affected by location (agro-climatic zone and soil quality), sawah size and rates of fertiliser as well as seed variety. The major factors affecting yields in the Cimanuk River Basin were therefore tested through regression analysis, treating modern and traditional varieties separately.

In the case of crop yields from modern varieties, the intensity of both urea and TSP use were statistically significant and important, explaining 45 percent of variations in yields (Table 6.4). The picture was quite different for traditional varieties. Rate of urea per hectare was statistically neither significant nor important and TSP, whilst significant, explained little of variations in yields. So, it appears that fertilisers were important in explaining yield differences, but only for modern varieties. Indeed, yields varied more by location than either farm size or variety (Table 6.1).
6.2.5 Modern Varieties and Harvest Labour

The use of modern varieties could also affect the demand for harvest, as distinct from pre-harvest, labour. This section examines these effects in the Cimanuk River Basin.

It seems reasonable that greater yields per hectare would require more labour effort in harvesting. Lowland farmers, who cultivated only modern varieties, indeed hired more harvest labour in hours per hectare than midland or upland farmers (Table 6.1).

Even where potential increased yields due to modern varieties have led to increases in hired harvest labour hours, it is possible that crop shares to harvesters had been reduced, as Pinnaduwage [1976] found in India. It was therefore decided to test whether crop shares were lower where modern varieties were more common. In fact, the Survey data indicates that the proportions of crop paid to harvest labourers were greater in the lowlands, where only modern varieties were grown: harvesters hired by lowland farmers received usually one-sixth of the crop harvested, whilst those hired in the midland and upland desa received one-eleventh or one-twelfth (Table 6.1). As against Pinnaduwage [1976], these findings are consistent with Kasrino and Chong's [1984, p.8] observations of rising real wages in rural lowland Java in the 1970s and early 1980s.

6.2.6 Modern Varieties and Costs of Production

Collier et al. [1981, p.8] estimated higher costs of production with modern varieties - modern variety seeds are more expensive, they
require more fertilisers per hectare and more maintenance work, whether by hand or mechanically.

In the Cimanuk River Basin, however, per hectare costs were highest for midland farmers, who planted both modern and traditional varieties, rather than lowland farmers, who planted modern varieties only. Midland farmers used more fertilisers per hectare, especially the relatively expensive TSP. Moreover, they paid higher hired labour costs (per hectare), because of greater (and cheaper) tractor use in the lowlands as well as the differential effects of the various hired labour contracts prevailing in each desa (Chapter 9).

6.2.7 Modern Varieties and Returns to Cultivation

Lowland W rice farmers earned high returns per hectare from the high yields they achieved from modern varieties (Table 6.1). However, one factor offsetting the increasing preference for modern varieties is that traditional varieties command higher prices per kilogramme because of consumer preferences. This explains why rice farmers in midland C, whilst cultivating traditional varieties almost exclusively, earned the second highest average returns per hectare in the Cimanuk River Basin.

6.3 LOCATION AND RICE CULTIVATION

That rice cultivation is affected by location - by which is meant climate, soil, altitude and accessibility - seems an almost foregone conclusion. However, very little of the literature deals with this explicitly. Those effects of location on rice cultivation which are associated with varieties have already been discussed. In this
TABLE 6.5

RICE CULTIVATION: DETERMINANTS OF FERTILISER USE
(REGRESSION ANALYSIS)
Cimanuk River Basin, 1982/83

A. Dependent Variable: Urea (kg per farm). Average = 245 kg.

<table>
<thead>
<tr>
<th>Independent Variables:</th>
<th>Farm Sawah Size</th>
<th>At least one household member working full-time in non-agriculture</th>
<th>Tenancy</th>
<th>Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(hectares)</td>
<td>(dummy: 1=yes 0=no)</td>
<td>(dummy: 1=tenant 0=not)</td>
<td></td>
</tr>
<tr>
<td>Regression Coefficients:</td>
<td>210</td>
<td>34</td>
<td>29</td>
<td>9</td>
</tr>
<tr>
<td>t-values:</td>
<td>(29.777)</td>
<td>(1.699)</td>
<td>(2.005)</td>
<td></td>
</tr>
<tr>
<td>Adjusted R^2:</td>
<td>0.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-ratio:</td>
<td>333.70</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Dependent Variable: TSP (kg per farm). Average = 120 kg.

<table>
<thead>
<tr>
<th>Independent Variables:</th>
<th>Farm Sawah Size</th>
<th>Midland Location</th>
<th>Tenancy</th>
<th>Share-cropping</th>
<th>Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(hectares)</td>
<td>(dummy: 1=midland 0=not)</td>
<td>(dummy: 1=tenant 0=not)</td>
<td>(dummy: 1=sharecropper 0=not)</td>
<td></td>
</tr>
<tr>
<td>Regression Coefficients:</td>
<td>87</td>
<td>23</td>
<td>19</td>
<td>-15</td>
<td>12</td>
</tr>
<tr>
<td>t-values:</td>
<td>(21.864)</td>
<td>(2.787)</td>
<td>(1.938)</td>
<td>(-1.437)</td>
<td></td>
</tr>
<tr>
<td>Adjusted R^2:</td>
<td>0.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-ratio:</td>
<td>139.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: (1) Tenancy: includes all rice farmers who were tenants (44 %)
(2) Variables tested but found not to be statistically significant:
- irrigation quality
- rice variety
- farmer extension programme (BIMAS etc.) participation

section, other effects of location, especially accessibility, on fertiliser use, labour intensity and crop sales, are considered.

Accessibility is defined in terms of road quality and distance to urban areas. First impressions would suggest that the lowland desa close to either Cirebon city (lowland W) or the Cirebon-Jakarta highway (lowland L) have easy access to markets. However, when the quality of connecting links is taken into account, the two midland desa are better off.

6.3.1 Location and Fertiliser Use

Widodo [1986] noted that West Javan farmer households sought off-farm employment sometimes specifically in order to pay for the purchased inputs (fertilisers and seeds). As already seen, midland farmers used more fertilisers per hectare than lowland rice farmers (Table 6.1). Among other reasons, this could be explained by easy access to fertiliser supplies obtainable in urban areas, so it was felt necessary to test the relationship between location and fertiliser use.

6.3.1.a Inorganic Fertilisers

In the case of inorganic fertilisers, tests differentiated between urea and TSP: urea is more necessary and more easily obtained, whilst TSP is more expensive.

In the Cimanuk River Basin, as Widodo [1986] suggested, farms used more urea when someone from their households was working full-time in non-agricultural wage employment or trade (Table 6.5), which was most common in the two midland desa (Chapter 10). TSP use was even more clearly related to location, the dummy for midlands being
statistically significant and important. Neither rice variety nor participation in farmer extension (BIMAS) programmes were statistically significant in determining the use of fertilisers.

There seemed to be two factors at work. Firstly, accessibility provided better access to education and extension services in the midlands. This could in turn have led to both better farm management, including the informed use of fertilisers, and to urban employment in Government administration, hence a steady flow of cash income, which was more common in the midlands than elsewhere in the Cimanuk River Basin. (Non-agricultural employment in lowland W, which was close to Cirebon city, was mostly seasonal). The second possible factor was agro-climatic: the midlands were open to greater production risks than the lowlands, especially in the cultivation of modern varieties, because water is better controlled in the lowlands with their technically irrigated sawah. Whilst greater risk might in general discourage farmers from higher production costs, the importance of rice in household total income and the effects of fertilisers in increasing yields probably combined to overcome this.

In conclusion, it appears that
- (1) intensity of fertiliser use in rice cultivation was related to access to other, year-round, sources of cash income;
- (2) intensity of fertiliser use hardly differed between farms with modern or traditional varieties;
- (3) fertiliser use explained variations in modern variety yields only (section 6.2.4.).
6.3.1.b Organic Fertilisers

In addition to the widespread use of inorganic fertilisers, almost 40 percent of midland farmers used organic fertilisers (mainly manure). This contrasted with less than five percent of either lowland or upland farmers doing so. The most immediate reason for this was the availability of pasture for cattle, which depends on location.

Pasture is an uneconomic use of lowland areas. Most lowland arable land is technically irrigated sawah, which can usually guarantee two rice crops and possibly a third, non-rice, crop per year. In any case, tractors are now a cheaper and more efficient form of power for ploughs than cattle. Pasture is also less economic in the uplands: upland sawah plots are usually too small to justify non-manual land preparation and the cooler upland climate encourages the cultivation of many vegetables and fruits, which can fetch high prices in cities, rather than pasture for livestock. In addition, farmers are forbidden to allow cattle to use upland dirt roads during the wet season, so that family members would have to spend time each day searching for fodder.

Midland sawah plots are often sufficiently large to warrant ploughing with cattle power, cattle are a common form of investment (Chapter 7) and pasture may be an economic use of land which cannot be cultivated for sawah rice or high value crops. A contributing factor might also be greater midland area production risks, as already mentioned. Thus a larger proportion of midland than lowland or upland farmers used organic fertilisers, even though the midland farmers were already applying more inorganic fertilisers too.
### Table 6.6

**Rice Cultivation: Labour Intensity per kg of Crop Produced (Hours/kg)**

*by Desa, Farm Size and Tenurial Status*

**Cimanuk River Basin, 1982/83**

<table>
<thead>
<tr>
<th>Lowland</th>
<th>Midland</th>
<th>Upland</th>
<th>C.R.B. Rice Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
</tbody>
</table>

**A. By Farm Size**

<table>
<thead>
<tr>
<th></th>
<th>Small Farms</th>
<th>Medium Farms</th>
<th>Large Farms</th>
<th>Average Labour/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Labour/kg</td>
<td>32</td>
<td>23</td>
<td>19</td>
<td>24</td>
</tr>
<tr>
<td>Family Labour/kg</td>
<td>19</td>
<td>10</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Hired Labour/kg</td>
<td>13</td>
<td>13</td>
<td>15</td>
<td>13</td>
</tr>
</tbody>
</table>

**B. Total Labour/kg, by Tenurial Status**

<table>
<thead>
<tr>
<th></th>
<th>Pure Owners</th>
<th>Owner-Tenants</th>
<th>Pure Tenants</th>
<th>Average Labour/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Harvest</td>
<td>26</td>
<td>24</td>
<td>22</td>
<td>24</td>
</tr>
</tbody>
</table>

Notes:

1. Kg of crop = gross quantity harvested (*gabah*).
2. a. Small Farms: less than 0.25 hectares total of sawah cultivated in 1982/83.
   b. Medium Farms: 0.25 to 0.99 hectares inclusive.
   c. Large Farms: 1 hectare or more.
3. a. Pure Owners: rice farmers cultivating their own sawah only.
   b. Owner-Tenants: rice farmers both cultivating sawah of their own and renting sawah as tenants.
   c. Pure Tenants: rice farmers renting all the sawah they cultivated.

TABLE 6.7

RICE CULTIVATION: DETERMINANTS OF FAMILY LABOUR USE

(REGRESSION ANALYSIS)

Cimanuk River Basin, 1982/83

Dependent Variable: Family Labour in Rice Cultivation (hours per farm). Average = 330.

<table>
<thead>
<tr>
<th>Independent Variables:</th>
<th>Adults per Household</th>
<th>Farm Size</th>
<th>Proximity to urban areas</th>
<th>Tenant sharecropper</th>
<th>At least one member working full-time in non-agriculture</th>
<th>Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(number)</td>
<td>(ha)</td>
<td>(dummy: 1=easy access, 0=not)</td>
<td>(dummy: 1=sharecropper, 0=not)</td>
<td>(dummy: 1=yes, 0=no)</td>
<td></td>
</tr>
</tbody>
</table>

Regression Coefficients: 66  92  -120  102  -74  103

t-values: (4.829)  (6.151)  (-3.899)  (2.983)  (-1.668)

Adjusted R²: 0.30  F-ratio: 21.92

Notes: (1) Family Labour: over 90 percent was in pre-harvest work.
(2) Variables tested but found not to be statistically significant:
- rice variety
- irrigation quality

6.3.2 Location and Labour Intensity

Geertz [1963, p.63] explained the extremely labour-intensive rice sawah cultivation of Java as being the outcome of a process of "agricultural involution" in response to population pressure caused by "Western intrusion" in colonial sugar plantation [p.63]. In his view, high labour intensity in rice cultivation was a passive response to deliberate pressure and led to a contraction of economic development. Boserup [1965, p.27] on the other hand argued that increased labour-intensity in developing countries was a dynamic response to population growth; the additional people employed in agriculture would raise yields to feed the growing population despite the dire predictions of the Malthusian school.

The data from the Cimanuk River Basin shows that rice cultivation was indeed labour intensive per kilogramme of crop produced. Labour intensity was greater:
- in upland, less accessible areas;
- on smaller farms; and
- on farms which were wholly owned (Table 6.6).

In differentiating between family and hired labour, hired labour intensity per kg varied less than that of family labour, which accounted for the most of the variations in total labour intensity.

Looking at variations in family labour hours, statistical analysis showed that sawah size, proximity to urban areas and participation in full-time non-agriculture were statistically more important than household size (Table 6.7). Family labour intensity, both per hectare and per kilogramme of crop, was particularly high in upland M (Tables 6.1 and 6.6). This can be explained by upland M's
### TABLE 6.8

**RICE CULTIVATION: FARM CHARACTERISTICS, INPUTS & YIELDS, by Sawah Size**

*Cimanuk River Basin, 1982/83*

<table>
<thead>
<tr>
<th>Location (% of rice farms):</th>
<th>&lt; 0.25</th>
<th>&lt; 1.00</th>
<th>≥ 1.00</th>
<th>All Rice Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowland</td>
<td>20</td>
<td>26</td>
<td>51</td>
<td>32</td>
</tr>
<tr>
<td>Midland</td>
<td>36</td>
<td>36</td>
<td>21</td>
<td>32</td>
</tr>
<tr>
<td>Upland</td>
<td>44</td>
<td>38</td>
<td>28</td>
<td>36</td>
</tr>
<tr>
<td><strong>Total Rice Farms</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Household Size:</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults (Aged 14+)</td>
<td>2.4</td>
<td>2.8</td>
<td>3.2</td>
<td>2.9</td>
</tr>
<tr>
<td>Children (Under 14)</td>
<td>1.5</td>
<td>1.8</td>
<td>1.9</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>Members per Household</strong></td>
<td>3.9</td>
<td>4.6</td>
<td>5.1</td>
<td>4.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% of Rice Farms Headed by Women</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24</td>
<td>9</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bimas Participation (% of farms)</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
<td>12</td>
<td>26</td>
<td>15</td>
</tr>
</tbody>
</table>

**Fertiliser Application (kg/ha):**

<table>
<thead>
<tr>
<th></th>
<th>&lt; 0.25</th>
<th>&lt; 1.00</th>
<th>≥ 1.00</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea</td>
<td>340</td>
<td>290</td>
<td>250</td>
<td>290</td>
</tr>
<tr>
<td>TSP</td>
<td>180</td>
<td>140</td>
<td>100</td>
<td>140</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Labour Hours per farm</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>260</td>
<td>690</td>
<td>2130</td>
<td>980</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Of Which (%)</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>61</td>
<td>48</td>
<td>27</td>
<td>45</td>
</tr>
<tr>
<td>Hired</td>
<td>39</td>
<td>52</td>
<td>73</td>
<td>55</td>
</tr>
</tbody>
</table>

**Labour Intensity (hours/ha):**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>1,160</td>
<td>660</td>
<td>300</td>
<td>660</td>
</tr>
<tr>
<td>Pre-Harvest Hired</td>
<td>480</td>
<td>470</td>
<td>530</td>
<td>490</td>
</tr>
<tr>
<td>Harvest Hired</td>
<td>230</td>
<td>240</td>
<td>280</td>
<td>250</td>
</tr>
<tr>
<td><strong>Total Hired</strong></td>
<td>720</td>
<td>710</td>
<td>810</td>
<td>740</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Labour/ha</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,880</td>
<td>1,370</td>
<td>1,110</td>
<td>1,440</td>
</tr>
</tbody>
</table>

contd.
Table 6.8 contd.

<table>
<thead>
<tr>
<th></th>
<th>- Sawah Cultivated, in hectares -</th>
<th>All Rice Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 0.25</td>
<td>&lt; 1.00</td>
</tr>
<tr>
<td>Costs of Production ('000 Rp/ha):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Material Inputs</td>
<td>60</td>
<td>45</td>
</tr>
<tr>
<td>- Hired Labour</td>
<td>110</td>
<td>125</td>
</tr>
<tr>
<td>- Taxes</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>- Land Rent</td>
<td>35</td>
<td>50</td>
</tr>
<tr>
<td>Total Costs/ha</td>
<td>215</td>
<td>230</td>
</tr>
<tr>
<td>Yields (tonnes/ha)</td>
<td>4.10</td>
<td>3.92</td>
</tr>
<tr>
<td>Returns ('000 Rp/ha):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Gross Returns/ha</td>
<td>770</td>
<td>725</td>
</tr>
<tr>
<td>- Net Returns/ha</td>
<td>555</td>
<td>495</td>
</tr>
<tr>
<td>Rice Crop Marketing:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Farms Marketing</td>
<td>32</td>
<td>74</td>
</tr>
<tr>
<td>% of Crop Marketed by Sellers</td>
<td>26</td>
<td>28</td>
</tr>
<tr>
<td>Net Returns, in milled rice equivalents (kg):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- per farm</td>
<td>280</td>
<td>885</td>
</tr>
<tr>
<td>- per household member</td>
<td>90</td>
<td>225</td>
</tr>
<tr>
<td>- % of farms earning &lt; 240 kg m.r.e. per member from rice</td>
<td>94</td>
<td>67</td>
</tr>
</tbody>
</table>

Notes:
(1) Sawah size: sum of area cultivated in both seasons.
(2) Bimas: Government-sponsored farmer extension programmes (Chapter 3).
(3) a. Material Inputs: seeds, fertilisers and pesticides.
   b. Net Returns: gross returns less costs.
(5) Net Returns in kg m.r.e. (milled rice equivalents): returns in Rp divided by average consumer price paid in 1982/83 by that household for milled rice (beras).
   240 kg m.r.e. per member = Sajogyo's [1975] poverty line.

relative inaccessibility, with little opportunity for non-agricultural employment, and small sawah size, which is consistent with results presented in Chapters 9 and 10. These results emphasize the importance of other rural activities, such as the cultivation of other staples and non-agricultural employment, which for the most part were ignored by Geertz [1963]. In agreement with Boserup [1965], Collier [1981b, p.166] concluded that the "evolution of change within the village is a much more dynamic process than... otherwise envisaged in... agricultural involution".

However, the family can do only so much. In facing up to the time constraints which rice cultivation imposes, additional labour needs must be met by hiring labour. In the Cimanuk River Basin, the intensity of hired labour per hectare was therefore greatest in the lowlands where sawah size was largest and time constraints greatest due to the water schedule imposed by technical irrigation and the use of quicker-maturing modern varieties (Table 6.1).

6.3.3 Location and Crop Sales

The third effect of location reviewed in this section relates to crop sales. Little of the literature on rice cultivation in Java deals with the marketing of crops from the farmers' point of view. When looking at a rural economy based on subsistence agriculture, a good reason for selling crops is for farmers to obtain cash to settle debts, especially those incurred in purchasing seeds, inorganic fertilisers and possibly hiring tractors. Crop sales, however, depend on farmers' access to markets - hence the link between location and marketing.
The proportion of farmers marketing some of their rice crop and the proportion of crop sold were both greatest in lowland L and upland G, where such marketing was encouraged by relatively large sawah, a generally more commercial agriculture (Chapter 7) and a lack of easy access to non-agricultural cash incomes. Distance from urban areas also explains why upland M sellers, with small average sawah size, sold a relatively large portion (one-third) of their small crops. This is consistent with observations made in Chapters 7 and 11 that upland M households depended on secondary staples for own consumption and earned low total incomes.

6.4 SAWAH SIZE AND RICE CULTIVATION

The effect of size of holdings on agricultural production and income is a common theme in development literature. This section will therefore review the relationship of sawah size and factors such as labour, production costs, modern technology and returns in rice production.

6.4.1 Sawah Size and Labour

Small farms used high levels of labour, using seventy percent more labour per hectare than large farms (Table 6.8). This difference was almost entirely due to differences in intensity of family labour: subsistence requirements mean that as much as possible needs to be extracted from small plots of sawah, as long as marginal returns to labour remain positive, so that households with small farms were more likely (than those with large farms) to work on their own farms on days when they could not find casual employment.
This apparent dualism in family labour has been used by some authors to justify the existence of surplus labour in their models (see Chapter 2), but, as Binswanger and Rosenzweig [1981] pointed out, is caused simply by different opportunity costs of family labour leading to differing factor use.

Nevertheless, hired labour is important even on small rice farms. In the Cimanuk River Basin, hired labour accounted for 40 percent of total rice labour on small farms (less than 0.25 hectares) (Table 6.8). A number of factors account for the high levels of hired labour on small farms [Booth et al. 1982, p.52].
- (1) The time constraints of peak periods, particularly in land preparation, transplanting and harvesting.
- (2) Land preparation was done exclusively by men, but one-quarter of small farms were run by households consisting of a woman head of household and her children. These households therefore had to hire men for land preparation.
- (3) Some tenant farmers were required to work on their landlord's sawah at certain times and needed to hire labour to perform tasks on their own sawah.
- (4) Some farm household members could earn more by working in non-agriculture. This is discussed more fully in Chapter 10.

6.4.2 Sawah Size and Costs of Production

It is often expected that average cost will be lower for larger farms, showing either economies of scale or simply lower input levels. In the Cimanuk River Basin, material input costs per hectare were indeed lower on larger farms, but both hired labour costs and rent per hectare were higher (Table 6.8). The reason why
more a symptom of rural economies characterised by "interlinked" markets than a natural attitude of developing country farmers.

Semi-subsistence farmers maximise profits subject to their production constraints, but limit crop sales to retain enough for their own consumption. For example, Wolgin [1975] showed that smallholders in Kenya combined both the risk-aversion and the profit-maximisation attitudes: they maximised utility rather than income, utility being a function of the variance of income as well as its average level.

In the Cimanuk River Basin, small farms earned net returns per hectare twelve percent greater than the average (Table 6.8). Net returns per hectare to rice cultivation were therefore less unequally distributed than sawah area. Leaving aside family labour, which would be valued at different opportunity costs for different sized farms, there is no clear evidence that small farms were earning lower returns to inputs.

6.4.4 Sawah Size and Modern Rice Technology

There is much discussion in the development literature as to whether modern technology has been taken up more quickly by larger farmers than small ones [e.g. Yotopoulos and Nugent 1976]. The technological gap is said to lead to a yield (and income) gap, thereby forcing small farmers into selling their land and either moving into low-wage non-agricultural employment or renting some sawah back.

One feature of the spread of modern technology is participation in Government farmer extension programmes, which disseminate modern
variety seeds, inorganic fertilisers, technical know-how, and so on. It is often assumed that large farms have preferential access to such programmes. At first sight, this seems to apply to the Cimanuk River Basin: only six percent of small farms but one-quarter of large farms participated in BIMAS (Table 6.8). Nevertheless, only one in four large farms took part and comparisons with Table 6.1 show that participation in BIMAS was more a function of location than sawah size. This section therefore continues its review of the technological gap between small and large farms by concentrating on lowland Java only, where technological advance in rice production has been greatest.

Small lowland farms in the Cimanuk River Basin participated less in BIMAS, used fewer pesticides and hired fewer tractors than large farms in the area. However, this did not affect yields: tractor use essentially influenced the time for land preparation, whilst it was found that pesticides and participation in BIMAS were not statistically significant determinants of yields. On the other hand, rice variety and fertiliser use levels were statistically significant determinants of yields differences in the Cimanuk River Basin (Table 6.4), but all lowland farmers, irrespective of size of holding, were planting modern varieties by 1982/83 and small farmers applied more than twice as much fertiliser per hectare than large farmers.

The suggested technological gap between small and large farms did not affect yields (and therefore returns) in the lowland Cimanuk River Basin. Indeed, small lowland farms produced yields 37 percent

4. Indeed, pesticides can be correlated with lower yields, since they are often applied where there has been or is likely to be pest damage.
higher and earned gross returns per hectare 45 percent higher than large lowland farms did. Nevertheless, small farms earned small incomes from rice, only eight percent of the average incomes of large farms. Thus small lowland farmers were not so much "poor but efficient" [Schultz 1964] but were poor despite earning even higher returns to inputs.

6.5 TENANCY AND RICE CULTIVATION

44 percent of farmers were tenants, 70 percent of these already cultivating some rice on their own land. Differing access to land for cultivation may affect inputs into production, yields, sales or returns and much of the development literature discusses whether tenancy leads to inefficiencies in production. Some of these topics are addressed in this section.

6.5.1 Tenancy and Farmer Efficiency

Whilst direct supervision of tenants is hardly possible for landlords, they have other ways of ensuring that tenants adhere to their side of the bargain through "interlinkages". These exist where two agents, such as a landlord and a tenant, trade in at least two markets simultaneously, determining all the contracts or terms of trade at the time [Bell and Srinivasan 1989]. For example, landlords and tenants act together in the land market and may also act together:

- (1) in the labour market (the landlord hires some member of the tenant's family);
- (2) in the credit market (the landlord lends to the tenant);
### TABLE 6.9

**RICE CULTIVATION: HOURS PER FARM & PER HOUSEHOLD MEMBER, by Sawah Size**

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>Sawah Cultivated, in hectares</th>
<th>All Rice Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.25</td>
<td></td>
</tr>
<tr>
<td>&lt; 1.00</td>
<td></td>
</tr>
<tr>
<td>≥ 1.00</td>
<td></td>
</tr>
</tbody>
</table>

#### Labour per farm (hours):

<table>
<thead>
<tr>
<th></th>
<th>&lt; 0.25</th>
<th>&lt; 1.00</th>
<th>≥ 1.00</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>160</td>
<td>300</td>
<td>510</td>
<td>330</td>
</tr>
<tr>
<td>Hired Pre-Harvest</td>
<td>70</td>
<td>260</td>
<td>1,060</td>
<td>430</td>
</tr>
<tr>
<td>Hired Harvest</td>
<td>30</td>
<td>130</td>
<td>560</td>
<td>220</td>
</tr>
<tr>
<td>Total Hired</td>
<td>100</td>
<td>390</td>
<td>1,620</td>
<td>650</td>
</tr>
</tbody>
</table>

Total Labour Hours per farm: 260 690 2,130 980

#### Family Labour per household adult (hours):

<table>
<thead>
<tr>
<th></th>
<th>&lt; 0.25</th>
<th>&lt; 1.00</th>
<th>≥ 1.00</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>70</td>
<td>115</td>
<td>170</td>
<td>120</td>
</tr>
</tbody>
</table>

Notes: (1) Sawah size: sum of area cultivated in both seasons.

(RICE CULTIVATION) 92

- (3) in the agricultural input market (the landlord contributes to the purchase of material inputs); and so on [Bardhan 1980].

In Java specifically, Hüsken [1979, p.144] noted that landlords offered interest-free loans to their tenants.

Bhadhuri [1973] described interlinkages as forms of exploitation or "semi-feudal" arrangements. Bell and Srinivasan [1989] tested this empirically in India and found that interlinked transactions were more common in wealthier, fertile and commercialised areas and between affluent farmers and rural-urban traders. Interlinkages were therefore not necessarily symptomatic of the exploitation of the poor by the wealthy and there was no reason to expect a sub-optimal use of land resources by tenants.

As far as the Cimanuk River Basin is concerned, pure tenants (those not already operating sawah of their own) in both the lowlands and uplands produced higher yields per hectare than pure owners or owner-tenants in the same locations (Table 6.9). Regression analysis suggested that pure tenants produced higher yields from modern varieties even after allowing for the effects of fertilisers, sawah size, location and pre-harvest labour (Table 6.4). The missing factor appears to be a managerial one which encouraged pure tenants to extract as much as possible from sawah. There is therefore no evidence for tenant inefficiency in terms of yields in the Cimanuk River Basin, consistent with other results for West Java, which found no efficiency differences between owners and tenants [Kasryno et al. 1982, p.vi].

Certainly it cannot be disputed that owners enjoy more secure access to land than tenants. However, analysis of the Cimanuk River Basin
showed that there was an important fourth class of owner-tenants, who cultivated sawah on average larger than pure owners, as did pure tenants. Indeed, even after allowing for the important cost of rents, both pure and owner-tenants earned higher net returns per farm from rice production than pure owners (Table 6.2). In some respects, therefore, the average tenant or owner-tenant had higher economic status than the average owner-operator.

6.5.2 Forms of tenancy: Sharecropping, Renting and Mortgaging

So far the discussion has not differentiated between different tenancy contracts. However, the type of relationship between the landlord and the tenant may influence tenants' use of sawah. This relationship is mainly characterised by the land contract: whether rent is fixed or variable, whether it is in cash or in kind and whether the landlord contributes to any input costs.

Three forms of tenancy were noted in the 1983 Cimanuk River Basin Survey: sharecropping (55 percent of tenants), renting (36 percent) and mortgaging (16 percent) 5.

- (1) Sharecropping rent is variable and in kind, being a proportion of crop produced. The landlord pays a certain (in theory, similar) proportion of material input costs and possibly taxes, but labour input is the tenant's responsibility, as land is the landlord's. According to the national Sharecropping Act of 1960, the tenant should receive at least half of the crop.

- (2) Renting is usually less complicated than sharecropping, the fixed rental payment being determined by sawah size, sawah irrigation quality and the season. Tenants who rent rather than

5. 7 percent of tenants leased in sawah through more than one form of tenancy.
sharecrop need to cover all production costs themselves and therefore tend to be initially somewhat wealthier households. This may explain why sharecropping was the more common form of tenancy in each of the six desa in the Cimanuk River Basin Survey.

- (3) A mortgager is an owner lacking cash and/or capital, who mortgagess some of his/her sawah to another farmer. This "landlord" pays the material input costs and taxes and the mortgager pays back a pre-determined fixed amount of cash at the end of the season. Should he/she default on payment, ownership passes to the creditor. Note, however, that the areas of sawah mortgaged in the Cimanuk River Basin were usually only a fraction of the sawah owned by the mortgager.

6.5.3 Sharecropping

Sharecropping has been considered as exploitation of tenants by landlords, more so than other types of tenancy [e.g. Sen 1966]. If this were so, sharecropping would dominate in areas characterised by high landlessness and therefore poor bargaining positions for tenants. In the Cimanuk River Basin, this would be the lowlands (Chapter 5).

However, data from the 1983 Survey showed that sharecropping was far more common in the midlands than elsewhere: sharecroppers accounted for 74 percent of tenants in the two midland desa, as compared with 52 and 39 percent of tenants in the upland and lowland desa respectively.

This appears to agree with Cheung [1969], whose arguments suggested that sharecropping would dominate in areas of greater production uncertainty (the midlands, in the Cimanuk River Basin). Cheung
explained the existence of different forms of tenancy in developing countries as the outcome of different risk scenarios. In the case of a risk-averse landlord and a risk-neutral tenant, the latter would bear the risk burden and rent from the former for a fixed rental payment, assuming this had the lowest expected average cost. In the case of both a risk-averse landlord and a risk-averse tenant, production uncertainty would be shared through a sharecropping contract 6. (Contract terms would vary according to the management and other human capital skills the tenant offered [Newbery and Stiglitz 1979]).

6.5.3.a Sharecropping: Landlords' Contributions and Rent Payments

Sharecroppers in the Cimanuk River Basin paid rents on average equivalent to around half (51 percent) of crop value (gross returns) and landlords' contributions to material input costs were on average also around half (43 percent). However, it should be noted that tenants had to pay for all hired labour (necessary because of time constraints) and that sharecroppers' labour costs per hectare were over 3 times their material input costs per hectare.

As Cheung [1969] suggested, payments under sharecropping in the Cimanuk River Basin tended to be higher than under rental contracts: renters paid only one-third as much rent as sharecroppers in terms of rice crop value.

In the light of the literature on landlessness and pure tenancy in lowland Java [White and Wiradi 1979; Kasryno 1983], it is interesting to note that in the Cimanuk River Basin, lowland 6. Cheung's approach also included an explanation of wage labour, this being the contract in the case of a risk-neutral landlord and a risk-averse tenant.
sharecroppers paid their landlords a smaller proportion of total crop (41 percent) than sharecroppers elsewhere. This was partly due to relative lowland labour shortages and hence the lowland owners' desire to ensure labour supply at peak periods, by offering potential hired labourers the possibility of sharecropping some sawah in the following season under favourable terms as tenants.

6.5.3.b Sharecropping: Farmer Incentives and Crop Yields

There is much literature on the effects of sharecropping on farmer efficiency. Sen [1966] argued that since the tenant sharecropper would receive less than the increase in output from increased input use, his incentive to raise production would be less than that for an owner-operator or a tenant paying fixed rent. In the Cimanuk River Basin, regression analysis showed that TSP use was negatively related to sharecropping, although this variable was statistically significant only at the 15 percent level (Table 6.4).

On the other hand, it can also be argued that sharecropping encourages higher input use, by sharing the cost of inputs. For example, Kasryno et al. [1982, p.v] found in Java that sharecropping was more common where yields per hectare were high. In the Cimanuk River Basin, sharecroppers planting modern varieties achieved the same yields per hectare as the average (4.23 t/ha) and those planting traditional varieties achieved yields slightly higher than the average (3.78 t/ha - compare with Table 6.4).

There was therefore no direct causal relationship between sharecropping and yields in the Cimanuk River Basin and although sharecroppers may have used less TSP than other farmers,
sharescropping was not associated with lower yields, as Sen [1966] predicted.

6.6 THE RELATIVE IMPORTANCE OF RICE CULTIVATION

Examination of the 1983 Cimanuk River Basin Survey data confirmed that rice sawah cultivation was highly labour intensive (Table 6.1). However, an employee in an industrialised country works on average 1,800 hours per year (37.5 hours per week for 48 weeks). By contrast, in the Cimanuk River Basin a total of just under 1,000 hours per farm were put into rice cultivation over the two seasons and, because of hired labour, the family together worked only 330 hours per farm (Table 6.9). An adult member of a rice farming household thus worked on average only 120 hours per year on the farm: "it is clear that rice agriculture... provides employment to families operating the mean-sized unit for only a small fraction of the days they have available" [Papanek 1985, p.45]. It is therefore necessary to look at what the households did with the rest of their time. This is undertaken in the Chapters to come.

In the meantime, it is important to establish to what extent rice played a role in bringing in adequate income. Using Sajogyo's [1975] income poverty line of 240 kilogrammes of milled rice equivalents (m.r.e.) per household member, the average rice farm in the Cimanuk River Basin did earn enough from rice production alone to be above this poverty line: average rice income (net returns) was 335 kg m.r.e. (Tables 6.1, 6.2, 6.8).
However, it was mostly only large farms which earned enough to support their families: almost 90 percent of large farms (1 hectare or more) earned at least 240 kg m.r.e. per member (Table 6.8). Small farms, despite their high net returns per hectare, earned on average less than 40 percent of the poverty line value from rice; only 6 percent of small farms earned enough to support their families. Rice incomes of medium-sized farms (average 0.5 hectares) were also generally inadequate, since only one-third earned more than the poverty line.

There were of course differences among farms in the same sawah size class: the same size of sawah could lead to different net returns per household member, due to a combination of factors such as location (irrigation quality, soil quality, accessibility), rice variety, fertiliser use; tenurial status and dependence on hired labour.

To sum up: not only was own-rice employment inadequate to cover labour hours available for work, but 60 percent of rice farmers did not earn enough from rice production alone to support their households for the year. 45 percent earned less than 180 kg m.r.e. per member from rice production, which is Sajogyo's [1975] destitution line. Clearly, employment in and income from activities other than rice cultivation were necessary for these farm households to survive.
CHAPTER 7

OTHER FARMING IN THE CIMANUK RIVER BASIN

Whilst rice cultivation dominates the Javanese landscape, other forms of farming have long been important too. Raffles [1817, p.110] observed that in addition to rice, the Javanese farmer raised "all the vegetables, fruit and poultry requisite for his own consumption". This is still very much the case today, with both rice farmers and sawahless households cultivating dry fields (tegal) and the gardens surrounding their houses, raising farm livestock and poultry, and farming fish ponds.

For the households in the 1983 Cimanuk River Basin Survey, such farming activities accounted on average for twenty percent of remunerated labour time and fifteen percent of household total income. In this Chapter, these farming activities will be examined in turn.

7.1 PALAWIJA CULTIVATION

The area devoted to non-rice field crops (palawija) by the households surveyed was small, accounting for only 13 percent of total land cultivated, compared with 82 percent for rice sawah (Table 7.1). Thus of the households cultivating palawija (almost all doing so in addition to cultivating rice), almost half worked less than 0.1 hectares to these "secondary" crops. Over eighty
### TABLE 7.1

**PALAWIJA CULTIVATION, by Desa**

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>Palawija Cultivators (as % of households surveyed)</th>
<th>42</th>
<th>36</th>
<th>86</th>
<th>65</th>
<th>80</th>
<th>93</th>
<th>66</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Land Cultivated:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>as % of total surveyed</td>
<td>8</td>
<td>5</td>
<td>29</td>
<td>16</td>
<td>10</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>Of Which (%):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Dry Fields</td>
<td>28</td>
<td>2</td>
<td>67</td>
<td>98</td>
<td>100</td>
<td>45</td>
<td>61</td>
</tr>
<tr>
<td>- Non-Rice Sawah</td>
<td>72</td>
<td>98</td>
<td>33</td>
<td>2</td>
<td>-</td>
<td>54</td>
<td>39</td>
</tr>
<tr>
<td>Palawija Land</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>B. Food Staples Cultivation:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Palawija Cultivators</td>
<td>55</td>
<td>21</td>
<td>95</td>
<td>94</td>
<td>59</td>
<td>96</td>
<td>77</td>
</tr>
<tr>
<td>% of These Marketing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palawija Food Staples</td>
<td>67</td>
<td>75</td>
<td>35</td>
<td>27</td>
<td>61</td>
<td>41</td>
<td>42</td>
</tr>
<tr>
<td><strong>C. Labour Hours per household:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Family</td>
<td>270</td>
<td>150</td>
<td>130</td>
<td>150</td>
<td>290</td>
<td>150</td>
<td>180</td>
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<tr>
<td>- Hired</td>
<td>70</td>
<td>10</td>
<td>100</td>
<td>90</td>
<td>60</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Total Labour</td>
<td>340</td>
<td>160</td>
<td>230</td>
<td>240</td>
<td>350</td>
<td>180</td>
<td>240</td>
</tr>
<tr>
<td>Labour per Hectare</td>
<td>3,410</td>
<td>1,040</td>
<td>1,450</td>
<td>1,390</td>
<td>4,850</td>
<td>1,580</td>
<td>2,300</td>
</tr>
<tr>
<td><strong>D. Costs and Returns ('000 Rp per household):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Material Costs</td>
<td>9</td>
<td>4</td>
<td>9</td>
<td>4</td>
<td>18</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>- Labour Costs</td>
<td>9</td>
<td>1</td>
<td>14</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>- Rent &amp; Taxes</td>
<td>13</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total Costs</td>
<td>31</td>
<td>7</td>
<td>27</td>
<td>16</td>
<td>26</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>Gross Returns</td>
<td>55</td>
<td>54</td>
<td>63</td>
<td>44</td>
<td>215</td>
<td>46</td>
<td>83</td>
</tr>
<tr>
<td>Net Returns</td>
<td>24</td>
<td>47</td>
<td>36</td>
<td>28</td>
<td>189</td>
<td>37</td>
<td>64</td>
</tr>
<tr>
<td><strong>E. Marketing:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Cultivators Marketing</td>
<td>73</td>
<td>74</td>
<td>50</td>
<td>45</td>
<td>92</td>
<td>43</td>
<td>60</td>
</tr>
<tr>
<td>% Marketed by Sellers</td>
<td>50</td>
<td>65</td>
<td>46</td>
<td>46</td>
<td>87</td>
<td>26</td>
<td>57</td>
</tr>
</tbody>
</table>

**Notes:**

1. Palawija: non-rice crops grown in fields.
2. Palawija staples: maize, cassava and sweet potatoes.
3. Hired Labour: all labour from outside the household.
4. a. Material Costs: expenditure on seeds and fertilisers.
   b. Labour Costs: wages plus value of meals provided.
   c. Gross Returns: sum of crops valued at sale prices.
   d. Net Returns: gross returns less costs of production.

**Source:** 1983 Cimanuk River Basin Survey, 205 palawija cultivating households.
percent of households which cultivated some palawija practised mixed cropping, with at least two crops being grown simultaneously.

Such small dimensions may explain why although palawija crops have received some attention in the macroeconomic literature, their importance for individual households is rarely quantified or compared with other sources of household income. There are good reasons, however, for examining the role of palawija cultivation in the Cimanuk River Basin.

- (1) Two-thirds of households surveyed cultivated palawija, as compared with eighty-five percent cultivating rice.
- (2) Palawija cultivation was sometimes the only form of farming for households without access to rice sawah land. Over one-third of households classified as landless in rice sawah terms cultivated palawija, which therefore becomes an important factor in studying the rural landless.
- (3) The extent to which palawija were cultivated on sawah land due to insufficient time or water for a rice crop reflected the adequacy of irrigation.
- (4) Palawija cultivation involved a substantial amount of market participation by cultivators. Almost every palawija cultivator purchased seeds and fertilisers and more than half hired non-household labour for palawija crop production. In addition, sixty percent sold crops and about half of their crop went to market.
- (5) Finally, with increased priority placed by the Government on the production of non-rice crops, it is important to establish which

1. "No less than six or eight kinds of vegetables are sometimes... seen to shoot up promiscuously in a single field" [Raffles 1817, p.117].
2. See especially the quarterly "Surveys of Recent Developments" in the Bulletin of Indonesian Economic Studies.
of these are the most remunerative, taking into account production
risks, the demands of rice cultivation and accessibility to markets.

These issues are addressed by looking at the characteristics of
palawija cultivation in the Cimanuk River Basin. Comparisons are
drawn between the desa, between households cultivating small and
large areas for palawija crops and between households cultivating
small and large areas of rice sawah. Palawija and rice cultivation
are also compared and contrasted.

7.1.1 Palawija Crops and Location

All palawija crops cultivated were food crops for family
consumption. The exception was one household in upland M, which
cultivated only cloves for sale. The foods were mostly
- (1) rice substitutes, known as secondary staples: maize, cassava,
sweet potatoes; or
- (2) rice complements: pulses, peanuts, green vegetables 3.

A few cultivators concentrated on growing cash food crops such as
chillies. It should be noted that 1983 was considered "an excellent
year not only for rice but also for all the major palawija crops"
[Booth 1984, p.22].

Due to the small average size of sawah holdings on Java, own rice
production is usually inadequate to satisfy household demand for
staple foods (Chapter 6). Thus whilst Java produces about half of
Indonesia's rice crop, it also produces 80 percent of the nation's
production of cassava, 75 percent of maize and 60 percent of sweet

3. From a nutritional point of view, pulses are essential
accompaniments to a rice meal which lacks other sources of proteins.
The rice protein is incomplete of itself and cannot be fully
absorbed by the human body, but the proteins in pulses supplement
and complete this.
potatoes [Birowo and Hansen 1981, p.2]. However, the Javanese consider these other staples as inferior to rice and prefer to spend income on the latter. Tabor et al. [1989, pp.31,44] estimated maize and cassava prices to be very sensitive to changes in rice prices, whilst demand for rice was highly inelastic with respect to both own-price and cross-prices with other staples.

The different palawija crops grown in the Cimanuk River Basin thus indicated the extent to which households' staple food requirements were being met (or failed to be met) by rice production. Maize, cassava and sweet potatoes were therefore more common where rice sawah size was small and/or irrigation inadequate for a dry season rice crop. More specifically, palawija crops grown in the lowlands were the third sawah crop, additional to the two annual rice crops which were grown from early-maturing modern varieties. In view of high rice yields per hectare and relatively large rice areas in the lowlands, the lowland palawija crops were mostly rice complements - pulses, beans and chillies - rather than substitute staples. It also follows that those lowlanders who did cultivate staples were more likely to market them than palawija staple cultivators elsewhere (Table 7.1).

Rice farmers in midland C and upland G also grew two rice crops per year, but since these were the slower-maturing traditional varieties, the farmers cultivated palawija only on tegal (permanently dry land) and not on sawah. Because of smaller sawah and lower rice yields than in the lowlands, the main palawija crops cultivated here included cassava and maize (staples) as well as pulses and chillies.
In midland S and upland M, small sawah size and inadequate technical irrigation meant that mainly secondary staples were grown instead of rice in the dry season. Four-fifths of midland S palawija cultivators cultivated cassava and maize and these households together actually outnumbered rice farmers in this desa, although rice remained the most important single staple. Peanuts were also a common crop in midland S. In upland M, where sawah size was smallest, every palawija cultivator grew sweet potatoes and/or cassava and/or maize.

7.1.1.a Upland G: A Special Case of Palawija

Consistent with the history of the Garut District (Chapter 4), almost every upland G palawija cultivator grew chillies and some green vegetables for market sale rather than own consumption. (Unfortunately the questionnaire did not allow them to specify these other vegetables). Less than half grew staples, which was in sharp contrast to the other five desa, for even lowland W palawija cultivators growing chillies also grew maize.

This distinction between upland G and the other desa is clear from Table 7.1: 85 percent of palawija crop produced in upland G was sold on the market and net returns were at least 4 times those elsewhere, although these market-oriented cultivators spent cash on relatively costly seeds and fertilisers. With the current search

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5. Net returns = total crop value less costs of production. Total crop value = sum of crops valued at local sale prices. Costs = sum of paid-out costs of material inputs, hired labour, and rent and land taxes. As for rice production, the opportunity cost of family labour and equipment was not included. Note that only seven percent of palawija cultivators were tenants, as compared with 44 percent of rice farmers.
among agricultural policy planners for non-rice crops which yield good returns per hectare, such facts may be important to bear in mind.

Policy planners also aim to find crops which can absorb family labour during the slack rice cultivation periods, especially in areas with high unemployment and limited off-farm job opportunities. Households cultivating palawija used on average only 180 household labour hours per annum, equivalent to only half an hour a day. However, demand could come in very significant peaks, supplying employment and income during slack rice cultivation periods. In both per household and per hectare terms, the upland G chillies etc. were quite labour absorptive, using more than twice the average (Table 7.1). The relatively large use of family labour in lowland W was equally due to chilli cultivation there, although this was always mixed with other crops and therefore not as intensive as in upland G.

Chilli cultivation had less effect on the hired labour market, for although upland G cultivators hired most labour per hectare, the absolute amount of hired labour and was greatest in the midlands. This parallels the importance of hired labour in midland rice cultivation and suggests that the hiring of labour was influenced by location (accessibility, local customs) as well as by the crop cultivated (time constraints and peak labour use periods).

7.1.2 Palawija Cultivation and Land Size

The next point of analysis was to see whether palawija cultivation characteristics varied between small, medium and large areas of land cultivated with palawija crops, as they did for rice cultivation
### TABLE 7.2

**PALAWIJA CULTIVATION, by Palawija Land Size**

Cimanuk River Basin, excluding upland G, 1982/83

<table>
<thead>
<tr>
<th>Palawija Land Size, In Hectares</th>
<th>Palawija Cultivating Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;.10</td>
<td>&lt;.25</td>
</tr>
</tbody>
</table>

| % of Palawija Cultivators | 43 | 37 | 20 | 100 |

### A. Labour Hours per hectare:

- **Family**
  - 2,100
  - 1,060
  - 540
  - 1,400
- **Hired**
  - 220
  - 280
  - 440
  - 300

**Total**

- 2,330
- 1,340
- 980
- 1,700

### B. Costs and Returns ('000 Rp/ha):

- **Gross Returns**
  - 366
  - 352
  - 246
  - 336
- **Total Costs**
  - 94
  - 85
  - 114
  - 95
- **Net Returns**
  - 272
  - 267
  - 132
  - 241

### C. Marketing:

- **% Farmers Marketing**
  - 32
  - 64
  - 74
  - 54
- **% of Crop Marketed By Sellers**
  - 44
  - 46
  - 45
  - 44

**Notes:**

1. Palawija: non-rice crops grown in fields.
2. Upland G palawija farms were excluded due to their disproportionate effects on figures (see Table 7.1).
3. Hired Labour: all labour from outside the household.
   b. Total Costs: sum of expenditure on seeds and fertilisers, wages paid and value of meals provided to hired workers, and rent and taxes.
   c. Net Returns: gross returns less costs.

**Source:** 1983 Cimanuk River Basin Survey, 166 palawija cultivating households
(Table 7.2). Upland G palawija cultivators were excluded from this analysis, due to their disproportionate effect on cost, sale and return figures.

Consistent with the literature on small farms in developing countries, as well as with the results in Chapter 6 on rice farming, households with larger palawija plots of land used less labour per hectare than households with smaller plots, especially in the case of family labour. Hired labour accounted for a higher percentage of total labour on larger plots (over 40 percent).

It is usual that larger farms are further from subsistence and sell more of their crop. The situation in the Cimanuk River Basin was not so straightforward, since although households with larger plots devoted to palawija crops were more likely to sell some of their crop, all who marketed sold about half of crop value whatever the size of their palawija plot. This can be explained partly with reference to the size of the households' rice sawah land, as discussed in the next section.

7.1.3 Palawija Cultivation and Rice Sawah Size

As already mentioned, there were strong links between rice sawah and palawija land, since 90 percent of households cultivating palawija were rice farmers, but the type of link varied by topographical zone. In the lowlands, more sawah per household meant more land to cultivate palawija as a third crop after two rice crops, so that large plots of palawija crops were associated with large rice farms for the same household. By contrast, lack of adequate irrigation in midland S and upland M forced households to grow palawija instead of
### TABLE 7.3

**DETERMINANTS OF GROSS RETURNS TO PALAWIJA CULTIVATION**

**(REGRESSION ANALYSIS)**

Cimanuk River Basin, excluding upland G, 1982/83

**Dependent Variable:** Gross Returns (Rp). Average = 35,000 Rp.

**Independent Variables:**
- Material Input Costs
- Hired Labour Rice Sawah Cultivated

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Material Input Costs (Rp)</th>
<th>Hired Labour (hours)</th>
<th>Rice Sawah Cultivated (hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression Coefficients:</td>
<td>4.4</td>
<td>133.7</td>
<td>10,962</td>
</tr>
<tr>
<td>t-values:</td>
<td>(6.648)</td>
<td>(2.870)</td>
<td>(2.657)</td>
</tr>
<tr>
<td>Constant:</td>
<td>10,259</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Adjusted R²:** 0.53  
**F-ratio:** 61.534

**Notes:**
1. Palawija: non-rice crops grown in fields.
2. Upland G palawija farms were excluded due to their disproportionate effects on figures (see Table 7.1).
4. Material Input Costs: expenditure on seeds and fertilisers.
5. Hired Labour: all labour from outside the household.

**Source:** 1983 Cimanuk River Basin Survey, 166 palawija cultivating households
## TABLE 7.4

**PALAWIJA CULTIVATION, by Sawah Size**

Cimanuk River Basin, excluding upland G, 1982/83

<table>
<thead>
<tr>
<th>Sawah Cultivated, in hectares</th>
<th>Palawija Cultivating Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>9</td>
</tr>
<tr>
<td>&lt;.25</td>
<td>17</td>
</tr>
<tr>
<td>&lt;1.00</td>
<td>55</td>
</tr>
<tr>
<td>&gt;1.00</td>
<td>19</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

### A. Land Cultivated:

<table>
<thead>
<tr>
<th>% of Palawija Cultivators</th>
<th>9</th>
<th>17</th>
<th>55</th>
<th>19</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>in hectares</td>
<td>.20</td>
<td>.11</td>
<td>.17</td>
<td>.30</td>
<td>.18</td>
</tr>
</tbody>
</table>

### B. Food Staples Cultivation:

<table>
<thead>
<tr>
<th>% of Cultivators</th>
<th>79</th>
<th>90</th>
<th>85</th>
<th>66</th>
<th>81</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of These Marketing Palawija Food Staples</td>
<td>36</td>
<td>15</td>
<td>42</td>
<td>62</td>
<td>39</td>
</tr>
</tbody>
</table>

### C. Costs and Returns (’000 Rp/ha):

<table>
<thead>
<tr>
<th>Gross Returns</th>
<th>308</th>
<th>446</th>
<th>310</th>
<th>323</th>
<th>336</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Costs</td>
<td>151</td>
<td>80</td>
<td>89</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>Net Returns</td>
<td>157</td>
<td>366</td>
<td>221</td>
<td>223</td>
<td>241</td>
</tr>
</tbody>
</table>

### D. Marketing:

<table>
<thead>
<tr>
<th>% Farmers Marketing</th>
<th>43</th>
<th>17</th>
<th>57</th>
<th>78</th>
<th>54</th>
</tr>
</thead>
</table>

Notes:
1. Palawija: non-rice crops grown in fields.
2. Upland G palawija farms were excluded due to their disproportionate effects on figures (see Table 7.1).
3. Hired Labour: all labour from outside the household.
   b. Total Costs: sum of expenditure on seeds and fertilisers, wages paid and value of meals provided to hired workers, and rent and taxes.
   c. Net Returns: gross returns less costs.

Source: 1983 Cimanuk River Basin Survey, 166 palawija cultivating households
rice, so that households cultivating large plots for palawija were mostly those which did not cultivate much rice sawah land.

Regression analysis (Table 7.3) showed that size of rice sawah cultivated was statistically related to palawija crop value, as were the cost of material inputs and the amount of hired labour. This was because households with more rice sawah could "afford" to cultivate non-staples, which usually command higher prices than staple palawija. Thus larger rice sawah was associated with higher gross returns from non-rice cultivation (Table 7.4). This is consistent with later findings that rice sawah is closely linked to other, non-rice, sources of household income (Chapter 11).

Palawija cultivators which had no rice sawah were entirely dependent on their palawija for own-produced staples (Table 7.4). This probably explains why a very high proportion of these households practised mixed cropping and also why they were relatively generous on material inputs and hired labour. A significant proportion sold some of their palawija crops, even staples. This was perhaps due to the inferiority of secondary staples (sell these and purchase rice) as well as household needs for cash income, which could not be got from rice sales.

7.1.4 Palawija Versus Rice Cultivation

Palawija cultivation is conditioned by the labour as well as land demands of rice cultivation. Even in pre-colonial Java, "the favoured [smallholder] crops were perennials demanding not so much attention that they would prevent the farmer from also growing his rice crop" [Reid 1984, p.155]. Some palawija crops can be cultivated at any time of year, to fit in land and labour
### TABLE 7.5

**RICE AND PALAWIJA CULTIVATION COMPARED, by Land Size Class**

_Cimanuk River Basin, excluding upland G palawija, 1982/83_

<table>
<thead>
<tr>
<th>No. of Households</th>
<th>0.1 - 0.249 ha. for:</th>
<th>0.25 - 0.99 ha. for:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rice</td>
<td>Palawija</td>
</tr>
<tr>
<td>A. Labour Hours per hectare:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Family</td>
<td>1,010</td>
<td>1,060</td>
</tr>
<tr>
<td>- Hired</td>
<td>740</td>
<td>280</td>
</tr>
<tr>
<td>Total Labour</td>
<td>1,750</td>
<td>1,340</td>
</tr>
<tr>
<td>B. Costs and Returns (‘000 Rp/ha):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Costs</td>
<td>57</td>
<td>33</td>
</tr>
<tr>
<td>Labour Costs</td>
<td>119</td>
<td>34</td>
</tr>
<tr>
<td>Rent &amp; Taxes</td>
<td>51</td>
<td>18</td>
</tr>
<tr>
<td>Total Costs</td>
<td>227</td>
<td>85</td>
</tr>
<tr>
<td>Gross Returns</td>
<td>606</td>
<td>352</td>
</tr>
<tr>
<td>Net Returns</td>
<td>379</td>
<td>267</td>
</tr>
<tr>
<td>C. Marketing:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Farmers Marketing</td>
<td>38</td>
<td>64</td>
</tr>
<tr>
<td>% Marketed By Sellers</td>
<td>26</td>
<td>46</td>
</tr>
</tbody>
</table>

**Notes:**
1. Palawija: non-rice crops grown in fields.
2. Upland G palawija farms were excluded due to their disproportionate effects on figures (see Table 7.1).
3. Hired Labour: all labour from outside the household.
   b. Total Costs: sum of expenditure on seeds and fertilisers, wages paid and value of meals provided to hired workers, and rent and taxes.
   c. Net Returns: gross returns less costs.

**Source:** 1983 Cimanuk River Basin Survey, 184 rice & 104 palawija farmers
### TABLE 7.6

DESA UPLAND G: RICE AND PALAWIJA CULTIVATION COMPARED,
for Farmers Cultivating 0.1 - 0.49 Hectares

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th></th>
<th>Rice</th>
<th>Palawija</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Labour Hours:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Family</td>
<td>250</td>
<td>390</td>
</tr>
<tr>
<td>- Hired</td>
<td>180</td>
<td>110</td>
</tr>
<tr>
<td><strong>Total Labour</strong></td>
<td>430</td>
<td>400</td>
</tr>
<tr>
<td><strong>Labour per Hectare</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Family</td>
<td>950</td>
<td>1,720</td>
</tr>
<tr>
<td>- Hired</td>
<td>540</td>
<td>620</td>
</tr>
<tr>
<td><strong>Total Labour</strong></td>
<td>1,490</td>
<td>2,340</td>
</tr>
<tr>
<td><strong>Hired as % of total</strong></td>
<td>37</td>
<td>19</td>
</tr>
</tbody>
</table>

**B. Costs and Returns ('000 Rp/ha):**

<table>
<thead>
<tr>
<th></th>
<th>Rice</th>
<th>Palawija</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Material Inputs</td>
<td>33</td>
<td>129</td>
</tr>
<tr>
<td>- Hired Labour</td>
<td>76</td>
<td>77</td>
</tr>
<tr>
<td>- Rent &amp; Taxes</td>
<td>96</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>205</td>
<td>217</td>
</tr>
<tr>
<td><strong>Gross Returns</strong></td>
<td>507</td>
<td>2,001</td>
</tr>
<tr>
<td><strong>Net Returns</strong></td>
<td>302</td>
<td>1,784</td>
</tr>
<tr>
<td><strong>Costs as % Gr. Returns</strong></td>
<td>38</td>
<td>12</td>
</tr>
</tbody>
</table>

**C. Marketing:**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>% Farmers</td>
<td>62</td>
<td>92</td>
</tr>
<tr>
<td>% Marketed by Sellers</td>
<td>28</td>
<td>92</td>
</tr>
</tbody>
</table>

**Notes:**
(1) Palawija: non-rice crops grown in fields.
(2) Hired Labour: all labour from outside the household.
(3) a. Gross Returns: sum of crops valued at sale prices.
    b. Total Costs: sum of expenditure on seeds and fertilisers, wages paid and value of meals provided to hired workers, and rent and taxes.
    c. Net Returns: gross returns less costs.

**Source:** 1983 Cimanuk River Basin Survey,
13 rice farmers, 13 palawija farmers
requirements for rice; cassava, for example, can be left in the earth and harvested at will over a period of fifteen months [Falcon et al. 1984]. Palawija crops are therefore commonly considered to require less labour and, because of their "inferiority", be less marketable than rice [Mears 1978, p.58]. However, few authors quantify such assumptions by comparing labour, costs, returns, sales and so on of palawija and rice cultivation for individual farms. This section attempts to fill the gap.

To this end, Table 7.5 distinguishes "small" (rice or palawija) farms from "medium-sized" farms. Both rice and palawija crops are given producer values (at sale prices). Data for upland C palawija cultivators have again been excluded and are considered separately.

The data show that palawija crops absorbed far less hired labour than rice, mainly because they have less strict time constraints and are mostly cultivated during slack rice production periods. As regards family labour, however, small palawija plots used about as much per hectare as rice farms of similar size. Moreover, whilst medium-sized palawija farms used about 20 percent less than similar size rice farms, this is not the large difference often suggested in the literature. Turning to upland C, palawija cash crop cultivation was more labour intensive than rice cultivation - both for family and for hired labour (Table 7.6). This belies the common assumption that palawija cultivation is necessarily a secondary rural activity.

Labour absorption by itself is nevertheless not a sufficient criterion: returns to labour must also be adequate if the cultivation of a particular crop is to be advocated.
For example, net returns to chilli etc. cultivation in upland G were very high, even compared to rice. It could be asked why upland G households bothered growing rice at all, since they could apparently afford to purchase their rice needs from sales of their palawija crops? Hardjono [1987, pp.192-193] pointed out that cultivators have to contend with both the high production risks inherent in vegetable cultivation and market uncertainties. As van der Kolf [1929, p.120] put it sixty years ago, the "farmer seldom carries all his eggs in one basket, so that in addition to a speculative market crop... he sticks to the cultivation of his well-known foods". This explains why most land in upland G was still used for subsistence, by cultivating rice and a few staple palawija crops.

It is also of interest to look at the marketing of palawija and rice. Whilst it is often assumed that farmers are more likely to sell rice than other crops, the Cimanuk River Basin data show that, for similar sized areas of land, the proportion of cultivators marketing palawija crops was at least as great as the proportion of rice farmers marketing their rice crops 6 (Table 7.5).

7.2 HOUSE GARDEN CROPS

In addition to open fields, rural households in Java also cultivate the gardens and yards around their houses. These supply food crops for own consumption and marketing as well as firewood, animal fodder, and building and handicraft materials. For example, coconut palms provide sugar, coconut milk (santan) and oil for food, fibres for matting, and shade for the house and crops which require indirect sunlight.

6. Note that these high palawija figures exclude the chilli sellers of upland G.
With the exception of Penny and Singarimbun [1973] and Stoler [1981], very little has been done to quantify the importance of gardens to rural households. Stoler [1981, p.243] estimated that a garden could account for up to three-quarters of land area cultivated by the household and could supply up to two-fifths of household calories consumed. She also estimated that garden produce alone could account for up to 27 percent of household total income. However, her study did not sufficiently quantify these other sources of household income for comparisons between these and garden income; such analysis will be found in Section 7.5 below, and Chapters 8 and 11. In the meantime, garden cultivation and income are considered on their own.

Over 80 percent of all households surveyed in the Cimanuk River Basin cultivated their house gardens. The crops ranged from the non-rice staples, pulses and root vegetables also grown as palawija in open fields, to fruit-trees, cloves, tea, coffee and timber. Garden income was estimated as the total value of annual garden produce valued at relevant sale prices. The details of the crops cultivated were not recorded in the 1983 Survey data set, although the nature of Javanese garden cultivation, with maybe twenty different crops being grown simultaneously but harvested or picked at different times means that the total can be difficult to estimate. Nevertheless, the figures are adequate and useful for comparisons with other sources of household income and between desa and different rice farm sizes:

- (1) Average income from garden cultivation was 56,000 Rp per household in the Cimanuk River Basin, only 13 percent less than the

7. Other morsels of land such as the edges of fields, paths and roads were also included.
### TABLE 7.7

**GARDEN PRODUCE, LIVESTOCK AND FISH POND INCOME, by Desa**

**Cimanuk River Basin, 1982/83**

<table>
<thead>
<tr>
<th></th>
<th>Lowland</th>
<th>Midland</th>
<th>Upland</th>
<th>All Relevant Households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td><strong>A. GARDEN PRODUCE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Households Surveyed</td>
<td>48</td>
<td>87</td>
<td>92</td>
<td>75</td>
</tr>
<tr>
<td>Returns/Household (Rp)</td>
<td>37,000</td>
<td>22,000</td>
<td>53,000</td>
<td>64,000</td>
</tr>
<tr>
<td>Labour/Household (hours)</td>
<td>56</td>
<td>62</td>
<td>109</td>
<td>22</td>
</tr>
<tr>
<td><strong>B. FARM LIVESTOCK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Households Surveyed</td>
<td>27</td>
<td>45</td>
<td>43</td>
<td>13</td>
</tr>
<tr>
<td>- By Type of Livestock (% of households surveyed):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poultry</td>
<td>13</td>
<td>45</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Small Ruminants</td>
<td>15</td>
<td>13</td>
<td>35</td>
<td>29</td>
</tr>
<tr>
<td>Large Ruminants</td>
<td>-</td>
<td>6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Returns/Household (Rp)</td>
<td>40,000</td>
<td>84,000*</td>
<td>88,000</td>
<td>55,000</td>
</tr>
<tr>
<td>Labour/Household (hours)</td>
<td>806</td>
<td>1,406</td>
<td>813</td>
<td>939</td>
</tr>
<tr>
<td><strong>C. FISH PONDS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent of Households</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td>Returns/Household (Rp)</td>
<td>-</td>
<td>-</td>
<td>53,000</td>
<td>46,000</td>
</tr>
<tr>
<td>Labour/Household (hours)</td>
<td>-</td>
<td>-</td>
<td>75</td>
<td>63</td>
</tr>
</tbody>
</table>

*: 45,000 Rp excluding one household earning over 900,000 Rp from poultry.

**Notes:**
1. Garden Returns: crops at sale prices less material costs.
2. a. Livestock Types: 17 households had more than one type.
   b. Small ruminants = goats or sheep. Large = oxen or water buffalo.
   c. Livestock Returns: value of own consumption plus sale or rent, including sale of manure, less fodder costs.
3. Fish Pond Returns: consumption at desa sale prices less feed costs.

**Source:** 1983 Cimanuk River Basin Survey, 252 households cultivating gardens, 119 households with livestock, 78 households with fish ponds.
TABLE 7.8

GARDEN PRODUCE, LIVESTOCK AND FISH POND INCOME, by Sawah Cultivated
Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>Sawah Cultivated, in hectares</th>
<th>All Relevant Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>46</td>
</tr>
<tr>
<td>&lt; .25</td>
<td>50</td>
</tr>
<tr>
<td>&lt; 1.00</td>
<td>145</td>
</tr>
<tr>
<td>≥ 1.00</td>
<td>68</td>
</tr>
</tbody>
</table>

### A. GARDEN PRODUCE

- % of Households Surveyed
  - 59
  - 78
  - 85
  - 93
  - 82

- Returns/Household (Rp)
  - None: 46,000
  - < .25: 30,000
  - < 1.00: 57,000
  - ≥ 1.00: 74,000
  - All: 56,000

### B. FARM LIVESTOCK

- % of Households Surveyed
  - 28
  - 32
  - 32
  - 43
  - 39

- By Type of Livestock (% of households surveyed):
  - Poultry
    - 7
    - 10
    - 12
    - 29
    - 16
  - Small Ruminants
    - 22
    - 22
    - 32
    - 29
    - 27
  - Large Ruminants
    - 2
    - 2
    - 3
    - -
    - 2

- Returns/Household (Rp)
  - Poultry: 30,000
  - Small Ruminants: 57,000
  - Large Ruminants: 57,000
  - All: 112,000
  - Labour/Household (hours)
    - 1,025
    - 635
    - 814
    - 978
    - 846

### C. FISH PONDS

- % of Households Surveyed
  - 4
  - 38
  - 29
  - 22
  - 25

- Returns/Household (Rp)
  - None: 48,000
  - < .25: 35,000
  - < 1.00: 43,000
  - ≥ 1.00: 42,000
  - All: 41,000

*: 81,000 Rp excluding one household earning over 900,000 Rp from poultry.

Notes:
1. Garden Net Returns: crops at sale prices less material costs.
2. a. Livestock Types: 17 households had more than one type.
   b. Small ruminants = goats or sheep. Large = oxen or water buffalo.
   c. Livestock Net Returns: value of own consumption plus sale or rent, including sale of manure, less fodder costs.
3. Fish Pond Net Returns: consumption at desa sale prices less feed costs.

average earned by palawija cultivators from their palawija crops (Table 7.7).

- (2) Households in the lowlands on average earned lower incomes from their gardens than those elsewhere in the Cimanuk River Basin, probably because of the relatively few garden crops which can be planted there, given that the cooler uplands are more amenable to a wide variety of crops and thus provide higher garden incomes.

- (3) At the same time, households with larger rice farms (but not those in the lowlands) earned incomes from garden crops higher than the average, presumably since these households were further from subsistence and could "afford" to cultivate non-staple, higher-value garden crops (Table 7.8).

Terra and Ochse [1934], Pennv and Singarimbun [1973] and Stoler [1981] all emphasized the importance of housegarden crops as a source of cash income, especially for the poorest households and/or those cultivating very little sawah. The Survey had not asked for information on garden produce sales, but given the relatively high commercialisation of palawija crops, it is likely that much garden produce was sold intermittently during the year for cash.

7.3 FARM LIVESTOCK

Rural households in developing countries raise farm livestock (including poultry) as

- a source of food;
- a source of cash income; and
- a form of investment in real goods.

Almost 40 percent of Cimanuk River Basin households reported having farm livestock (Table 7.7). Cattle were the least common form of
livestock: only six households (2%) owned draught animals (water buffalo). On the other hand, over 25 percent of households raised sheep or goats ("small ruminants"); Knipscheer et al. [1983, pp.74,76] estimated that 20 percent of farms in Indonesia have sheep or goats and noted that these "are easy to raise, prolific and have a ready market. Their initial maintenance costs are low and they utilise marginal land and crop residues". Hart [1986, p.108] emphasized the similar importance of chickens as a form of saving in rural Java: in the Cimanuk River Basin, over 15 percent were poultry-raisers, one-third of whom also owned sheep or goats.

Unlike palawija or garden cultivation, the proportion of households with farm livestock did not vary much by desa, but the type of livestock did (Table 7.7). Poultry, which does not require pasture, was more common in the lowlands where land is mostly rice sawah 8. Thus half of Cimanuk River Basin poultry farmers were in lowland L alone, one of whom earned almost 1 million Rp from chickens 9. More and larger livestock was to be found in the midlands rather than the uplands, since upland sawah plots are usually too small to justify the use of draught power and cattle are prohibited from upland (dirt) roads during the wet season.

More medium and large rice farms owned livestock than small rice farms or landless households (Table 7.8): once again, other forms of farm income were related to sawah cultivation. Sawah size was the only statistically significant determinant of variations in

8. This has also contributed to the substitution of (cheaper) mechanical for cattle power for land preparation in rice cultivation, as seen in Chapter 6.
9. "Income" from farm animals = value of own consumption plus sale or rent, including sale of manure, less fodder costs. Although the costs of hired labour were allowed for, no household reported hiring labour for livestock care.
livestock income for households earning high incomes (100,000 Rp or more), explaining 23 percent of variations in livestock income.

Households with livestock averaged over 800 hours per year, or more than two hours a day in caring for this. Although this figure does not appear to be much, it is far higher than family labour hours in rice (330) or palawija cultivation (180). However, as with garden crops, most of the caring for farm animals was done by children [Kristanto 1982, p.76], who have a low opportunity cost of time. It could therefore be misleading to attach the same quality to livestock labour as to rice labour, which is carried out by adults only.

7.4 FISH POND FARMING

25 percent of households surveyed in the Cimanuk River Basin owned fish ponds. These were all in the midlands and uplands, especially upland H (Table 7.7). In view of the literature on brackish-water fish ponds in coastal villages [Collier et al. 1977], it might seem surprising that there were no fish ponds in the lowland Cimanuk River Basin. However, neither lowland L nor lowland W were coastal and almost all land consisted of irrigated sawah.

"Income" from fish ponds was calculated as produce at desa sale prices after costs of fish feed, if any, had been deducted. Although the questionnaire had allowed for sales, households in fact consumed all the fish themselves. Such incomes were generally smaller than those earned from animal livestock and were on average higher in the midlands than the uplands.
### TABLE 7.9

**COMPONENTS OF OTHER FARM INCOME (NET RETURNS), by Desa, Sawah and Income**

*Cimanuk River Basin, 1983*

<table>
<thead>
<tr>
<th>A. By Desa</th>
<th>Lowland</th>
<th>Midland</th>
<th>Upland</th>
<th>All Relevant Households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of Households Surveyed</td>
<td>69</td>
<td>96</td>
<td>100</td>
</tr>
<tr>
<td>Other Farm Income ('000Rp)</td>
<td></td>
<td>56</td>
<td>76</td>
<td>123</td>
</tr>
<tr>
<td>Of Which (%):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Garden</td>
<td></td>
<td>43</td>
<td>58</td>
<td>47</td>
</tr>
<tr>
<td>- Palawija</td>
<td></td>
<td>28</td>
<td>19</td>
<td>33</td>
</tr>
<tr>
<td>- Livestock</td>
<td></td>
<td>29</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>- Fish Pond</td>
<td></td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Total O.F.Income</td>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. By Sawah Size</th>
<th>-- Sawah Cultivated, in hectares --</th>
<th>All Relevant Households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of Households Surveyed</td>
<td>72</td>
</tr>
<tr>
<td>Other Farm Income ('000Rp)</td>
<td></td>
<td>76</td>
</tr>
<tr>
<td>Of Which (%):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Garden</td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>- Palawija</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>- Livestock</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>- Fish Pond</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Total O.F.Income</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. By Other Farm Income</th>
<th>---- Other Farm Income Class (Rp) ----</th>
<th>All Relevant Households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of Households Surveyed</td>
<td>12</td>
</tr>
<tr>
<td>% of Other Farm Income:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Garden</td>
<td></td>
<td>59</td>
</tr>
<tr>
<td>- Palawija</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>- Livestock</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>- Fish Pond</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Total O.F.Income</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Notes: (1) Garden Income: crops at sale prices less material input costs
(2) Palawija Income: non-rice field crops at sale prices less material input costs, hired labour costs, rent and land taxes
(3) Livestock Income: value of own consumption plus sale of rent, including sale of manure, less fodder costs
(4) Fish Pond Income: consumption at desa sale prices less feed costs

7.5 OTHER FARM INCOME: AN OVERVIEW

Having so far treated the four types of other-farm (non-rice) farm activities separately, it is time to look briefly at such income in total and compare the importance of its components.

92 percent of households surveyed carried out at least one non-rice farming activity (Table 7.9); more households surveyed earned farm income from non-rice than from rice farming. Even in the lowlands, where over ninety percent of land was rice sawah and average sawah size per household was relatively large, over eighty percent of households were engaged in other types of farming.

Although the average income earned from non-rice farming (135,000 Rp) was much smaller than the average earned from rice production (390,000 Rp), other farming activities were important in encouraging nutritionally balanced diets as well as ensuring small amounts of cash income throughout the year. This was especially the case for livestock, which could be converted into cash at times of special need (e.g. just before festivals).

What of the components of other-farm income? More households cultivated garden crops than palawija and whilst the former comprised almost half of other-farm income, palawija accounted for only thirty percent. Garden income was more important than palawija income in all desa (except upland G) and also for all rice sawah classes; even small rice farms cultivating less than 0.25 hectares of sawah and therefore heavily reliant on palawija for food staples earned slightly more from garden crops than palawija. Indeed, although the relative importance of garden income declined as total other-farm income rose, it still remained more important than
palawija income for households earning large other-farm incomes. Indeed, in the lowlands, palawija income was less important than that from livestock.

This finding emphasizes again the necessity of quantifying sources of income when studying the survival strategies of rural households, since the usual emphasis in the literature has been on palawija, not garden crops, as the most important type of farming after rice. Indeed, one-fifth of households cultivating their gardens did not have access to sawah, which makes their gardens all the more important.
CHAPTER 8

FARMING IN THE CIMANUK RIVER BASIN

The five types of farming enterprises (rice, garden and palawija cultivation, livestock and fish ponds) in the Cimanuk River Basin have been treated individually so far, but are now brought together in this Chapter. The determinants of total farm income are tested statistically, and the importance of rice and sawah in total farm income is judged.

8.1 FARM LABOUR

Almost every household in the Cimanuk River Basin Survey was a farmer of rice, palawija, garden crops, livestock or fish ponds. The average farmer carried out three farming activities, the most common trio being rice, garden and palawija crop cultivation, although eleven percent of farmers were involved in all five types of farming.

The average farm household spent 840 hours on all own farm activities in 1982/83; this averages sixteen hours per week per household (Table 8.1). 16 hours is less than half a working week for one person in an industrialised country (37¾ hours) and one-third of the average hours reported per week by farmers in the E.C. (over 50 hours) [Eurostat 1989, Table 12].

1. This excludes non-remunerative maintenance and repairs, crop processing for home consumption, etc.
## TABLE 8.1

**FARM LABOUR AND INCOME, by Sawah Size**

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>Sawah Size, in hectares</th>
<th>Rice (No.)</th>
<th>&lt;0.25</th>
<th>&lt;0.5</th>
<th>1.0+</th>
<th>ALL FARMER HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households (% of Farmer Households)</td>
<td>11</td>
<td>17</td>
<td>49</td>
<td>23</td>
<td>100</td>
</tr>
</tbody>
</table>

### A. Family Farm Labour per farm household:

- Hours for the Year
  - 530
  - 570
  - 860
  - 1,140
  - 840
- Hours per Week
  - 10
  - 11
  - 16
  - 22
  - 16
- Of Which (%): Rice
  - 38
  - 48
  - 51
  - 42
- Non-Rice:
  - Gardens: 35
  - 17
  - 11
  - 14
  - 15
  - Palawija: 30
  - 21
  - 16
  - 11
  - 18
  - Livestock: 35
  - 21
  - 24
  - 23
  - 24
  - Fish Ponds: <1
  - 3
  - 1
  - 1

Total Family Farm Labour (%)
- 100
- 100
- 100
- 100

### B. Farm Income per farm household:

- '000 Rp
  - 80
  - 160
  - 390
  - 1,110
  - 480
- kg m.r.e./member
  - 80
  - 190
  - 340
  - 930
  - 420
- Of Which (%): Rice
  - 57
  - 73
  - 82
  - 64
- Non-Rice:
  - Gardens: 55
  - 14
  - 11
  - 7
  - 15
  - Palawija: 25
  - 13
  - 8
  - 6
  - 11
  - Livestock: 19
  - 8
  - 5
  - 4
  - 7
  - Fish Ponds: 1
  - 8
  - 3
  - 1
  - 3

Total Farm Income (%)
- 100
- 100
- 100
- 100

### C. Returns per Hour (Rp/hour):

- Rice
  - 780
  - 1,330
  - 3,110
  - 1,680
- Non-Rice: Gardens
  - 1,040
  - 650
  - 1,560
  - 1,190
  - 1,270
  - Palawija
  - 370
  - 240
  - 310
  - 740
  - 390
  - Livestock
  - 30
  - 100
  - 70
  - 130
  - 90
  - Fish Ponds
  - 3,240
  - 1,380
  - 1,560
  - 1,340
  - 1,520

Av. Farm Returns/Hour
- 350
- 460
- 810
- 1,730
- 910

Notes:
1. Number of Farming Activities. Maximum number was five: rice cultivation, palawija (non-rice field crops) cultivation, garden cultivation, livestock rearing and fish pond farming.
2. Farm Income in kg m.r.e. per member: m.r.e. = "milled rice equivalents". Farm income in Rp was divided by the average annual price paid for milled rice by the household and divided again by the number of household members. Sajojo's [1975] poverty line was 240 kg m.r.e. per capita.

Source: 1983 Cimanuk River Basin Survey, 296 households earning farm incomes
TABLE 10.1
NON-AGRICULTURAL LABOUR AND INCOME, by Desa
Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>LOVLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>HOUSEHOLDS WORKING IN NON-AGRICULTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>Proximity to Town (Km)</td>
<td>4</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Proximity to City (Km)</td>
<td>35</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Households Working in Non-Agriculture (% of Households Surveyed)</td>
<td>71</td>
<td>75</td>
<td>80</td>
</tr>
</tbody>
</table>

A. Labour Hours per Household Working in Non-Agriculture:
- as % of Household Total Labour: 51 29 57 56 53 62 52
- Hours in Non-Agriculture (per Household):
  - Annual Hours: 1,250 1,050 1,650 1,460 1,330 2,080 1,510
  - Hours per Week: 24 20 32 28 26 40 29

B. Non-Agricultural Income per Household Working in Non-Agriculture:
- as % of Household Total Income: 38 22 47 40 34 35 36
- '000 Rp/Household: 247 249 674 494 217 261 364
- in Kg m.r.e. per Household Member: 180 250 490 420 270 230 310

Notes: (1) Non-Agricultural Labour Income: sum of returns from cottage industry, gathering, industrial wage employment, trade, services. Calculated, where relevant, net of costs of raw materials, transport and lodging, and of interest payments on borrowed capital.
(2) Household Total Income: includes non-labour income received.
(3) Kg m.r.e.: income in milled rice equivalents (kilogrammes) per household member, using the average annual consumer price paid by each household in 198/83. Subsistence line = 180 kg m.r.e. per person, poverty line = 240 kg m.r.e. per person.

Sources: Wiradi and Manning 1984, Table 2.2; 1983 Cimanuk River Basin Survey, 240 households working in non-agriculture.
The small number of income-generating hours spent on farming in the Cimanuk River Basin seems due to a combination of two factors:

- (1) Farm size was usually small. Rice sawah was the most important type of farm land (82 percent of land cultivated), yet almost thirty percent of households surveyed cultivated either less than 0.25 hectares of sawah or none at all. The average farm therefore could rarely generate enough employment for one person, let alone the household, for an entire year.

- (2) The major source of farm income, rice sawah cultivation, had substantial time constraints. On an island where two rice crops a year are the expected norm, the flooding of fields is either carefully planned (technical irrigation) or dependent on daily rainfall (rainfed irrigation). In both cases the farmer has scarcely a few days to do the work required at that stage of the crop cycle. This means that rice farmers are forced to hire much labour at peak labour demand times; in the Cimanuk River Basin hired labour was more than own family labour used on rice sawah land (Table 8.2). Even the ten largest rice farms surveyed (3-7 hectares) used only 15 hours a week of household labour on own rice cultivation, compared to 61 hours of hired labour.

The periodic peaks and troughs of labour demand in rice cultivation meant that the average household rice labour hours were not well-distributed over time. Other farm activities (palawija, garden crops, livestock and fish ponds) were therefore organised, preferably in the slack rice periods, in order to supplement household income with otherwise unemployed family labour.
In milled rice equivalents per person, the average farm household earned enough from farming activities to support itself: average farm income was 420 kg m.r.e. per member, 75 percent higher than the "poverty line" of 240 kg. The average farm household was therefore a cukupan, "one who has enough" (Table 8.2).

This average disguises, however, a very uneven income distribution, since half of farmers failed to reach the poverty line with income derived from their own farm. One-third of farmers failed to reach even subsistence at 180 kg per member. These paling miskin (poorest) farmers could be identified as belonging to one of three groups of rural households: (1) those without sawah; (2) those cultivating very small areas of sawah; and (3) sawah tenants, especially sharecroppers. The main difference between households earning the least and the most from farming therefore lay in access to sawah (Table 8.2), which is confirmed in statistical analysis below.

8.2.1 Rice Income versus Other Farm Income

Access to sawah for rice cultivation was particularly important because net returns per family labour hour were much higher from rice cultivation than from the other farming activities: rice farming accounted for a significantly higher proportion of farm income than it did for farm labour, 64 and 42 percent respectively (Table 8.1). This suggests that This difference between rice and other farming activities was probably affected by:

- (1) the returns to land implicit in rice farming "income", as contrasted with most other farming activities;
- (2) the necessarily daily hours spent looking after livestock, irrespective of its value: livestock accounted for one-quarter of farm labour but only seven percent of farm income; and

- (3) BULOG (Government) policies which ensured floor prices of rice at harvest-time as well as purchase of farmers' rice crops. Farmer prices of other farm crops were administered to a lesser extent and tended to be lower.

Nevertheless, other farm activities were important because on average they added thirty percent to the basic rice income. Whilst over forty percent of rice farmers were poor (paling miskin) in terms of rice income alone, twenty percent of these managed to achieve sufficient income (cukupan status) in terms of total farm income by earning sometimes substantial incomes from other farm activities. None of these farmers were in either lowland desa, where other farm activities were less common. By contrast, more than half the poorest upland rice farmers managed to earn enough from other farm activities to be cukupan in total farm income. In half these cases the critical activity was garden cultivation, which emphasizes yet again the importance of this activity to poor households and the need for more detailed research, especially on the opportunities and risks in cultivation and marketing.

Other farm activities helped those without any access to sawah, but their incomes remained below the subsistence line (of 180 kg per person), with only two exceptions. These results again confirm the major role of access to sawah in determining farm income.
### Table 8.2

**FARM LABOUR AND INCOME, by Income in Rice Kg. Equivalents per Member**

**Cimanuk River Basin, 1982/83**

<table>
<thead>
<tr>
<th>Farm Income in Kg m.r.e. per Household Member</th>
<th>below subsistence</th>
<th>poor</th>
<th>adequate</th>
<th>ALL FARM HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Farm Households</td>
<td>14</td>
<td>21</td>
<td>13</td>
<td>52</td>
</tr>
<tr>
<td>Number of Members</td>
<td>4.7</td>
<td>5.0</td>
<td>4.6</td>
<td>4.3</td>
</tr>
<tr>
<td>Number of Adults</td>
<td>2.8</td>
<td>2.9</td>
<td>2.7</td>
<td>2.8</td>
</tr>
<tr>
<td>Sawah (Hectares)</td>
<td>.08</td>
<td>.29</td>
<td>.50</td>
<td>1.19</td>
</tr>
<tr>
<td>Pure Owners</td>
<td>27</td>
<td>57</td>
<td>59</td>
<td>50</td>
</tr>
<tr>
<td>Owner-Tenants</td>
<td>2</td>
<td>19</td>
<td>23</td>
<td>39</td>
</tr>
<tr>
<td>Pure Tenants</td>
<td>12</td>
<td>13</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>Without Sawah</td>
<td>59</td>
<td>11</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Total Farmers</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

**Family Farm Labour (Hours per Week):**

<table>
<thead>
<tr>
<th></th>
<th>Rice</th>
<th>Non-Rice: Gardens</th>
<th>Non-Rice: Palawija</th>
<th>Non-Rice: Livestock</th>
<th>Non-Rice: Fish Ponds</th>
<th>Total Hours per Week</th>
<th>% of Farm Income (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Rice</td>
<td>29</td>
<td>67</td>
<td>71</td>
<td>71</td>
<td>64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Rice: Gardens</td>
<td>16</td>
<td>17</td>
<td>9</td>
<td>11</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Rice: Palawija</td>
<td>19</td>
<td>7</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Rice: Livestock</td>
<td>14</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Rice: Fish Ponds</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Hours per Week</td>
<td>7</td>
<td>12</td>
<td>15</td>
<td>20</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Farm Income (%)</td>
<td>29</td>
<td>67</td>
<td>71</td>
<td>71</td>
<td>64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

1. Households with adequate incomes (at least 240 kg m.r.e. per person) = "cukupan".
2. Farm Income in kg m.r.e./member. M.r.e. = "milled rice equivalents". Farm income in Rp was divided by the average annual price paid for milled rice by the household and divided again by the number of household members.

Source: 1983 Cimanuk River Basin Survey, 296 households earning farm incomes
**TABLE 8.3**

**DETERMINANTS OF FARM INCOME (REGRESSION ANALYSIS)**

Cimanuk River Basin, 1982/83

Dependent Variable: Farm Income (Rp). Average = 480,000 Rp.

Independent Variables:

<table>
<thead>
<tr>
<th>Rice Sawah Cultivated (Hectares)</th>
<th>Value of Palawija Crop Sold (Rp)</th>
<th>Proximity to Urban Areas (Dummy: 1=easy access, 0=not)</th>
<th>Lowland Location (Dummy: 1=lowland, 0=not)</th>
<th>Sawah Sharecropper (Dummy: 1=sharecropper, 0=not)</th>
</tr>
</thead>
<tbody>
<tr>
<td>426,900</td>
<td>1.067</td>
<td>110,700</td>
<td>-67,900</td>
<td>-57,800</td>
</tr>
</tbody>
</table>

Regression Coefficients: 426,900 1.067 110,700 -67,900 -57,800

t-values: (25.177) (8.594) (3.720) (-2.095) (-1.661)

Constant: 94,900

Adjusted $R^2$: 0.74  F ratio: 161.07

Notes: (1) Farm Income: sum of net returns from rice, palawija crops, garden crops, livestock and fish ponds.
(2) All palawija crops were valued at sale prices, whether sold or not.

Source: 1983 Cimanuk River Basin Survey, 284 households earning farm incomes (= 296 households less 12: 10 earning extremely small and 2 earning extremely large farm incomes)
8.3 THE DETERMINANTS OF FARM INCOME: REGRESSION ANALYSIS

Sawah size was a major determinant of variations in farm income; the proportion of the palawija crop sold, lowland location and accessibility to urban areas were also statistically significant (Table 8.3).

Given the results of analyses in Chapters 6 and 7, the importance of sawah size will come as no surprise: rice was the major contributor to farm income and income from other farming activities was often positively related to sawah size. One hectare of sawah could generate on average 450,000 Rp in total farm income - almost the average farm income of 480,000 Rp.

Diversification of farming activities helped households with small plots of sawah earn income from additional sources. However, the number of farming activities per household was not statistically significant, since returns per hour varied so widely among other farm activities. In upland M, for example, the average farm household carried out four farming activities, but average farm income was small. Agricultural diversity there was less a sign of prosperity than a function of small sawah size coupled with relative inaccessibility to urban areas and non-agricultural employment (Chapter 10). This is possibly the only example of Geertzian involution [Geertz 1963] noted in the Cimanuk River Basin Survey.

The value of palawija crop sold was statistically related to total farm income (Table 8.3) 2. The households earning relatively large farm incomes from palawija crop sales were mostly those from

2. Palawija crops were valued at sale prices whether sold or not.
upland G, who cultivated chillis and other high-value market-oriented crops (Chapter 7).

The agro-climatic zone in which the farmers operated affected their farm incomes. Lowland location was negatively related to farm income (Table 8.3), because lowland farmers did not have the choice of the wide range of (high-value) fruits and vegetables which could be cultivated in the cooler uplands, nor did they raise ruminants (more "valuable" livestock than poultry), because rice sawah was a more profitable use of land (Chapter 7). Put another way: lowland farmers with small rice farms were more likely to have total farm incomes smaller than those of similar-sized farms elsewhere. This suggests that small lowland farms would be all the more anxious to secure off-farm sources of income, a hypothesis discussed in later Chapters.

In addition to location in the sense of climatic zone, that of accessibility was also statistically significant in determining farm income (Table 8.3). Households which were closer to urban areas earned more from their farms, probably because they were closer to urban markets for selling fruits and vegetables.

Since sharecroppers usually pay at least half of their rice crop to landlords, being a sharecropper means, ceteris paribus, earning less farm income. Being a sharecropper was therefore negatively related to farm income (Table 8.3). However, sharecroppers earned higher farm incomes than the average because they cultivated more sawah than the average. Even when differentiating between rice farm size classes - small, medium and large - sharecroppers earned only slightly (4-7 percent) smaller total farm incomes than non-
sharecroppers. These observations suggest that the form of access to sawah did not necessarily affect total farm income as much as some of the development literature has argued [e.g. Geertz 1963; Wiradi 1986].

Household size (number of members or adults, worker-dependents ratio, etc.) was not statistically significant, even when family labour variables were excluded. Farm income was primarily a function of access to non-labour factors, which is not unexpected in a rural area of high population density where land is scarce and labour abundant.

8.4 THE IMPORTANCE OF RICE AND SAWAH IN FARMING

Preceding analyses concerning the importance of sawah in determining farm income appear to justify the emphasis placed by the literature on rice as the major farming activity in Java. There are, however, at least three caveats to make.

- (1) Almost twenty percent of rice farmers earned more from other farm activities than from rice cultivation. For example, the "survival strategies" of households with small rice farms meant that two-fifths of these were in such a situation; the crucial other farm activities were mostly garden and/or palawija crop cultivation, but livestock was occasionally important too. In addition, seventeen percent of households with medium-sized rice farms, and two with large farms, earned less from rice than other farm activities. These incomes were generally due to particularly high net returns to palawija (upland G), gardens or fish ponds (upland M), or livestock (midland and lowland desa), rather than particularly low returns to rice cultivation.
- (2) It is likely that Government policy benefited affluent farmers directly more than poor ones, since large rice farms earned a higher proportion of income from rice. It is presently being argued that a policy-making body interested in assisting small (mostly poor) farms should consider non-rice crop inputs and prices [see the "Surveys of Recent Developments" in the Bulletin of Indonesian Economic Studies]. The analyses in this and previous Chapters justify this argument in quantitative terms. Nevertheless, there may be partial compensation through wealthy farmers' income-elasticity of demand for leisure, which induces them to hire more labour, thus benefiting small farmers and the landless indirectly [see Barnum and Squire 1980, Soedjono et al. 1985]. The extent to which small rice farms were dependent on income from their other farm activities as compared with income from working on others' sawah is clearly a major topic and taken further in the next Chapter.

- (3) The results presented in this and the previous two Chapters suggest that calling someone a "farmer" just because he/she cultivates some land can be a misnomer: analysis in later Chapters shows that many so-called farmers actually spend more time in off-farm employment, agricultural and non-agricultural, than in farming.

3. The BULOG rice pricing policies have been aimed primarily at increasing production as well as improving rural welfare.
The analysis of rice cultivation in Chapter 6 highlighted the importance of hired labour to rice farmers: almost every farmer hired in some labour from outside the household. Hired labour accounted for 55 percent of total rice labour on average. "Hiring in" means "hiring out": two out of every three households worked on others' sawah. Chapter 6 looked at hired labour as an input to rice production; in this chapter, hired labour as a source of income will be examined. Labour contracts, wages and the importance of off-farm agriculture in total labour and income will also be discussed.

This Chapter starts with a survey of the literature on the demand for and supply of hired agricultural labour in developing countries. The extent to which the findings of other studies apply to the Cimanuk River Basin is then analysed econometrically. There follows a discussion of wage determination and the major rural labour contracts in Java. The discussion of wages leads into a discussion of income earned from off-farm employment, whose determinants are also analysed econometrically. The discussion then moves from a single-period analysis to assessing the longer-term effects of modern rice technologies, especially modern rice varieties and mechanisation, on these labourer households. Finally, the relative importance of agricultural wage income with respect to household total income is assessed.
9.1 THE DEMAND FOR AND SUPPLY OF HIRED AGRICULTURAL LABOUR: A REVIEW OF THE LITERATURE

Farmers demand hired labour either because family labour is inadequate compared to the size of land cultivated, and/or because of time constraints [van der Kolff 1936, p.8]. Studies of the demand for labour in developing countries [e.g. Binswanger and Rosenzweig 1980, Sahn and Alderman 1988] have often found low or inelastic demand for hired labour with respect to wages. Leaving aside the controversial topic of labour-saving techniques for the moment, these low elasticities suggest that farmers find it difficult to substitute family for hired labour even when wages rise. Although household size is important, it is not very flexible, so that time constraints may explain more of the variations in demand for hired labour than household size.

The importance of time constraints in rice cultivation on Java were confirmed by the Cimanuk River Basin data. Hired labour accounted for forty percent of labour on even very small rice farms, and household size and sawah size, when included in a regression analysis of the determinants of hired labour (Chapter 6), left a substantial amount of variation in hired labour unaccounted for. Time constraints exclusive to rice cultivation also explain why hired labour was almost entirely for rice cultivation alone - less than three percent of agricultural wage labour worked on other crops.

The factors influencing rural labour supply in a developing country are more numerous and it is therefore more difficult to determine which are the crucial ones in any particular circumstances. For
TABLE 9.1

DETERMINANTS OF AGRICULTURAL WAGE LABOUR & INCOME

(REGRESSION ANALYSIS)

Cimanuk River Basin, 1982/83

A. Dependent Variable: Agricultural Wage Labour (Hours/household).
   Average = 740 hours.

<table>
<thead>
<tr>
<th>Independent Variables:</th>
<th>Number of Adults (Number)</th>
<th>Employment Outside Home Desa (Dummy: 1=employment 0=not)</th>
<th>Lowland Location (Dummy: 1=lowland 0=not)</th>
<th>Proximity to Urban Areas (Dummy: 1=easy access 0=not)</th>
<th>Sawah Pure Ownership (Dummy: 1=pure owner 0=not)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression Coefficient:</td>
<td>145</td>
<td>285</td>
<td>450</td>
<td>-380</td>
<td>-230</td>
</tr>
<tr>
<td>t-value:</td>
<td>(2.361)</td>
<td>(1.650)</td>
<td>(2.918)</td>
<td>(-2.464)</td>
<td>(-1.619)</td>
</tr>
<tr>
<td>Constant:</td>
<td>345</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R²:</td>
<td>0.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Dependent Variable: Agricultural Wage Labour Income (Rp/Household).
   Average = 110,000 Rp

<table>
<thead>
<tr>
<th>Independent Variables:</th>
<th>Agricultural Wage Labour (Hours)</th>
<th>Employment Outside Home Desa (Dummy: 1=employment 0=not)</th>
<th>Lowland Location (Dummy: 1=lowland 0=not)</th>
<th>Size Of Sawah Cultivated (Hectares)</th>
<th>Sawah Pure Ownership (2)</th>
<th>Sawah Pure Tenancy (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression Coefficient:</td>
<td>59.5</td>
<td>59,000</td>
<td>25,100</td>
<td>32,400</td>
<td>-25,100</td>
<td>33,200</td>
</tr>
<tr>
<td>t-value:</td>
<td>(9.289)</td>
<td>(4.091)</td>
<td>(1.783)</td>
<td>(3.849)</td>
<td>(-1.849)</td>
<td>(1.751)</td>
</tr>
<tr>
<td>Constant:</td>
<td>26,630</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R²:</td>
<td>0.57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: (1) Labour Hours: 760 hours = 740 (rice) + 20 (other crops).
(2) Sawah Pure Owners: rice farmers cultivating only their own sawah.
(3) Income: 115,000 Rp = 111,000 Rp (rice) + 4,000 Rp (other crops).
(4) Sawah Pure Tenants: rice farmers cultivating only rented sawah.

Source: 1983 Cimanuk River Basin Survey, 183 households with members working as agricultural wage labourers (198 households, less 15 earning less than 10,000 Rp).
### Table 9.2

**AGRICULTURAL WAGE LABOUR AND INCOME, by Desa**

*Cimanuk River Basin, 1982/83*

<table>
<thead>
<tr>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>AGRICULTURAL WAGE LABOURER HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
</tbody>
</table>

| Households with Members Working in Agricultural Wage Employment (% of all households) | 75 | 87 | 46 | 49 | 69 | 56 | 64 |

**A. Rice Cultivation by Agricultural Wage Labourer Households**

- **Sawah per A.W.L. Household (hectares)**
  - Landless: 36
  - Pure Owners: 26
  - Owner-Tenants: 10
  - Pure Tenants: 28

  **Tenurial Status (% of A.W.L. Households):**
  - Landless: 31
  - Pure Owners: 41
  - Owner-Tenants: 8
  - Pure Tenants: 8

  **Ag. Wage Households (%)**
  - 100

**B. Agricultural Wage Labour:***

- **Hours per Household**
  - 660
  - 1,450
  - 430
  - 360
  - 380
  - 720
  - 740

  **Of Which (%):**
  - Land Preparation: 22
  - Planting: 15
  - Maintenance: 13
  - Harvesting: 50

  **Agri.Wage Labour Hours**
  - 100

**C. Agricultural Wage Income:**

- **'000 Rp per Household**
  - 110
  - 240
  - 90
  - 60
  - 90
  - 40
  - 110

- **Kg m.r.e./Member**
  - 90
  - 225
  - 65
  - 55
  - 95
  - 40
  - 105

  **Of Which (%):**
  - Land Preparation: 22
  - Planting: 17
  - Harvesting: 50

  **Agri.Wage Income**
  - 100

**Notes:**

1. a. Pure Owners: rice farmers cultivating only their own sawah.
   b. Pure Tenants: rice farmers cultivating only rented sawah.
   c. Owner-Tenants: rice farmers both owning and renting.

2. Labour: Land Preparation: 95% = hoeing; Maintenance: 91% = weeding.

3. Income in kg milled rice equivalents/member: income divided by average consumer price paid for milled rice and by number of household member.

**Source:** 1983 Cimanuk River Basin Survey.

198 households with members working as agricultural wage labourers.
example, Bardhan [1979, p. 81] found that labour supply in India was related to the number of household dependents, farm size, income from other sources and education levels. Chew and Shand [1983, p. 7] found that off-farm labour (both agricultural and non-agricultural) was inversely related to sawah size and on-farm labour. Wiradi and Manning [1984, pp. 43-44] noted that tenurial status also affected the rural labour market via the tenancy contract, which can be expected for two reasons:

- (1) landlords often require tenants to work for them additionally as hired labourers; and
- (2) since tenants must pay their landlords with part of the rice crop, they seek extra income in off-farm work.

9.2 AGRICULTURAL WAGE LABOUR IN THE CIMANUK RIVER BASIN

Regression analysis yielded five statistically significant independent variables determining the supply of agricultural wage labour hours in the Cimanuk River Basin (Table 9.1):

- (1) location;
- (2) accessibility;
- (3) working outside the home desa;
- (4) household size; and
- (5) tenurial status.

Although these variables together could explain only 16 percent of variations, they are worth looking at in some detail, especially since the first three were related more to desa environment than the individual household.

---

1. Sahn and Alderman [1988] found that experience in agricultural work was more important than education.
The proportion of households working in off-farm agricultural employment was highest in the lowlands (Table 9.2) and regression analysis showed that lowland location was of benefit in gaining such work. Demand for hired labour was likely to be greater in the lowlands for three reasons.

- (1) Lowland agriculture relies heavily on rice cultivation, whereas in the hillier, cooler areas of Java, a more diverse range of crops are grown.

- (2) The passage of water through (lowland) technical irrigation channels is of necessity very carefully timed, which leads to important time constraints.

- (3) Lowland rice farms tend to be larger than elsewhere.

More specifically, the regression coefficient in the equation suggested that lowland households in the Cimanuk River Basin were likely to be hired for 450 hours a year more than households elsewhere (Table 9.1). This compares with an average of 740 hours per household in the Cimanuk River Basin Survey, and was substantially higher than the 330 hours which lowland rice farmers spent on their own rice farms in the same year. The case of lowland L was particularly striking: with the largest average farm size and the lowest population density of the six desa in the Cimanuk River Basin Survey, households in lowland L which obtained agricultural wage employment worked on average 2.7 times more hours in this activity than households from any other desa - and spent almost half of these hours outside lowland L.

The negative sign attached to accessibility to urban areas in the regression equation meant that households both had to and were more likely to find agricultural wage employment in areas which could
### TABLE 9.3

**AGRICULTURAL WAGE LABOUR OUTSIDE THE DESA, by Desa**

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>LOVLAND</th>
<th>UPLAND</th>
<th>EX-DESA LABOURER HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>L</td>
<td>G</td>
</tr>
</tbody>
</table>

**Ex-Desa Labourer Households:**

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>As % of All Households Working in Agricultural Wage Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>74</td>
</tr>
</tbody>
</table>

**A. Tenurial Status (% of Ex-Desa Labourer Households):**

| | Landless | Pure Owners | Owner-Tenants | Pure Tenants | | |
|---|---------|-------------|---------------|-------------| | |
| | 43 | 5 | 5 | 12 | | |
| | 14 | 64 | 67 | 43 | | |
| | 36 | 18 | 12 | 19 | | |

**Ex-Desa Labourer Households:**

| | 100 | 100 | 100 | 100 | 100 |

**B. Agricultural Wage Labour Hours:**

<table>
<thead>
<tr>
<th></th>
<th>Total Agri. Wage Employment Hours per Ex-Desa Labourer Household</th>
<th>Of which outside the desa (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>810</td>
<td>1,620</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>54</td>
</tr>
</tbody>
</table>

**C. Agricultural Wage Income ('000 Rp):**

<table>
<thead>
<tr>
<th></th>
<th>Total Agri. Wage Income per Ex-Desa Labourer Household</th>
<th>Of which from outside the desa (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>130</td>
<td>260</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>55</td>
</tr>
</tbody>
</table>

**D. Average Agricultural "Wage" earned by Ex-Desa Labourer Households:**

<table>
<thead>
<tr>
<th></th>
<th>Outside the Desa (Kg m.r.e./hour)</th>
<th>Within the Desa (Kg m.r.e./hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.70</td>
<td>.64</td>
</tr>
<tr>
<td></td>
<td>.44</td>
<td>.60</td>
</tr>
</tbody>
</table>

**Notes:**

1. Ex-Desa Labourer Households: households with members working in agricultural wage employment outside their home desa.
2. No households from midland areas worked outside their desa.
3. a. Pure Owners: rice farmers cultivating sawah entirely their own.
   b. Owner-Tenants: rice farmers both cultivating their own sawah and renting some in during 1982/83.
   c. Pure Tenants: rice farmers cultivating only rented sawah.
5. Average Income Per Hour: total net income earned in/outside the desa divided by total labour hours worked in/outside the desa. Then divided by milled rice consumer price paid by household, to convert to milled rice equivalents in kilograms ("Kg m.r.e.").

**Source:** 1983 Cimanuk River Basin Survey, 73 households with members working in agricultural wage employment outside their home desa.
provide few opportunities for non-agricultural wage employment. Figures in Table 9.2 show that the average number of hours was greatest in lowland L and upland M, both relatively far from urban areas.

The discussion so far has been in terms of the desa in which the households were located, not where they actually worked. In fact, despite the closeness of desa life and strong community ties, a substantial proportion (over one-third) of households obtained agricultural wage labour work outside their own desa. About half of the agricultural wage employment hours obtained by these households was outside their own desa. Regression analysis suggested that households which managed to obtain such work could raise their employment by about 285 hours, or forty percent of the average. Some characteristics of these households are given in Table 9.3:

- (1) none of the relevant households were from the midlands, whilst more than half were from lowland L.
- (2) Most households working on others' farms in other desa were sawah owner-operators themselves, except those from lowland W. 80 percent of these were either landless or pure tenants (cultivating sawah entirely rented); since much of rented land in lowland W was owned by landlords residing outside the desa [Chapter 5], it is likely that these tenants leaving lowland W for rice wage labour went to work on their landlords' sawah in another desa.

The relevance of the number of adults in the labourer household to agricultural wage labour hours is of particular interest because it contrasts with the analysis in previous chapters, where household size was barely statistically significant with regard to on-farm
labour. The fact that it was the number of adults rather than members which was significant indicates that agricultural wage employment was more a function of members available for such work than of the number of dependents and workers. In this respect, note that in Bardhan's [1979, p.81] study of rural India, agricultural labour supply was related more to the number of dependents in the household than the number of adults.

Pure ownership (the cultivation of sawah which is owned wholly by the operator) was statistically significant in explaining variations in agricultural wage labour hours. Owner-operators do not "lose" any of their farm income to landlords as tenants do, which both raises their incentives for working on their own farms and also means that obtaining off-farm employment and income is less imperative for them than for tenants cultivating the same area of sawah. Thus households which wholly owned all the sawah they cultivated were less likely to be working on others' farms.

9.3 AGRICULTURAL WAGES AND LABOUR CONTRACTS

The factors mentioned so far could be termed "push" agents which stimulated or forced households to seek off-farm agricultural work. What of the "pull" force of wages?

On Java, Booth and Sumdrum [1984, p.245] estimated that the labour supply was relatively inelastic with respect to wages even in the case of the landless. Bardhan [1979, p.80] found labour supply elasticity with respect to wages to be low in West Bengal and Sahn and Alderman's [1988, p.179] results were similar for Sri Lanka. Even in the U.S., farmers' labour supply elasticity was estimated at only 0.34 [Huffman 1980, p.16]. This section examines the reasons
why wages are apparently not relevant in determining agricultural labour supply in developing countries, with the Cimanuk River Basin as a specific example.

9.3.1 Rural Wages: a Review of the Literature

According to classical economic thought, labour is available for hire where the marginal product of own farm labour equals the off-farm wage rate. When Polzin and MacDonald [1971] tested this for part-time farmers in the U.S.A., they concluded that farmer behaviour was indeed consistent with the classical optimising rule for maximum efficiency.

However, the undisputed existence of persistent and high rural unemployment in many developing countries and especially Java means that the prevailing real wage levels must lie above the intersection of the demand for and supply of agricultural labour. Although this does not necessarily mean that the labour market is uncompetitive in the long-run, the most common and accepted explanation is that agricultural wages in developing countries are "institutionally" determined (Chapter 2), although observers disagree how and by whom.

Leibenstein [1957] predicted that employers would hire labour only above a certain "efficiency wage", which lay above the intersection of the labour demand and supply curves, because a minimum level of nutrition was necessary to ensure labour productivity at low incomes. Evenson and Binswanger [1980] tested this theory in India and Sahn and Alderman [1988] in Sri Lanka, and both sets of authors agreed with Leibenstein. Lluch and Mazumdar [1981] similarly observed that Javanese farmers were willing to pay a premium to
labourers to induce them to work more intensively. Weiss [1980] argued that employers paid this premium even in wealthier industrial economies and where wages were flexible, because employers suffered from imperfect information and raised wages in order to attract better quality workers. It should perhaps be noted that the persistence of this kind of imperfect information is unlikely in the Javanese context, where rural labour is usually local and often hired on a daily basis [see Stiglitz 1974].

Datt and Ravallion [1988] found that employers were not the only ones to keep real wages above their competitive levels and argued, using data from India, that there was implicit collusion among workers in accepting or rejecting wage rates - the "reservation wage" argument.

It is likely that wages on Java are determined by "employers" and "labourers" together, albeit not competitively, since they are often the same people. With small farm size, yet periodic heavy reliance on hired labour, rural Java lacks a clear-cut distinction between landowners and labourers: the employer of today is the hired worker of tomorrow. In the Cimanuk River Basin, for example, 62 percent of rice farmers both hired and sold agricultural labour. This explains why Mubyarto et al. [1982] felt that the gotong-royong (mutual self-help) principle was the most important institution determining rural Javanese wage rates.

Kasryno et al. [1980] drew attention to the "social" determination of (money) wages, since they are heavily influenced by the rural cost-of-living, especially the price of rice. This follows from the

2. Lluch and Hazumdar used this to explain the existence of segmented (dualistic) rural labour markets.
importance of rice to the Javanese population [Chapter 3], although Kasrino and Chong [1984] noted that the effect of the rice price was falling somewhat with its declining importance in the rural cost-of-living. Nevertheless, Mazumdar and Sawit's [1986] study of rural wages found that different rice prices explained much of the wide differences in money wages between desa, apparent in even the same region, which in their case was the Cimanuk River Basin. Mazumdar and Sawit also found that the (institutionally determined) money wages moved in discrete jumps and rarely more than once a month, whilst rice prices fluctuated continuously. This explained the common observation [e.g. Collier et al. 1982a] that money wage adjustments tend to lag behind rice prices. It follows that real wages can vary from week to week even if money wages follow rice prices' overall upward trend between harvest-time and paceklik (lean period).

9.3.2 Rural Wages and Labour Contracts: the Cimanuk River Basin

In the Cimanuk River Basin, labour was hired for the four main rice cultivation tasks:

1. Land preparation. Performed by men, 95 percent of hours being for hoeing, the rest for working with draught cattle or tractors.

2. Transplanting. Performed only by women.

3. Maintenance tasks. These were weeding (91 percent), fertilising and pesticide spraying and were performed mainly by women.

4. Harvesting. Both men and women participated in the harvest, but harvest labour was particularly important to women as the agricultural task with the best returns out of those to which they had access.
Harvest labour was on average the single most important agricultural wage labour task, accounting for almost forty percent of total agricultural wage labour (Table 9.2).

Hired agricultural labour was subject not only to periodic fluctuations in demand, but was also paid in different forms and at different times depending on which of the four main labour contracts was relevant to that labourer. This plethora of wages makes the Javanese rural labour market a fascinating topic, but at the same time emphasizes the scope for confusion when discussing the "rural wage".

"Income" from agricultural wage labour in the Cimanuk River Basin was calculated so as to include the value of all payments in kind as well as cash. Harvest labour was paid only in kind, with each labourer receiving a specified share (bawon) of the amount of padi he/she had harvested. The "open harvest" bawon was determined at the village level, taking other local agricultural and non-agricultural wages into account: desa location alone could explain eighty percent of variations in bawon paid by rice farmers in the Cimanuk River Basin [Chapter 6]. Pre-harvest labour could be paid in both cash ("wages") and kind, which consisted of meals supplied to labourers. Men also received some tobacco as part of the meal. All pre-harvest labour was entitled to one meal per day or more, depending on the number of hours worked, but was paid cash only under the harian ("daily") contract.

3. Raffles [1817, p.cclix] noted that "bawon" originally meant eight times the quantity of sheaf which could be clasped between two hands.
TABLE 9.4

RICE WAGE LABOUR CONTRACTS, by Desa

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>LOULAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>AGRICULTURAL WAGE LABOURER HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
</tbody>
</table>

A. Agricultural Wage Labour Hours:

<table>
<thead>
<tr>
<th>Total per Desa</th>
<th>21,700</th>
<th>64,500</th>
<th>9,600</th>
<th>9,000</th>
<th>13,200</th>
<th>2,400</th>
<th>126,400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Of Which (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Harian</td>
<td>46</td>
<td>48</td>
<td>62</td>
<td>68</td>
<td>26</td>
<td>32</td>
<td>46</td>
</tr>
<tr>
<td>- Borongan</td>
<td>52</td>
<td>52</td>
<td>2</td>
<td>26</td>
<td>13</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td>- Ceblokan</td>
<td>&lt;1</td>
<td>-</td>
<td>33</td>
<td>4</td>
<td>47</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>- Sambatan</td>
<td>2</td>
<td>&lt;1</td>
<td>3</td>
<td>2</td>
<td>14</td>
<td>42</td>
<td>5</td>
</tr>
<tr>
<td>Total Labour Hours</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

B. Harian "Wages" (in real terms, kg m.r.e./hour):

<table>
<thead>
<tr>
<th>Activity</th>
<th>Men Only</th>
<th>Women Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoeing</td>
<td>.64</td>
<td>.49</td>
</tr>
<tr>
<td>Planting</td>
<td>.64</td>
<td>.45</td>
</tr>
<tr>
<td>Weeding</td>
<td>.75</td>
<td>.35</td>
</tr>
<tr>
<td></td>
<td>.59</td>
<td>.38</td>
</tr>
<tr>
<td></td>
<td>.65</td>
<td>.37</td>
</tr>
<tr>
<td></td>
<td>.54</td>
<td>.47</td>
</tr>
<tr>
<td></td>
<td>.64</td>
<td>.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.49</td>
</tr>
</tbody>
</table>

Notes: (1) Total Hours per Desa: indicates the overall impact of the number of households with members working in agricultural wage employment as well as the number of hours worked by each household.
(2) a. Harian: daily contract, paid according to the number of hours worked.
   b. Borongan: piece-work contract, paid according to work done. In the Cimanuk River Basin Survey, borongan was exclusively for harvesting work.
   c. Ceblokan: the labourer carries out, without pay, planting and/or maintenance work on a certain section of sawah, in return for the exclusive right to harvest that area.
   d. Sambatan: exchange help between farmers without pay.

198 households with members working as agricultural wage labourers.
Harian workers are hired at a fixed rate per day, the number of hours composing a day being determined at the village level. It is usually five or eight (additional three hours in the afternoon), but eight-hour days are unusual for women, who commonly spend their afternoons on household tasks and possibly in other remunerative activities. The basic harian wage rate is institutionally determined at the village level, and is founded on the local rice price prevailing at the beginning of the season. Harian wages are usually higher than those under other contracts in the same desa and are at the same time the yardstick for setting these other wage rates.

Harian contracts in the Cimanuk River Basin accounted for almost half of hired off-farm agricultural labour hours (Table 9.4). It is immediately apparent from the Table that there were large spatial differences in rural labour markets characterised by different labour contracts. In a desa with easy access to urban employment, labourers will be less anxious to obtain off-farm agricultural employment. By contrast, in a desa with fewer job opportunities and a higher degree of uncertainty in finding agricultural employment under a contract which lasts only one day, the labourer is likely to settle for lower returns (? "exploitation") under a different contract, in return for some job security. This argument explains why harian was least common in the upland desa. The reason that harian was more common in the midlands than the lowlands is that labourers in the latter spent many more hours in harvest work, which was paid under the borongan contract.

The borongan labourer is contracted to finish a certain task on a certain area of sawah, rather like a piece-work contract in the
textile industry. All borongan labour in the Cimanuk River Basin consisted of harvest work. However, not all harvest labour was necessarily hired under borongan: in some cases, access to harvest employment was not "open" but depended on a particular contract known as ceblokan.

Under ceblokan, the labourer (possibly with other members of his/her household) transplants and/or weeds a certain area of the rice crop without cash payment, in return for the exclusive right to harvest that area, including determining who should harvest. The harvested crop is, as always, shared between the labourer and the farmer-employer. The labourer is thus assured of exclusive access to a remunerative agricultural task (harvesting) at the end of the season, but in the meantime does not earn any cash wages and is paid only in meals. Thus even when the ceblokan bawon is higher than "open harvest" bawon, it needs to be discounted to its present value at the times of planting and weeding.

Ceblokan is a frequent subject of contention in the literature. Hart [1986, p.180] noted that ceblokan labourers' households require other sources of income in the middle of the rice season and/or need to borrow, often from the ceblokan employer. Some authors [e.g. Husken 1979. p.148] have argued that ceblokan is a form of sharecropping, since the farmer shares the risk of the harvest with the labourer, but it should be emphasized that the labourer neither contributes to capital inputs nor supplies all pre-harvest labour [Van der Kolff 1936, p.17].

Ceblokan in the Cimanuk River Basin was used almost exclusively for planting and was significant only in midland S and upland G (one-
third and half of total agricultural labour hours respectively - Table 9.4). It was common in upland G because of the desa's relative inaccessibility to non-agricultural wage labour (upland M is discussed below).

The practice of ceblokan in midland S seems at first surprising in view of its proximity to non-agricultural wage labour. It can, however, be explained as a form of Bardhan's [1980] interlinkages in land and labour markets: three-quarters of midland S households working as ceblokan labourers were sawah tenants. It is likely that that the tenancy contracts required tenants to work on their landlords' sawah, thus ensuring an agricultural labour supply during the peak planting periods in a desa close to urban non-agricultural employment. This overlap between tenancy and hired labour contracts may also explain why the only men hired for weeding in the Cimanuk River Basin were all sharecroppers (in midland S).

Sambatan is another contract under which there are no cash wages paid, only meals supplied, but for more neighbourly reasons. Sambatan is in fact a formal version of the famous gotong-royong (mutual self-help) principle. Sawah operators and members of their household work for a few hours in each other's fields, keeping precise tallies of the type of work and number of hours, the other operator's household then reciprocating when required.

Sambatan could be anticipated in areas where there are many farms, of average small size - requiring only a few hours of hired labour for each task - and also in areas with poor accessibility, where cash for wages is in relatively short supply. All upland M households surveyed cultivated sawah, average size was small and it
was 50 km to the kecamatan (District sub-capital). It is therefore not surprising that over forty percent of labour there was *sambatan*. This explains why although the average number of agricultural wage labour hours was highest in upland M after lowland L, average agricultural wage income earned was much the lowest of the six desa (Table 9.2). Further research in assigning values to non-cash wage employment would be useful.

This section has examined the types and incidence of the main agricultural labour contracts in Java, using example of the Cimanuk River Basin. The analysis has shown that cash wages are often not paid and even when they are, are primarily institutionally determined. It is therefore not surprising that they have little effect on agricultural labour supply.

### 9.4 AGRICULTURAL WAGE INCOME IN THE CIMANUK RIVER BASIN

Average income from off-farm agricultural employment was 110,000 Rp per household. In kilogrammes of milled rice equivalents (m.r.e.), this was equivalent to 105 kg per household member, whilst the subsistence line is at 180 kg m.r.e. per member [Sajogyo 1975]. However, over eighty percent of households with members working in off-farm agriculture earned less than 180 kg from such employment, and only thirteen percent earned enough to be placed above the poverty line of 240 kg m.r.e. per household member. The average household with members working in agricultural wage employment could not be sustained by income from this alone; agricultural wage income averaged only twenty percent of these households' total incomes from all activities.
Nevertheless, on an island characterised by small farms and generally low incomes, even a small contribution from a particular source of income could make a significant difference to the rural household's standard-of-living. For example, one-quarter of households earning less than 240 kg m.r.e. per member from farming activities managed to earn enough with the addition of agricultural wage income to reach or exceed the poverty line and thus become cukupan.

Regression analysis was carried out (Table 9.1) and yielded six statistically significant independent variables which together could explain almost sixty percent of variations in agricultural wage income:

1. labour hours;
2. working outside the desa;
3. location;
4. sawah size;
5. pure ownership; and
6. pure tenancy.

Although accessibility was significant in determining labour hours, it was not so with regard to income. Average agricultural wage income was smallest in the most inaccessible desa, upland M, because forty percent of agricultural labour hours were unpaid (exchange), as discussed above.

The number of hours alone explained over thirty percent of variations in agricultural income. (Labour hours were discussed in section 9.2 above). However, because of both the various forms of non-cash payment and the fact that those working long hours often earned lower wages, one extra hour of employment generated on
TABLE 9.5

AGRICULTURAL WAGE LABOUR AND INCOME, by Sawah Size
Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>No Sawah</th>
<th>&lt;0.25</th>
<th>&lt;1.0</th>
<th>1.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice Sawah Size, in Hectares</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sawah</td>
<td>63</td>
<td>74</td>
<td>66</td>
</tr>
</tbody>
</table>

A. Agri. Wage Labourer Household Distribution:

By Desa Topography (%):
- Lowland:
  - 62
  - 21
  - 35
  - 69
  - 43
- Midland:
  - 24
  - 30
  - 30
  - 6
  - 24
- Upland:
  - 14
  - 49
  - 35
  - 25
  - 33

A.W.L. Households:

<table>
<thead>
<tr>
<th>Lowland</th>
<th>Midland</th>
<th>Upland</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

By Tenurial Status (%):
- Pure Owners:
  - 81
  - 49
  - 33
  - 45
- Owner-Tenants:
  - 11
  - 27
  - 61
  - 26
- Pure Tenants:
  - 8
  - 24
  - 6
  - 14

A.W.L. Households Which Were Also Rice Farmers:

<table>
<thead>
<tr>
<th>Lowland</th>
<th>Midland</th>
<th>Upland</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

B. Household Composition:

A.W.L. Households Headed by Women (% of A.W.L. Households):

<table>
<thead>
<tr>
<th>Lowland</th>
<th>Midland</th>
<th>Upland</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>19</td>
<td>8</td>
<td>3</td>
</tr>
</tbody>
</table>

Adults per A.W.L. Household:

<table>
<thead>
<tr>
<th>Lowland</th>
<th>Midland</th>
<th>Upland</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3</td>
<td>2.3</td>
<td>2.8</td>
<td>3.0</td>
</tr>
</tbody>
</table>

C. Agricultural Wage Labour:

Hours per A.W.L. Household:

<table>
<thead>
<tr>
<th>Lowland</th>
<th>Midland</th>
<th>Upland</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>670</td>
<td>730</td>
<td>630</td>
<td>1,110</td>
</tr>
</tbody>
</table>

D. Agricultural Wage Labour Income:

- '000 Rp / A.W.L. Household:
  - 110
  - 80
  - 100
  - 190
  - 110

- Kg m.r.e. / Member:
  - 110
  - 95
  - 90
  - 165
  - 105

Notes: (1) a. Pure Owners: rice farmers cultivating only their own sawah.
      b. Pure Tenants: rice farmers cultivating only rented sawah.
      c. Owner-Tenants: rice farmers both cultivating own sawah and renting.
(2) Adults: households members aged 14 and over.
(3) Income: Kg milled rice equivalents/Member: income divided by the average consumer price paid for milled rice and by number of household members.

198 households with members working as agricultural wage labourers.
average only 60 Rp more in income, which is smaller than the average agricultural wage income per hour of 160 Rp.

**Ex-desa employment** had the largest effect on agricultural wage income after the number of hours worked. Average income per hour from ex-desa agricultural wage labour was generally higher than from "inside" work because most ex-desa labourers were men, who could leave the household (temporarily) more easily and who tended to obtain employment in the better-paid jobs of land preparation and harvesting (Table 9.3). (Ex-desa agricultural wage income was calculated as net after covering the costs of transport and lodging). It should be recalled that ex-desa agricultural employment was reported in only four out of the six desa, not in either midland desa, and that it was most common among lowland L households. Nevertheless, even after allowing for lowland location in the regression equation, a household with members working as agricultural wage labourers outside the home desa earned on average 60,000 Rp more than one whose members worked only in the village - a difference of more than half the average agricultural income earned (110,000 Rp).

In a rural economy characterised by an abundance of labour and little land, it could be expected that households with sawah of their own are more likely to obtain agricultural employment, because the farmer-labourer of today can return the offer of employment tomorrow. Whilst the same proportion of rice farmers as landless households worked on others' farms (64 and 63 percent respectively), there were some noticeable differences among rice farmers depending on sawah size (Table 9.5). Households with large rice farms were less likely to have members working on others' farms, probably
because they could more easily "afford" some leisure\(^4\). However, when they did work as agricultural wage labourers, members of households with large rice farms obtained sixty percent more hours' employment and earned more than double the average agricultural wage income of landless and small farm households with members working as agricultural wage labourers.

Sawah size was therefore statistically significant in determining income, via its effect on returns per hour rather than number of hours (Table 9.1). Labourers from large rice farms were given preferential treatment possibly because the employer expected or hoped that members of his/her family would be invited to work on those farms in turn. This is consistent with Hart [1986, p.165], who estimated that wages earned by households in a Central Javanese desa were positively related to size of sawah cultivated.

When, however, regressions were carried out on the six individual desa of the Cimanuk River Basin Survey, sawah size was statistically significant only in the lowlands, especially lowland L. Since it is often argued that land size is related to earnings from other activities in rural areas of high population density and underemployment [e.g. Hart 1986, p.148], it is interesting that agricultural wage incomes should be strongly linked to sawah size in only one of the six desa surveyed. Indeed, this desa was lowland L, where average sawah size was largest and population density lowest compared to the other five desa.

\(^4\) This was not because their farms could absorb all family labour: analysis in Chapter 8 showed that even the very largest farms could absorb the equivalent of only one adult for fifteen hours a week on average.
The statistical significance of both pure ownership and pure tenancy in determining variations in agricultural wage incomes tallies with other evidence in the Cimanuk River Basin of interlinkages in the land and labour markets, e.g. sharecroppers and ceblokan labourers in midland S as discussed above. Pure tenancy was statistically significant only for income, not labour hours, which suggests that landlords paid a premium to their tenants as a type of "efficiency wage".

9.5 HIRED LABOUR AND CHANGING TECHNOLOGIES IN JAVA

The discussion, limited by the single period covered by the Survey data, should nevertheless take into account the changes in Javanese rice cultivation which have affected the demand for hired labour. In Chapter 6, this was carried out from the farmers' point of view, whilst here it is done from the labourers'.

The two main topics are the spread of modern rice varieties and of mechanisation. Although both of these started in lowland Java, which favoured them for agro-climatic and institutional reasons, mechanisation spread independently of the adoption of modern varieties, because it reduced costs (displaced labour) without affecting yields [Barker et al. 1985].

9.5.1 Hired Labour and Modern Varieties

Following their introduction during the "Green Revolution", modern rice varieties were expected to increase labour absorption per hectare because of (a) the possibility of more crops per year and (b) the need for more labour in maintenance tasks. In the event, the effects of modern varieties were somewhat more complex [Wahab
TABLE 9.6

DETERMINANTS OF DEMAND FOR HIRED AGRICULTURAL LABOUR

(REGRESSION ANALYSIS)

Cimanuk River Basin, 1982/83

A. Dependent Variable: Pre-harvest Hired Male Labour (Hours/Farm). Av. = 220 hours.

Independent Variables:  | Rice Sawah Cultivated | Lowland Location (Hectares) | Constant (Dummy: 1=lowland, 0=not)
---|---|---|---
Regression Coefficients: | 215 | -182 | 98
\(t\)-values: | (14.225) | (-5.566)
Adjusted \(R^2\): 0.44  | F-ratio: 101.84

B. Dependent Variable: Pre-Harvest Hired Female Labour (Hours/Farm). Av. = 210 hours

Independent Variables:  | Rice Sawah Cultivated | Rainfed Sawah (Hectares) | Sawah Sharecropping (Dummy: 1=rainfed, 0=not) | Household Women Adults (Number)
---|---|---|---|---
Regression Coefficients: | 284 | -81 | -64 | -37
\(t\)-values: | (19.508) | (-1.611) | (-1.908) | (-1.678)
Constant: 39  | F-ratio: 95.46
Adjusted \(R^2\): 0.59

C. Dependent Variable: Harvest Hired Labour (Hours/Farm). Average = 220 hours.

Independent Variables:  | Rice Sawah Cultivated | Upland Location (Hectares) | Proximity to Urban Areas (Dummy: 1=upland, 0=not) | Sawah Tenancy (Dummy: 1=tenant, 0=not) | Sawah Sharecropping (Dummy: 1=sharecropper, 0=not) | Rice Crop (tonnes)
---|---|---|---|---|---|---
Regression Coeff.s: | 138 | -159 | -128 | -56 | 48 | 26
\(t\)-values: (6.512) | (-7.141) | (-5.852) | (-2.449) | (2.686) | (5.273)
Constant: 129  | F-ratio: 230.59
Adjusted \(R^2\): 0.84

1985] and it proved necessary to differentiate between hired and household labour.

Sinaga and Sinaga [1976] argued that the introduction of modern varieties had not changed the demand for hired labour in Indonesia, but had benefited farmers and landlords at the expense of labourers. On the other hand, Collier et al. [1982] found evidence of a decline in hired pre-harvest labour where modern varieties had been introduced. A third line was taken by Hardjono [1987, p. 221] who stressed that more household rather than hired labour was being used, because modern varieties required more fertilising and weeding. These are not as time-constrained as land preparation or planting and so labour was less likely to be hired.

In the face of these diverse approaches, analysis of the Cimanuk River Basin data did not show up any differences between modern and traditional varieties in their use of hired labour. In the lowlands, where rice farmers planted only modern varieties, farmers indeed used less pre-harvest male labour than farmers in areas where traditional varieties were cultivated, but this difference was due to the spread of tractors in land preparation in lowland Java and not to rice varieties (Table 9.6; Chapter 6). Nor did rice varieties appear to have an effect on the level for pre-harvest female labour: this was determined by sawah size, sawah quality, the number of women adults in the farmer household and the type of tenancy contract (sharecroppers were less likely to hire women for maintenance tasks).

Modern varieties have certainly raised demand for harvest labour hours where they have produced higher yields. Thus when regression
analysis was used to estimate the determinants of the level of hired harvest labour among the rice farmers surveyed in the Cimanuk River Basin, the amount of rice crop produced was statistically significant (Table 9.6). However, modern varieties may have changed the distribution of hired harvest hours in two ways.

- (1) Sickles are being increasingly used for the shorter and tougher modern varieties, which are difficult to harvest using the traditional hand-knife (ani-ani). As a result, the number of harvesters is restricted as compared to traditional harvesting, since sickle-users require space around them to swing their implements.

- (2) Early studies noted that sickles were being used by men only [Collier 1981]. This entailed a loss to women, who traditionally dominate the harvest and obtain their highest agricultural wage incomes from it. The Cimanuk River Basin Survey did not record whether sickles were being used, but the author observed that by 1987, women were just as likely to be using sickles as men [see also Manning 1988, p.40]. One village head explained the earlier exclusion of women as male chauvinism in the face of new technology: once the novelty had worn off, women were allowed to use the sickles (i).

9.5.2 Hired Labour and Mechanisation

Despite large pools of surplus agricultural labour, it appears that Javanese farmers have been adopting labour-displacing techniques. How can this be explained?

Hayami and Ruttan [1973] argued that since agricultural innovation was induced by changes in relative factor prices, technical change
was endogenous to development. They assumed there were no distortions in the factor markets caused by Government policies, but many observers of rural Java and other areas in Asia have argued that this is precisely what has happened: the adoption of labour-saving techniques such as tractors and rotary weeders [Chapter 6] was not due to rising real wages but to "direct and indirect Government policies which lowered the real price of capital to farmers" [Jayasuriya and Shand 1983, p.22].

In a cross-country study, Lingard and Wicks [1982, p.99] estimated that mechanisation had provoked losses to landless labourers in West Java, but not in The Philippines or Thailand. Many recent studies have, however, judged innovations in Javanese agriculture in a more positive light. Manning [1988, p.55] found that whilst "mechanisation in general... had the effect of creating pockets of relatively elite wage workers..., because of limited spread, it [had] not significantly affected the predominantly casual nature of labour contracts in rice farming". Soedjono et al.'s [1985, pp.48-49] modelling results showed that technical innovations caused sufficient increases in crop production and sales to offset the direct negative effects on hired labour, by raising farmer incomes and hence demand for leisure. This raised demand for both hired agricultural labour and, with high income-elasticity of demand for non-agricultural products, for rural non-agricultural labour.

Turning to the situation in the Cimanuk River Basin, it was found that the "subsidized" tractors replaced much hoeing labour in the lowlands [Chapter 6]. Hoeing in the lowlands was therefore paid a lower real wage than in the midlands or uplands (Table 9.4). This was all the more unfortunate for the labourers concerned, because it
provided higher hourly wage rates than planting or maintenance. Wages for the latter jobs maintained their relative position because rotary weeders were just as likely to be found there as in the other desa [Chapter 6].

9.6 INCOME FROM AGRICULTURAL WAGE LABOUR AND FARMING COMPARED

Having looked at both own farming activities and off-farm labour on others' farms, it is of interest to compare the importance of these two major sources of rural income and to place agricultural wage income into a wider perspective.

Firstly, a household earning little from agricultural wage labour was not necessarily poor. Agricultural wage income averaged only 110 kg m.r.e. per household member, but labourer households earned on average three times this from their own farming activities. Thus whilst one in eight labourer households reached cukupan status (240 kg m.r.e. per member) from agricultural wage employment alone, two-thirds managed to do so from all agricultural activities, on- and off-farm.

Secondly, even non-rice farming could be more important than off- farm agricultural employment:

(a) far more households were involved in other farm activities than agricultural wage employment (283 and 198 respectively);

(b) forty percent of labourer households earned more from other farming activities than from agricultural wage employment 5.

It is therefore all the more regrettable that whilst the literature on agricultural wage employment in Java is abundant, that on rural

5. Seventy percent of these were from either upland desa.
households' "secondary" farming activities (palawija crops, garden crops, livestock and fish ponds) is scarce.

Finally, this analysis shows that the term "landless agricultural labourer" often used to describe rural households not cultivating sawah can be misleading on two accounts. In the first place, households without sawah might have other types of land to cultivate, especially gardens; they might also earn farm income from livestock and fish ponds. In the second place, the agricultural wage income of three-quarters of "landless agricultural labourers" in the Cimanuk River Basin was too low even for subsistence, so that they had to work in non-agriculture - the topic of the following Chapter.
CHAPTER 10

NON-AGRICULTURAL EMPLOYMENT AND INCOME

One-third of the households classified as rural in the Cimanuk River Basin Survey remained below the poverty line in agricultural income from their own farms and agricultural wage employment. Agriculture generated on average only 23 hours' employment per household per week in 1982/83, which was not even full-time employment for one member, so that households sought non-agricultural employment, as self-employed and/or hired workers. Non-agricultural activities are the subject of this final Chapter on household activities in the Cimanuk River Basin.

"Non-agriculture" comprised all labour activities which were not own-farming or hired agricultural wage employment, that is, industrial and service sector activities. Making string, hawking iced drinks, running a shop, working on construction sites and being employed in Government administration were therefore all classified as non-agricultural work. Defined in this way, 41 percent of all labour in the Cimanuk River Basin Survey was in non-agriculture; 25 percent of all households surveyed earned more than half their income from non-agricultural work. Many households also earned non-labour income, which is discussed separately below.

78 percent of the households surveyed in the Cimanuk River Basin reported working in non-agricultural labour activities, fewer than

1. 240 kg of milled rice equivalents per household member per year.
those cultivating rice (82 percent) but more than those working as agricultural labourers (64 percent). Households involved in non-agriculture spent on average 29 hours per household per week in non-agricultural activities, but only 25 hours in agriculture: 15 in farming and 10 in agricultural wage employment (Table 10.1). Participant households therefore tended to spend more time in non-agriculture than in agriculture. Because of the very low (net) returns to some kinds of work, however, these activities generated 36 percent of these participant households' total incomes.

10.1 REVIEW OF THE LITERATURE

Hymer and Resnick [1969] were among the first to draw specific attention to rural non-agricultural activities, which they called "Z-activities" after Becker's [1966] analysis 2. Although Hymer and Resnick recognised that non-agricultural income could be crucial for individual rural households, they predicted that its importance would decline with the growth of the agricultural sector. They felt this was desirable because non-agricultural activities, which were highly labour-absorptive in LDCs, were characterised by low returns to labour and low labour productivity, so that their contribution to the development of the economy as a whole was questionable.

Many studies, including those specific to Java, subsequently established the vital importance of non-agricultural activities to rural households and the rural economy. These studies, such as Anderson and Leiserson [1980], Barnum and Squire [1980], and Hymer and Resnick [1969], have shown that non-agricultural activities play a crucial role in rural economies. However, the term "non-agricultural" is used here: "off-farm" is somewhat confusing, since much non-agricultural work is carried out at home ("on-farm") and "off-farm" could be taken to include agricultural wage employment too.
Soedjono et al. [1985], Shand [1986] and Rietveld [1986] arrived at some common conclusions:

- (1) Rural non-agricultural employment can reduce rural unemployment during agricultural slack seasons and by using labour which cannot find industrial employment, e.g. old people and children.
- (2) It is particularly beneficial to the lot of the landless and near-landless and thus improves rural income distribution.
- (3) It can create backward linkages to the agricultural and industrial sectors, via the poorest households' high marginal propensity to consume both agricultural and non-agricultural products. In contrast to Hymer and Resnick, the relative importance of rural non-agricultural activities will rise, not fall, on this count alone.
- (4) Capital inputs can be provided for agriculture as well as consumer products to be sold locally and elsewhere.
- (5) Some of these activities are productive if not necessarily remunerative: construction and repairs of houses, local roads and irrigation networks, as well as women's chores such as food processing and dressmaking.

These observations help explain why non-agricultural activities have increased in importance in Java. Even at the time of Hymer and Resnick's article, non-agricultural employment in Java was more rural than urban: the 1971 Census indicated that more than half of employment in services and construction, two-thirds that in trade and three-quarters that in manufacturing was rural [Jones 1981, p.246]. Thus whilst less than twenty percent of Javanese heads of household were primarily in non-agriculture in the 1920s, by the
TABLE 10.1
NON-AGRICULTURAL LABOUR AND INCOME, by Desa
Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>LOYLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>HOUSEHOLDS WORKING IN NON-AGRICULTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>Proximity to Town (Km)</td>
<td>4</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Proximity to City (Km)</td>
<td>35</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Households Working in Non-Agriculture (% of Households Surveyed)</td>
<td>71</td>
<td>75</td>
<td>80</td>
</tr>
</tbody>
</table>

A. Labour Hours per Household Working in Non-Agriculture:
- as % of Household Total Labour
  Hours in Non-Agriculture (per Household):
  - Annual Hours | 1,250 | 1,050 | 1,650 | 1,460 | 1,330 | 2,080 | 1,510 |
  - Hours per Week | 24 | 20 | 32 | 28 | 26 | 40 | 29 |

B. Non-Agricultural Income per Household Working in Non-Agriculture:
- as % of Household Total Income
- '000 Rp/Household | 247 | 249 | 674 | 494 | 217 | 261 | 364 |
- in Kg m.r.e. per Household Member | 180 | 250 | 490 | 420 | 270 | 230 | 310 |

Notes: (1) Non-Agricultural Labour Income: sum of returns from cottage industry, gathering, industrial wage employment, trade, services. Calculated, where relevant, net of costs of raw materials, transport and lodging, and of interest payments on borrowed capital.
(2) Household Total Income: includes non-labour income received.
(3) Kg m.r.e.: income in milled rice equivalents (kilogrammes) per household member, using the average annual consumer price paid by each household in 1982/83. Subsistence line = 180 kg m.r.e. per person, poverty line = 240 kg m.r.e. per person.

Sources: Wiradi and Manning 1984, Table 2.2; 1983 Cimanuk River Basin Survey, 240 households working in non-agriculture.
TABLE 10.2  
NON-AGRICULTURAL ACTIVITIES, by Desa Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>HOUSEHOLDS WORKING IN NON-AGRICULTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
</tbody>
</table>

A. Household Participation (% of All Households Surveyed):

| Cottage Industry | 25 | 28 | 8 | 27 | 2 | 75 | 28 |
| Trade            | 15 | 9  | 27| 41 | 18| 44 | 26 |
| Service Wage Labour | 35 | 34 | 27| 21 | 12| 4  | 22 |
| Industrial Wage Labour | 12 | 25 | 29| 25 | 14| 7  | 18 |
| Gathering        | 10 | 8  | 14| 19 | 14| 13 | 13 |

Non-Agri. Activities: 71 75 80 90 53 95 78

B. Income per Hour (Rp/Hour):

| Cottage Industry | 210| 160| 340| 300| 140| 30 | 140 |
| Trade            | 190| 110| 460| 350| 160| 350| 330 |
| Service Wage Labour | 260| 340| 360| 310| 170| 330| 300 |
| Industrial Wage Labour | 320| 270| 320| 340| 270| 340| 310 |
| Gathering        | 80 | 180| 240| 100| 150| 190| 150 |

Non-Agriculture: 210 250 380 310 180 150 270

Agricultural Labour: 170 160 180 160 200 110 160

C. % of Non-Agricultural Income (Only Households Working in Non-Ag):

| Cottage Industry | 21 | 22 | 8  | 16 | 4  | 45 | 21 |
| Trade            | 20 | 10 | 29 | 35 | 31 | 43 | 29 |
| Service Wage Labour | 43 | 40 | 25| 15 | 23 | 2  | 23 |
| Industrial Wage Labour | 10 | 25 | 31| 24 | 26 | 6  | 20 |
| Gathering        | 6  | 3  | 7  | 10 | 16 | 4  | 7  |

Non-Agri. Income: 100 100 100 100 100 100 100

Notes: (1) Service Wage Labour: includes self-employment except trade.
(2) a. Non-Agricultural Labour Income: sum of returns from cottage industry, gathering, industrial wage employment, trade, services.
   Calculated, where relevant, net of costs of raw materials, transport and lodging, and of interest payments on borrowed capital.
   b. Income per hour: non-agriculture: household total non-agricultural income divided by household total non-agricultural labour.

Sources: Wiradi and Manning 1984, Table 2.2; 1983 Cimanuk River Basin Survey, 240 households working in non-agriculture.
beginning of the 1970s this had risen to one-quarter [[Ranneft 1929, p.81; Jones 1981, p.246].

If account is taken of other household members involved, this figure is higher. For example, by 1985, after a period of rapid economic growth fuelled by oil revenues, 37 percent of Central Java's rural labour force was primarily non-agricultural [Sandee and Weijland 1989, p.81]. These figures exclude the many agricultural households which earned non-agricultural income as an extra. Kasryno and Chong [1984, p.50], for example, estimated that non-agricultural employment accounted for 44 percent of total annual labour in ten Javanese desa. The corresponding estimate for the Cimanuk River Basin Survey was similar (41 percent, as mentioned above).

As to the reasons for the importance of non-agriculture, much of the relevant literature has emphasized the differences between those authors who believe that rural households have been "pushed" into them by the lack of agricultural opportunities and those who feel they have been "pulled" out by higher returns in non-agricultural employment [Chapter 3]. For example, Soedjono et al. [1985, p.45] found that non-agriculture exerted a powerful pull effect. The non-agricultural labour supply of the Javanese farmers surveyed was highly elastic with respect to wages: a one percent rise in wages elicited a 2.2 percent rise in labour supply. Hart and Sisler [1978, p.825] agreed on the pull effect for farmers, who earned relatively high non-agricultural returns per hour. They noted, however, that the survival strategies of the landless kept them in seasonal but "more certain" agricultural labour and concluded that they were being pushed into non-agriculture during slack agricultural periods.
A number of studies have noted differences among farmers. For example, Chew and Shand [1983, p.7] found that households with smaller farms were more likely to work in non-agriculture than those with larger farms. However, Kikuchi et al. [1979, p.28] found those with more sawah earned higher non-agricultural incomes. It could be that the larger farm households had been pulled into non-agricultural employment which was less menial and brought in higher returns per hour. The result was that "only" one-third of Kikuchi et al.'s small rice farms but as much as 54 percent of larger farms earned more from non-agriculture than agriculture.

Both the "push" and the "pull" points of view apply to the households surveyed in the Cimanuk River Basin, but depend on the type of activity, accessibility and agricultural conditions in each desa.

10.2 FIVE NON-AGRICULTURAL ACTIVITIES IN THE C.R.B. SURVEY

As mentioned, over three-quarters of all the Cimanuk River Basin households surveyed worked in non-agriculture. In milled rice equivalents, non-agricultural (labour) income averaged 310 kg per household member, well above the poverty line (Table 10.1).

The degree of participation in non-agriculture, hours and incomes varied widely between the six desa, as analysed in the sections which follow. In order of the number of households involved, the non-agricultural activities can be classified as follows (Table 10.2):

- (1) cottage industry (29 percent of households);
- (2) trade (26 %);
- (3) service wage labour (22 %);
### TABLE 10.3

**COTTAGE INDUSTRY, by Desa**

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th></th>
<th>LOWLAND</th>
<th></th>
<th>MIDLAND</th>
<th></th>
<th>UPLAND</th>
<th></th>
<th>COTTAGE INDUSTRY HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
<td>G</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Households in Cottage Industry (% of All Households Surveyed)</td>
<td>25</td>
<td>28</td>
<td>8</td>
<td>27</td>
<td>2</td>
<td>75</td>
<td>28</td>
</tr>
<tr>
<td>Labour per Week (Hours)</td>
<td>6</td>
<td>11</td>
<td>14</td>
<td>15</td>
<td>12</td>
<td>33</td>
<td>21</td>
</tr>
<tr>
<td>Income/Hour (Rp/Hour)</td>
<td>210</td>
<td>160</td>
<td>340</td>
<td>300</td>
<td>140</td>
<td>30</td>
<td>140</td>
</tr>
<tr>
<td>Cottage Industry Income in Kg m.r.e. per Member</td>
<td>30</td>
<td>230</td>
<td>150</td>
<td>310</td>
<td>40</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

1. The activities, in descending order of popularity:
   - Lowland W and lowland L: brickmaking, dressmaking and basket-work.
   - Midland S and midland C: preparation of snack-foods, basket-work, dressmaking and carpentry.
   - Upland G: dressmaking (one household).
   - Upland M: string-making and basket-work.

2. a. Income: net after costs of raw materials and interest payments.
   b. Kg m.r.e.: income in milled rice equivalents (kg) per household member, using the average annual consumer price paid by each household.

**Source:** 1983 Cimanuk River Basin Survey, 88 households in cottage industry.
### TABLE 10.4

GATHERING, by Desa

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th></th>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W</td>
<td>L</td>
<td>S</td>
</tr>
<tr>
<td>Households Reporting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gathering (% of All</td>
<td>10</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Households Surveyed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour per Week (Hours)</td>
<td>3</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Income/Hour (Rp/Hour)</td>
<td>80</td>
<td>180</td>
<td>240</td>
</tr>
<tr>
<td>Gathering Income in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kg m.r.e. per Member</td>
<td>10</td>
<td>80</td>
<td>50</td>
</tr>
</tbody>
</table>

Notes:
1. Gathering consisted almost entirely of fetching bamboo/wood.
   Men from some lowland households also went fishing.
2. a. Income: gathered goods valued at sale prices.
   b. Kg m.r.e.: income in milled rice equivalents (kg) per household member, using the average annual consumer price paid by each household.

- (4) industrial wage labour (18 %); and
- (5) gathering (13 %).

In order of importance of income generated, the order changes to:
- (1) trade;
- (2) service wage labour;
- (3) cottage industry;
- (4) industrial wage labour; and
- (5) gathering.

However, the analysis is set out along more traditional lines, that is, cottage industry, gathering, industrial wage labour, trade and service wage labour.

10.2.1 Cottage industry

Cottage industry ranged widely from string-making, basket-work and brickmaking to cooking snack foods, dressmaking and carpentry. Indeed, cottage industry was the most common industrial employment in Indonesia: over eighty percent of the manufacturing labour force was in cottage industry [McCawley 1983, p.29].

Almost thirty percent of households reported some kind of cottage industry work (Table 10.3). They spent more time in this, 21 hours per week, than in farming or agricultural wage employment (17 and 15 hours respectively). Net income 3 averaged only 70 kg of milled rice equivalents per household member, well below the poverty line, mainly because of the very low returns to particular activities.

Almost half of the households were in upland M alone, where they spent long hours making string. Indeed, string-making in upland M

3. Income was calculated net of input costs and interest paid on borrowed capital, if any; total costs averaged just over one-quarter of gross returns.
was a prime example of a "push" into low wage, low productivity non-agriculture. This activity yielded by far the lowest returns per hour of any activity in the Cimanuk River Basin Survey, a paltry 20 Rp/hour, as compared with an average of 200 Rp/hour from other cottage industry activities. The main reason why string-making was so unremunerative was competition from plastics, which are cheap and, unlike string, durable, light in weight and not prone to disintegrate when wet. (Basket-work suffered from similar competition and was the activity with the second lowest average returns, 50 Rp/hour).

Nevertheless, seventy percent of upland M households had members making string, simply because of the lack of alternative sources of income, i.e., low opportunity cost of labour. Households in other desa surveyed enjoyed larger sawah size, better agricultural wage labour opportunities or reasonably easy access to urban non-agricultural employment. Upland M households had none of these. In addition - or maybe because of this - upland M women traditionally did not work outside the home except on others' nearby sawah. The attractions of string-making were that it could be done at home and was easy enough for young children to participate in; the average number of participants was four per household, mainly women and children. Since they tended to work all year round, upland M households averaged as much as 33 hours per week in cottage industry, almost one industrial country's working week.

By contrast, the most common cottage industry of the lowlands was quite remunerative: twenty percent of lowland households made bricks during agricultural slack periods, when rice stalks became available for burning. The need for rice-straw explains why bricks were made
only by rice farmers and mostly on larger farms. Whilst it is a
traditional activity - Raffles [1817, p.165] commented on the
ubiquity of brickmaking in Java - brickmaking is also a remunerative
one, because of the construction boom in recent years.

The midland desa, especially midland C, are worth mentioning because
of the variety of mostly skilled activities carried out there: snack
foods, dressmaking and carpentry, probably stimulated by easy access
to urban markets. Average returns per hour and cottage industry
incomes were therefore significantly higher than in the lowlands or
uplands.

It is often assumed that cottage industry work is part of the
"survival strategies" of the poorest rural households, that is,
those without or with very little sawah. However, merely seventeen
percent of sawahless households in the Cimanuk River Basin Survey
worked in cottage industry and earned "only" 22 percent of their
total income from this activity. More large rice farms 4 were
involved, who earned twice the incomes of the sawahless households,
because they mostly worked in remunerative jobs such as dressmaking,
brick-making and carpentry, which require greater initial capital
outlay.

10.2.2 Gathering

13 percent of households reported gathering from uncultivated areas,
mostly during slack periods 5 (Table 10.4). Although agricultural
by nature, the motives for gathering are frequently the same as

4. Small farms = less than 0.25 hectares.
Medium-sized farms = between 0.25 and 0.99 hectares inclusive.
Large farms = 1 hectare or more.
5. Gathered fodder was included in livestock farming calculations.
those for other non-agricultural self-employment activities such as cottage industry and it is therefore included here.

In eighty percent of households, women and older children fetched wood and bamboo, mainly for construction and weaving. The men of a few lowland households occasionally went fishing. Households seemed to have a good idea of what the gathered goods were worth and "income" from gathering activities was estimated at sale prices of the goods concerned. Such income was generally small: in milled rice equivalents per household member, the households earned on average merely 40 kg during the entire year from gathering activities. Nevertheless, despite its menial associations, average returns per hour to gathering were somewhat higher than those to cottage industry.

As expected, the gatherers were "disadvantaged" relative to other households surveyed in the Cimanuk River Basin, being characterised by at least one of the following:

- (1) living in a desa far from urban areas;
- (2) having a large number of children relative to the number of adults;
- (3) being landless;
- (4) cultivating sawah as pure tenants, especially sharecroppers.

However, despite these "disadvantages", as much as three-quarters of gatherer households were cukupan in terms of total income, earning more than 240 kg of milled rice equivalents per person from various activities over the year. Gathering accounted for quite a small part (ten percent) of their total incomes.
### Table 10.5

**INDUSTRIAL WAGE LABOUR, by Desa**

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>INDUSTRIAL WAGE LABOUR HOUSEHOIDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>12</td>
<td>25</td>
<td>29</td>
<td>25</td>
</tr>
</tbody>
</table>

- **Households in Industrial Wage Labour (% of All Households Surveyed)**: 12, 25, 29, 25, 14, 7, 18
- **Labour per Week (Hours)**: 9, 8, 16, 13, 22, 15, 13
- **Income/Hour (Rp/Hour)**: 320, 270, 320, 340, 270, 340, 310
- **Industrial Wage Income in Kg m.r.e. per Member**: 130, 100, 180, 120, 330, 200, 160

**Notes:**
1. The activities, in descending order of popularity:
   - Lowland W and lowland L: skilled and unskilled construction work and small-scale manufacturing.
   - Midland S and midland C: skilled and unskilled construction work, small-scale manufacturing and heavy industry.
   - Upland G and upland M: skilled construction work and agricultural produce processing.
2. **(a)** Income: net after any transport and lodging costs.
   **(b)** Kg m.r.e.: income in milled rice equivalents (kg) per household member, using the average annual consumer price paid by each household.

**Source:** 1983 Cimanuk River Basin Survey, 57 households in industrial wage labour.
### TABLE 10.6

**SERVICE WAGE LABOUR, by Desa**

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>Households in Service Wage Labour (% of All Households Surveyed)</th>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>35</td>
<td>27</td>
<td>12</td>
</tr>
<tr>
<td>L</td>
<td>34</td>
<td>27</td>
<td>12</td>
</tr>
<tr>
<td>S</td>
<td>21</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td>C</td>
<td>12</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td>G</td>
<td>4</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>M</td>
<td>22</td>
<td>24</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Labour per Week (Hours)</th>
<th>27</th>
<th>17</th>
<th>33</th>
<th>22</th>
<th>32</th>
<th>10</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income/Hour (Rp/Hour)</td>
<td>260</td>
<td>340</td>
<td>360</td>
<td>310</td>
<td>170</td>
<td>330</td>
<td>300</td>
</tr>
<tr>
<td>Service Wage Income in Kg m.r.e. per Member</td>
<td>180</td>
<td>320</td>
<td>430</td>
<td>480</td>
<td>220</td>
<td>80</td>
<td>310</td>
</tr>
</tbody>
</table>

Notes: (1) Main service activities (non-trade), in descending order of popularity:
- Lowland W and lowland L: becak driving, nightwatchmen, local admin.
- Midland S and midland C: Government administration, self-employment, teaching, local administration, goods repairs.
- Upland G: public transport, local administration.
- Upland M: local administration (one household).

(2) a. Income: net after transport and lodging costs.
b. Kg m.r.e.: income in milled rice equivalents (kg) per household member, using the average annual consumer price paid by each household.

## TABLE 10.7

**TRADE, by Desa**

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>TRADING HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>15</td>
<td>9</td>
<td>27</td>
<td>41</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Labour per Week * (Hours)</th>
<th>37</th>
<th>48</th>
<th>29</th>
<th>26</th>
<th>23</th>
<th>27</th>
<th>30</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Income/Hour * (Rp/Hour)</th>
<th>190</th>
<th>110</th>
<th>460</th>
<th>350</th>
<th>160</th>
<th>350</th>
<th>320</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Trading Income in Kg m.r.e. per Member *</th>
<th>290</th>
<th>360</th>
<th>540</th>
<th>320</th>
<th>280</th>
<th>380</th>
<th>370</th>
</tr>
</thead>
</table>

**TYPES OF TRADING, in descending order of popularity:**

- Lowland W: Hawking drinks, snack-foods, agricultural produce.
- Lowland L: Running a warung, hawking snack-foods.
- Midland S: Running a warung, selling agricultural produce on a market, hawking snack-foods.
- Midland C: Hawking snack-foods, drinks and non-perishables, running a shop.
- Upland G: Selling agricultural produce on a market, hawking snack-foods, agricultural produce.
- Upland M: Acting as middlemen for non-perishables, hawking non-perishables, selling agricultural produce on a market, hawking agricultural produce and running a warung.

*: Excludes two warung households:
- one working 160 hours/week, earning 740 Rp/hour and 3,360 kg m.r.e. (Midland S);
- one working 100 hours/week, earning 820 Rp/hour and 3,840 kg m.r.e. (Midland C).

**Notes:**
1. Income: net after input, transport and lodging costs, and any interest payments.
2. Kg m.r.e.: income in milled rice equivalents (kg) per household member, using the average annual consumer price paid by each household.

**Source:** 1983 Cimanuk River Basin Survey, 80 households working in trade.
10.2.3 Industrial Wage Employment

Almost twenty percent of Cimanuk River Basin households surveyed worked in industrial wage employment (Table 10.5). Just as for cottage industry, far fewer hours were worked in industrial wage employment in the two lowland desa than elsewhere, because the work there was carried out only during agricultural slack periods (see also Chapter 9), whereas most of the upland and midland households had someone working all year round.

A few households were engaged in small-scale manufacturing, heavy industry, or processing agricultural produce, but most (70 percent) worked as skilled or unskilled labourers on construction sites. Since these jobs generally required strong physical effort, all the workers were men and were generally well-paid: the average wage earned was 310 Rp/hour, more than double the average returns to cottage industry. Thus although average hours were relatively short (13 hours per household per week), industrial wage employment contributed on average 30 percent of household total income for households with members engaged in such work.

10.2.4 Trade

In 1980, trade was the largest non-agricultural sector in rural Java and accounted for half of non-agricultural employment in the major cities [Manning 1988, p.57]. This importance of trade was reflected among the households in the Cimanuk River Basin Survey: over one-quarter were involved in trade (Table 10.7).

Trading households generally sold snacks, drinks or small manufactured goods; selling agricultural produce was common only
from upland G, where high-value vegetables and fruits were cultivated [Chapter 7]. Over half of traders were hawkers, another 30 percent sold from warung (shops or stalls) or on markets and the remainder acted as middlemen for larger traders.

Trading households spent 32 hours per week in trade (preparation, transport and sale), a higher average than for households in any other activity in the Cimanuk River Basin Survey. They were rewarded by the highest average returns per hour (320 Rp/hour) of any of the non-farming activities. Households involved in trading therefore earned a high proportion of household total income from trade, 44 percent on average. Some trader households earned very large incomes indeed: the two largest incomes from a single activity in the Cimanuk River Basin Survey were from trade, 6.1 and 4.2 million Rp, whilst the largest rice income was just 3.7 million Rp.

Trade incomes per trading household were on average greatest in the two midland desa, which both had easy access to urban areas; all the households earning more than 1 million Rp from trade came from either of the two midland desa. However, trading activities were not always related to access to urban areas, since over two-fifths of households from upland M, the most inaccessible desa, were traders. One entrepreneurial trader from upland M had built up a network selling goods rather than perishables and, despite the distance from urban areas, this activity took off to the point where many fellow villagers participated, often travelling long distances (up to 300 km to Semarang in Central Java). The good returns they earned seem to have attracted (i.e. "pulled") upland M households into trading as opposed to other off-farm activities. By contrast,
for example, it appears that lowland W traders were mostly "pushed" into this activity through lack of alternative sources of income.

10.2.5 Service Wage Employment

The final category of non-agricultural labour found among the households of the Cimanuk River Basin Survey was wage employment in services. Since 75 percent of the Javanese population was classified as rural and the Indonesian service sector is said to account for forty percent of national GDP, it would be surprising if many rural households did not report participating in the service sector [Rietveld 1988, p.76; Chapter 1]. The jobs reported by households in the Cimanuk River Basin Survey ranged widely from becak driving to being employed in public administration and self-employed professionals, barbers, healers and so on have been included for convenience. Just over one-fifth of households reported working in one of these jobs (Table 10.6). They spent on average 24 hours per week there, more than were reported for any other activity except trading.

Service wage employment was the only non-agricultural activity which was relatively common among households from the two lowland desa, usually in the form of becak driving ⁶. This was almost exclusively an agricultural slack period job, especially since the becak drivers came from households which cultivated mostly large areas of rice sawah land (average 1.8 hectares per household).

---

⁶. Becak driving was almost exclusive to lowland households, who were closest to large cities in flat coastal areas and for whom this was a job easily adapted to seasonal employment (a number of drivers share one becak over the year).
Whilst services were a source of temporary employment in the lowlands, ninety percent of the midland households which reported working in services did so in full-time "better-class" jobs as Government employees, self-employed professionals, teachers, village administrators and so on. Working in public administration was particularly characteristic of households from midland S, where most households have a relative in the civil service in Jakarta and almost every child attends secondary school.

10.3 RURAL HOUSEHOLDS AND INCOMES EARNED IN URBAN AREAS

Hugo's [1978] pioneering study drew attention to the magnitude of circular migration in Java, especially between rural West Java and Jakarta. He emphasized that circular migrants were not necessarily "pushed" out of the desa but were also attracted by a chance to supplement their incomes and improve their standards of living [p.108]. They maintained "strong social and economic connections" with their desa in order to obtain harvest employment as well as participate in Lebaran 7 [pp.250, 292]. Hugo estimated that circular migrants contributed on average just under half of household total income of those that participated, and concluded that migration had promoted a "much wider spatial distribution of the wealth generated in Jakarta", so that migrants' remittances allowed for the "inversion of the parasitic function traditionally ascribed to cities" [pp.264, 270, 303].

Other studies of rural Java [e.g. Collier et al. 1982b], have similarly noted large numbers of circular migrants. Hetler [1989, p.59] found that "circular migration remittances increasingly

7. The festival which marks the end of the fasting month Ramadan; it is celebrated in style with feasts and presents.
<table>
<thead>
<tr>
<th></th>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>HOUSEHOLES WITH NON-LABOUR INCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>Households Earning Non-Labour Incomes (% of Households Surveyed)</td>
<td>38</td>
<td>25</td>
<td>69</td>
<td>59</td>
</tr>
<tr>
<td>Non-Labour Income:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- as % of Non-Labour Income Household's Total Income</td>
<td>17</td>
<td>18</td>
<td>23</td>
<td>16</td>
</tr>
<tr>
<td>- in Kg m.r.e/Member</td>
<td>90</td>
<td>290</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>Of Which (%):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Remittances/Gifts</td>
<td>65</td>
<td>64</td>
<td>62</td>
<td>65</td>
</tr>
<tr>
<td>- Sawah Rent</td>
<td>35</td>
<td>36</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>- Government Pension</td>
<td>-</td>
<td>-</td>
<td>24</td>
<td>7</td>
</tr>
<tr>
<td>Non-Labour Income</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: (1) Kg m.r.e.: income in milled rice equivalents (kg) per household member, using the average annual consumer price paid by each household.

dominated as the primary source of support" for households with migrant members. Such remittances encouraged the expansion of local rural enterprises and services. Furthermore, the fact that so much labour remained linked to the land rather than settling permanently in the cities meant that people could return to rural areas in the later 1980s when national oil revenues and therefore Government public expenditure declined, a decline, which, with a few exceptions, affected urban areas more immediately than rural ones.

Many non-agricultural activities took members of rural households to urban areas. These were commuters or circular (seasonal) migrants - the Survey excluded permanent migrants as members of the households, although any remittances they made were accounted for under "non-labour incomes" (see below). 71 percent of non-agricultural labour incomes were earned outside the households' home desa, 52 percent entirely in urban areas. Thus 23 percent of total income earned by the households surveyed in the Cimanuk River Basin was earned in urban areas. The main activity which involved going to the city was trade: three-quarters of trade incomes were earned in towns and cities. Urban areas were less important for service or industrial wage employment (two-fifths and one-third of incomes respectively).

Evaluating the role of accessibility is a complex matter. No easy conclusion can be drawn from the Cimanuk River Basin Survey data, since agricultural conditions in each desa determined the need and time available for, and hence the type of, non-agricultural activities. Access could then play a role in determining how many of these activities took place in urban areas.
This situation probably explains why there was a "marked clustering of individuals from all classes from the same village in similar occupations in the city" [Manning 1988, p.68]. Specific examples from the 1983 Survey already discussed include becak driving by lowland L households, Government employment for midland S households and goods trading by upland M households.

10.4 NON-LABOUR INCOMES

The discussion so far has concerned income earned from labour activities, but non-labour income (rents, remittances, gifts) was also important. Although this is the final source of income to be discussed, it was not a negligible one: almost half (47 percent) of households surveyed in the Cimanuk River Basin reported earning some non-labour income in 1982/83 and this accounted on average for eight percent of household total incomes, more than the average for cottage industry, gathering, or industrial wage incomes (Table 10.8).

Given the above discussions concerning rural-urban migration, it is not surprising that four-fifths of households reporting non-labour income received "gifts" or remittances from other members of their families (some received both sawah rent and remittances). One lowland W household (of one member) was entirely dependent on remittances for income.

One-quarter of rent earners were sawah landlords. These households were, as one would expect, among the more wealthy ones in the Cimanuk River Basin Survey, their total incomes exceeding average total income by forty percent. However, these high incomes were not necessarily due to the rent earned from sawah, since this averaged
only 17 percent of the total income of these landlord households. Only one quarter of landlords did not cultivate some sawah themselves and the average size of sawah cultivated by the other three-quarters (which included tenants) was 1.1 hectares, an important source of income.

The number of landlords and the amount of rent they earned were characterised by desa location: there were few landlords in the uplands and these received relatively small rents (280 kg of milled rice equivalents). Landlords were also few in the lowlands, but these were closer to the traditional LDC powerful landlord stereotype: they clearly owned more and better quality sawah, since each received as much as 910 kg m.r.e. in rent, more than three times that of upland landlords. This ties in with the higher incidence of landlessness and more unequal distribution of land in lowland Java than elsewhere. These observations indicate once again the problems that could arise in discussing the characteristics of rural activities without explicit reference to location or agro-climatic zone.

Finally, a few households were entitled to pensions as former Government employees; these households were all but one in the two midland desa, where many households reported having members working in public administration.

In the Cimanuk River Basin Survey, a household which participated in non-agricultural labour activities earned on average enough from these activities to support the entire household for the year: at 310 kg of milled rice equivalents per member, this was above the
poverty line of 240 kg [Sajogyo 1975]. Most of the large incomes earned came from employment in the service sector, i.e. trading, Government administration and professional services.

Non-agricultural income was more important than agricultural wage labour income in the Cimanuk River Basin Survey. This is shown by the fact that the average non-agricultural income earned (by households working in non-agriculture) was three times the average 110 kg m.r.e. per member earned from agricultural labour (by households working in agriculture). Non-agricultural income per participant household was higher even in lowland L, where opportunities for agricultural employment were much more favourable than in the other five villages surveyed (Chapter 9).

Perhaps the best summary of the positive effects of non-agricultural employment on an Asian rural economy is found in Oshima [1984, p.33], writing about The Philippines:

"The additional employment... contributed to the fuller and better utilization of the labor force in pronouncedly seasonal, monsoon economies... More remunerative and interesting work in nearby factories, shops, stores and offices was found... The higher incomes earned enabled farm families to purchase machine-made clothing, housewares and other products they formerly made more laboriously. Perhaps more important, the higher incomes contributed to the additional purchase of machines, equipment, fertilizers, insecticides and other inputs needed for farming and to more education for children. While skills in spinning and weaving were lost, new, more modern ones were learned, and
commuting out of the villages opened up to the villagers new ways of living and thinking."

This is clearly shown in specific areas of the Cimanuk River Basin, where households were attracted into a wide range of remunerative non-agricultural activities. However, these still need to reach the less favoured areas. An informed analysis of the rural non-agricultural sector is vital; devising rural development policies and forecasting their effects must be preceded by the recognition that "rural" does not equate with "agricultural" and that "non-agriculture" covers a multitude of activities varying in effort, skills, returns to labour and status.
The central topic of this thesis is the survival strategies of rural households in Java, that is, the extent to which they earned adequate incomes, the sources of such incomes and their degree of dependence on these sources. Although they may have given the impression of living near subsistence, the multifarious activities allowed 89 percent of households surveyed to be cukupan, that is, earning total incomes greater than the poverty line of 240 kg of milled rice equivalents per member. Indeed, the average household total income was as high as 760 kg per member, three times the poverty line.

To illustrate how this level of income is made up by the individual aspects of rural activities already discussed, this Chapter deals with total labour hours and total incomes. These are analysed in terms of the influence of such factors as location, sawah land size and non-agricultural activities, which are tested and evaluated by way of regression analysis of household total income.

The 309 households surveyed in the Cimanuk River Basin spent 2,500 hours in remunerative activities in 1982/83, equivalent to 48 hours per household per week (Table 11.1). Since the average household included almost three adults, they worked only 17 hours
**TABLE 11.1**

**RURAL EMPLOYMENT AND INCOME:**

**ACTIVITIESUNDERTAKENBYRURALHOUSEHOLDS&SOURCESOFINCOME**

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>Labour Hours</th>
<th>Income</th>
<th>(Relevant Households)</th>
<th>Returns per Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>309 hhlds (% of total)</td>
<td>309 hhlds (% of total)</td>
<td>(Number)</td>
<td>Relevant hhlds (Rp/hour)</td>
</tr>
</tbody>
</table>

**OWN FARMING:**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>15</td>
<td>35</td>
</tr>
<tr>
<td>Garden Crops</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Palawija Crops</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Livestock</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Fish Ponds</td>
<td>&lt;1</td>
<td>1</td>
</tr>
</tbody>
</table>

**AGRICULTURAL LABOUR:**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Wage Employment</td>
<td>20</td>
<td>14</td>
</tr>
</tbody>
</table>

**NON-AGRICULTURAL LABOUR:**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cottage Industry</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Trading</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Service Wage Employment</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Industrial Wage Employment</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Gathering</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

**NON-LABOUR:**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Labour Income</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Average per household for all households: 2,500 hours 861,700 Rp (309) 502

Notes:
1. Average Income of 861,690 Rp per household was equivalent to 763 kg of milled rice equivalents per member; the poverty line was 240 kg.

Source: 1983 Cimanuk River Basin Survey, 309 households
per week each, less than half the 37½ hour working week normal in an industrialised country.

When 5 hours per household per day were added to allow for non-remunerated household tasks and childcare (Chapter 5 and White [1981, pp.136-137]), total labour hours rose to 83 hours per household per week, or 30 hours per adult. Thus even if unremunerated labour hours are included (40 percent of the total), it cannot be said that the rural households were fully occupied during their available labour time.

However, less than full-time employment could in theory be compensated by high returns per hour. Unfortunately, the activity with the highest returns in the Cimanuk River Basin Survey, own rice cultivation, also had the greatest swings in household labour demand over time. Whilst own labour supply was insufficient during land preparation and harvesting, few households cultivated enough sawah land to employ all members during the slack periods.

This situation led to "occupational multiplicity" per household and even per household member [White 1981]. Some activities, such as livestock husbandry, cottage industry, agricultural wage labour, often yielded low returns per hour, whilst others, such as trading, cultivating high-value food crops, services and industrial wage labour mostly paid better (Table 11.1). However, households could not freely choose in this range: in addition to the straightforward problem of the availability of work, members of the household were aided or constrained by factors such as the number of adults, the size of sawah cultivated, relationships with other farmers,
landlord-tenant ties, geographical accessibility, agro-climatic zone and so on. 1

11.1. LABOUR ACTIVITIES AND SOURCES OF INCOME

Rice cultivation certainly provided the main employment and income in the Cimanuk River Basin Survey. Cultivating own rice and working on others' sawah accounted for 35 percent of total remunerated labour time and generated 49 percent of household total incomes (Table 11.1). This justifies the emphasis placed in the literature on rice cultivation as the primary rural activity.

However, non-rice sources of income – non-agriculture, other farming and non-labour income – together contributed as much to income as rice did. Indeed, the households surveyed spent more time in non-agricultural activities (40 percent) than on their own and others' rice sawah together (35 percent). This happened because of the inadequately small average size of sawah cultivated and the relatively low returns to agricultural wage labouring, which "pushed" and/or "pulled" households into alternative additional sources of income.

Trading was the third most important source of income (11 percent) in the Cimanuk River Basin Survey after rice cultivation and agricultural wage employment, although it was practised by far fewer households (85, 65 and 26 percent respectively). As seen in

1. Occupational multiplicity had a further effect on hours spent for the purpose of work. Similarly to commuting, time was used in moving between jobs.
FIGURE 11.1

HOUSEHOLD EMPLOYMENT AND INCOME, by desa
Cimanuk River Basin, 1982/83

A. Labour Activities (% of total)

B. Sources of Income (% of total)

Source: 1983 Cimanuk River Basin Survey, 309 households
TABLE 11.2
RURAL HOUSEHOLDS' MAIN LABOUR ACTIVITIES, By Desa
Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOWLAND</td>
<td>MIDLAND</td>
<td>UPLAND</td>
<td>ALL</td>
</tr>
<tr>
<td>W</td>
<td>L</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>1,930</td>
<td>3,070</td>
<td>2,370</td>
<td>2,260</td>
</tr>
<tr>
<td>2,260</td>
<td>2,940</td>
<td>3,290</td>
<td>2,500</td>
</tr>
</tbody>
</table>

B. Activities Ranked by % of Household Labour Time (in parentheses)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Agri.L</th>
<th>Agri.L</th>
<th>Trade</th>
<th>Trade</th>
<th>Rice</th>
<th>Cott.Ind</th>
<th>Agri.L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(32)</td>
<td>(40)</td>
<td>(16)</td>
<td>(24)</td>
<td>(21)</td>
<td>(35)</td>
<td>(20)</td>
</tr>
<tr>
<td>2</td>
<td>Services</td>
<td>Livestock</td>
<td>Services</td>
<td>Rice</td>
<td>Agri.L</td>
<td>Trade</td>
<td>Rice</td>
</tr>
<tr>
<td></td>
<td>(21)</td>
<td>(15)</td>
<td>(14)</td>
<td>(15)</td>
<td>(17)</td>
<td>(21)</td>
<td>(15)</td>
</tr>
<tr>
<td>3</td>
<td>Rice</td>
<td>Rice</td>
<td>Rice</td>
<td>Livestock</td>
<td>Palawija</td>
<td>Rice</td>
<td>Trade</td>
</tr>
<tr>
<td></td>
<td>(11)</td>
<td>(14)</td>
<td>(14)</td>
<td>(14)</td>
<td>(14)</td>
<td>(15)</td>
<td>(14)</td>
</tr>
<tr>
<td>4</td>
<td>Trade</td>
<td>Trade</td>
<td>Livestock</td>
<td>Agri.L</td>
<td>Livestock</td>
<td>Livestock</td>
<td>Livestock</td>
</tr>
<tr>
<td></td>
<td>(10)</td>
<td>(4)</td>
<td>(13)</td>
<td>(11)</td>
<td>(13)</td>
<td>(8)</td>
<td>(12)</td>
</tr>
<tr>
<td>Other</td>
<td>(26)</td>
<td>(27)</td>
<td>(43)</td>
<td>(36)</td>
<td>(35)</td>
<td>(21)</td>
<td>(39)</td>
</tr>
<tr>
<td>Total</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
</tr>
</tbody>
</table>

Notes: (1) Agri.L : agricultural wage labour (working on others' rice crops).
       (2) Cott.Ind: cottage industry.
       (3) Palawija: non-rice crops grown in fields.
       (4) Rice : own rice cultivation.
       (5) Services: service sector work excluding trading.

Source: 1983 Cimanuk River Basin Survey, 309 households
TABLE 11.3

RURAL HOUSEHOLDS’ MAIN SOURCES OF INCOME, By Desa
Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>W L L S C G M</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A. Total Household Income (in kg milled rice equivalents)

<table>
<thead>
<tr>
<th></th>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>560</td>
<td>1,060</td>
<td>910</td>
<td>800</td>
</tr>
</tbody>
</table>

B. Sources of Income Ranked by % of Household Income (in parentheses)

<table>
<thead>
<tr>
<th></th>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rice</td>
<td>Rice</td>
<td>Rice</td>
<td>Rice</td>
<td>Rice</td>
</tr>
<tr>
<td></td>
<td>(23)</td>
<td>(25)</td>
<td>(16)</td>
<td>(17)</td>
</tr>
<tr>
<td>3. Services</td>
<td>Services</td>
<td>Trade</td>
<td>Non L</td>
<td>Agri.L</td>
</tr>
<tr>
<td></td>
<td>(14)</td>
<td>(10)</td>
<td>(13)</td>
<td>(13)</td>
</tr>
<tr>
<td>4. Non L</td>
<td>Non L</td>
<td>Services</td>
<td>Services</td>
<td>Garden</td>
</tr>
<tr>
<td></td>
<td>(7)</td>
<td>(5)</td>
<td>(11)</td>
<td>(7)</td>
</tr>
<tr>
<td>Other</td>
<td>(19)</td>
<td>(14)</td>
<td>(35)</td>
<td>(29)</td>
</tr>
<tr>
<td>Total</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
</tr>
</tbody>
</table>

C. Household Mean Returns per Hour from Labour Activities (Rp/hour)

<table>
<thead>
<tr>
<th></th>
<th>LOWLAND</th>
<th>MIDLAND</th>
<th>UPLAND</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>590</td>
<td>420</td>
<td>420</td>
<td>460</td>
</tr>
</tbody>
</table>

Notes:
1. Agri.L: agricultural wage labour (working on others’ rice crops).
2. Cott.Ind: cottage industry.
7. Services: service sector work excluding trading.

Source: 1983 Cimanuk River Basin Survey, 309 households
Chapter 10, the forms of trading varied widely, and evinced both "push" and "pull" forces for rural households.

In order to understand to what extent these overall results for the Cimanuk River Basin Survey could be representative of Java, it is important to look at variations within the River Basin. Following the pattern of previous Chapters, the next sections deal with differences by location, farm size and total income.

11.1.1. Location Factors in Labour Activities & Sources of Income

When it was decided to survey households in different villages in the Cimanuk River Basin, the six villages were specifically chosen to allow for location differences, i.e. two lowland, two midland and two upland, with varying degrees of accessibility. Indeed, the analyses presented here show certain similarities between households within each area as well as contrasts between the three areas and therefore justify the selection (Tables 11.2, 11.3; Figure 11.1).

For example, rice farming was the most important single source of income in all six desa surveyed. However, whilst agricultural wage labour was second in both lowland desa, trade played that role in both midland desa and non-rice crops were important only in the uplands. Rietveld [1986, p.109] found a strong positive relationship between non-agricultural income and density of rural population. The Cimanuk River Basin Survey appears to show a similar pattern: density ranged from 3 persons per hectare of sawah cultivated in lowland L up to 10 in midland S, whilst the share of income from non-agriculture ranged from 18 to 37 percent respectively.
The oil boom had affected lowland Java in particular, improving infrastructure and access to cities as well as worsening land distribution [Collier 1981; Kasryno 1983]. It may therefore seem paradoxical that the lowland households surveyed obtained more income from rice than the midland or upland ones, but further analysis shows that lowland rice farms were generally larger than elsewhere. Large rice farms not only balanced out (in terms of total income) the lack of agricultural diversity in the lowlands; they also ensured a high demand for hired labour, especially at peak periods. This, coupled with the fact that labour contracts were generally more favourable to lowland workers than further upland, meant that lowland households earned 40 percent of incomes from own rice farming and another 24 percent from agricultural wage labour.

Since rice agriculture was so dominant in the lowlands, other activities were essentially seasonal. Indeed, the third major source of income, services, consisted almost entirely of seasonal work in the cities during agricultural slack periods, especially becak driving. Even cottage industry adapted to this pattern: brick-making took place only just after the harvests.

Upland G desa was also notably "agricultural", but here especially because the cooler climate encouraged crop diversity. upland G households earned large incomes from other crops, especially high-value chillies and green vegetables, so that these farming activities together accounted for almost as much income as rice farming.

The relative inaccessibility of upland M desa discouraged the cultivation of high value but easily perishable crops for distant
FIGURE 11.1
HOUSEHOLD EMPLOYMENT AND INCOME, by sawah size
Cimanuk River Basin, 1982/83

A. Labour Activities (% of total)

B. Sources of Income (% of total)

Source: 1983 Cimanuk River Basin Survey, 309 households
## TABLE 11.4

**RURAL HOUSEHOLDS' MAIN LABOUR ACTIVITIES, By Sawah Size**

*Cimanuk River Basin, 1982/83*

<table>
<thead>
<tr>
<th>Rice Sawah Size, in hectares</th>
<th>No Sawah</th>
<th>&lt;0.25</th>
<th>&lt;0.5</th>
<th>1.0+</th>
<th>ALL HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Total Labour Hours (per Household)</td>
<td>2,150</td>
<td>2,630</td>
<td>2,440</td>
<td>2,740</td>
<td>2,500</td>
</tr>
<tr>
<td>B. Activities Ranked by % of Household Labour Time (in parentheses)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(27)</td>
<td>(20)</td>
<td>(18)</td>
<td>(23)</td>
<td>(20)</td>
<td></td>
</tr>
<tr>
<td>2. Trade</td>
<td>Agri.L</td>
<td>Rice</td>
<td>Agri.L</td>
<td>Rice</td>
<td></td>
</tr>
<tr>
<td>(14)</td>
<td>(19)</td>
<td>(13)</td>
<td>(17)</td>
<td>(15)</td>
<td></td>
</tr>
<tr>
<td>3. Services</td>
<td>Cott.Ind</td>
<td>Livestock</td>
<td>Services</td>
<td>Trade</td>
<td></td>
</tr>
<tr>
<td>(14)</td>
<td>(19)</td>
<td>(13)</td>
<td>(13)</td>
<td>(14)</td>
<td></td>
</tr>
<tr>
<td>4. Livestock</td>
<td>Rice</td>
<td>Trade</td>
<td>Livestock</td>
<td>Livestock</td>
<td></td>
</tr>
<tr>
<td>(13)</td>
<td>(9)</td>
<td>(13)</td>
<td>(13)</td>
<td>(12)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>(32)</td>
<td>(33)</td>
<td>(38)</td>
<td>(34)</td>
<td>(39)</td>
</tr>
<tr>
<td>Total</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
</tr>
</tbody>
</table>

**Notes:**
1. Agri.L: agricultural wage labour (working on others' rice crops).
2. Cott.Ind: cottage industry.
5. Services: service sector work excluding trading.

**Source:** 1983 Cimanuk River Basin Survey, 309 households
TABLE 11.5

RURAL HOUSEHOLDS' MAIN SOURCES OF INCOME, By Sawah Size

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>No. Sawah Size, in hectares</th>
<th>ALL HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25</td>
<td>600</td>
</tr>
<tr>
<td>0.5</td>
<td>510</td>
</tr>
<tr>
<td>1.0</td>
<td>670</td>
</tr>
<tr>
<td>1.0%</td>
<td>1,260</td>
</tr>
<tr>
<td></td>
<td>760</td>
</tr>
</tbody>
</table>

A. Total Household Income (in kg milled rice equivalents)

<table>
<thead>
<tr>
<th>Sawah Size</th>
<th>600</th>
<th>510</th>
<th>670</th>
<th>1,260</th>
<th>760</th>
</tr>
</thead>
</table>

B. Sources of Income Ranked by % of Household Income (in parentheses)

1. Agri.L (24) Rice (22) Rice (39) Rice (60) Rice (35)
Other (28) (34) (30) (21) (32)
Total (100) (100) (100) (100) (100)

C. Household Mean Returns per Hour from Labour Activities (Rp/hour)

<table>
<thead>
<tr>
<th>Sawah Size</th>
<th>210</th>
<th>230</th>
<th>390</th>
<th>810</th>
<th>430</th>
</tr>
</thead>
</table>

Notes: (1) Agri.L : agricultural wage labour (working on others' rice crops).
(2) Garden : crops grown in housegardens.
(3) Non L : non-labour income: remittances, sawah rent, Govt pensions.
(4) Rice : own rice cultivation.
(5) Services: service sector work excluding trading.

Source: 1983 Cimanuk River Basin Survey, 309 households
urban markets. Upland M households' traded with these markets in manufactured goods rather than foods or agricultural produce. Given the lack of agricultural opportunities, these households were often "pushed" into non-agricultural activities: string-making accounted for one-third of remunerated labour but less than ten percent of income. Nevertheless, not all such activities paid poorly: trading was second in line and the traders earned three times as much per hour as agricultural wage labourers from the same desa.

Non-agriculture was also important in the two midland desa, one of which enjoyed particularly easy access to urban areas (midland S). As much as half of midland labour time was spent in non-agriculture, which included a wide range of activities: Government and local administration, shop-keeping, construction work, cooking and/or hawking snack-foods, marketing agricultural produce and teaching, all yielding good returns per hour. Midland households also earned relatively substantial non-labour incomes in the form of remittances, sawah rents and Government pensions to ex-employees. The fact that, after rice, the three major sources of income in the midlands were trade, services and non-labour income emphasizes the difference between "rural" and "essentially agricultural" households.

11.1.2. Farm Size Factors in Labour Activities & Sources of Income

11.1.2.a. Rice Farmer Households

For rice farmer households, increasing sawah size meant that proportionately more household labour was allocated to own rice farming, but this rarely took up much labour time (Table 11.4; Figure 11.2). On rice farms of at least one hectare, own rice
cultivation was the most important labour activity, although even here it accounted for only 23 percent of household total labour time. Households with less than one hectare of sawah spent more time working as hired labourers on others' sawah than on their own. This reinforces earlier observations concerning the importance of hired labour in rice cultivation (Chapter 6).

The differences in sawah size showed up more clearly in non-agricultural activities. Households with small farms spent more time in trading activities and cottage industry, whilst households with large farms worked more hours in services and industrial wage employment, especially seasonal becak driving and construction work.

Own rice cultivation generated 41 percent of rice farm household total incomes (Table 11.5). This compares with Soedjono et al.'s [1985] estimate of 45 percent of household income for 450 rice farmers in Central Java. However, the remaining 59 percent show just how important the other sources of income were, even to households with large rice farms, which earned two-fifths from other activities.

Households with small farms (up to 0.25 hectares of sawah) earned only just over twenty percent of income from own rice cultivation. They were characterised by "job-multiplicity" (Table 11.4; Figure 11.2), earning
- (1) almost eighty percent from other sources,
- (2) as much from non-agriculture (34 percent) as from agriculture other than own rice cultivation (35 percent), and
- (3) as much from other farming (17 percent) as from agricultural wage employment (16 percent).
In other words, rural non-agricultural activities and other farming (non-rice crops and livestock) made up over half the income of households whose small rice farms were inadequate to satisfy their needs. Agricultural wage employment certainly helped to raise income from "rice", but in percentage terms remained small.

11.1.2.b. Households Not Cultivating Sawah

Agricultural wage employment was the major labour activity for households without sawah, accounting for 27 percent of total remunerated labour time (Table 11.4; Figure 11.2). In terms of primary employment therefore, these households might be classified as landless agricultural labourers, as much of the literature assumes, but, like households with small rice farms, they were characterised by job multiplicity:

- (1) households without sawah spent 73 percent of remunerated labour time working in other activities (mainly trading, services and livestock), and

- (2) agricultural wage employment generated only 24 percent of household total income (Table 11.5); non-agricultural labour activities generated almost twice as much (44 percent). The rest came from other farming and non-labour income.

These average figures, however, disguise major differences in total income according to household dependence on non-agricultural income [see Rietveld 1986, p.112]. For example, sawahless households earning at least 75 percent of household total income from non-agricultural activities 2 earned high total incomes averaging over 1,200 kg of milled rice equivalents per household member (the

2. In this case excluding gathering activities.
poverty line was 240 kg), mainly from trading, construction work and
services. On the other hand, sawahless households not earning any
non-agricultural incomes were amongst the poorest surveyed. They
earned only 320 kg m.r.e. per member, less than half the average for
the Cimanuk River Basin Survey, which came mainly as remittances
from family members (40 percent) and earnings from agricultural wage
employment (33 percent).

In short, rural households which cultivated no sawah of their own
were not necessarily landless agricultural labourers, but those
whose largest single source of income was agricultural wage labour
were also usually the poorest.

11.1.3. Total Income, Labour Activities & Sources of Income

As already mentioned, household total incomes varied widely in the
Cimanuk River Basin Survey. 11 percent of the households surveyed
earned less than 240 kg milled rice equivalents per member (the
poverty line) and 21 percent earned 1,000 kg or more.

The income differences between the poorest and wealthiest were due
more to differences in returns per hour (i.e. the specific
activities undertaken) than in hours worked. The poorest households
obtained remunerated employment for 1,700 hours during the year and
earned on average only 170 Rp per hour; the wealthiest obtained on
average almost twice as much employment (3,100 hours) and earned
over four times more per hour (800 Rp/hour).

Agricultural wage employment was the major labour activity for all
income classes except the wealthiest; rice was second for all except
the poorest (Table 11.6). Cottage industry accounted for an
FIGURE 11.3

HOUSEHOLD EMPLOYMENT AND INCOME, by total income

Cimanuk River Basin, 1982/83

A. Labour Activities (% of total)

B. Sources of Income (% of total)

Source: 1983 Cimanuk River Basin Survey, 309 households
<table>
<thead>
<tr>
<th>Household Income in kg m.r.e. per Member</th>
<th>ALL HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 240</td>
<td>11</td>
</tr>
<tr>
<td>&lt; 500</td>
<td>36</td>
</tr>
<tr>
<td>&lt; 1,000</td>
<td>32</td>
</tr>
<tr>
<td>1,000 ≤</td>
<td>21</td>
</tr>
<tr>
<td><strong>Number of Households (% of total)</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

A. Total Labour Hours (per Household)

<table>
<thead>
<tr>
<th></th>
<th>1,670</th>
<th>2,420</th>
<th>2,460</th>
<th>3,070</th>
<th>2,500</th>
</tr>
</thead>
</table>

B. Activities Ranked by % of Household Labour Time (in parentheses)

<table>
<thead>
<tr>
<th></th>
<th>Agri.L (28)</th>
<th>Agri.L (22)</th>
<th>Agri.L (19)</th>
<th>Trade (21)</th>
<th>Agri.L (20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Agri.L</td>
<td>(28)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cott.Ind</td>
<td>(13)</td>
<td>Rice (14)</td>
<td>Rice (16)</td>
<td>Rice (16)</td>
<td>Rice (15)</td>
</tr>
<tr>
<td>Services</td>
<td>(11)</td>
<td>Cott.Ind (14)</td>
<td>Trade (16)</td>
<td>Services (15)</td>
<td>Trade (14)</td>
</tr>
<tr>
<td>Rice</td>
<td>(10)</td>
<td>Livestock (13)</td>
<td>Livestock (12)</td>
<td>Livestock (14)</td>
<td>Livestock (12)</td>
</tr>
<tr>
<td>Other</td>
<td>(38)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>(100)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Source: 1983 Cimanuk River Basin Survey, 309 households
### TABLE 11.7

**RURAL HOUSEHOLDS' MAIN SOURCES OF INCOME, By Household Total Income**

Cimanuk River Basin, 1982/83

<table>
<thead>
<tr>
<th>Household Income in kg m.r.e. per Member</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 240</td>
<td>11</td>
</tr>
<tr>
<td>&lt; 500</td>
<td>36</td>
</tr>
<tr>
<td>&lt; 1,000</td>
<td>32</td>
</tr>
<tr>
<td>1,000 ≤</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
</tr>
</tbody>
</table>

#### Number of Households (% of total)

<table>
<thead>
<tr>
<th>&lt; 240</th>
<th>&lt; 500</th>
<th>&lt; 1,000</th>
<th>1,000 ≤</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>36</td>
<td>32</td>
<td>21</td>
<td>100</td>
</tr>
</tbody>
</table>

#### A. Sources of Income Ranked by % of Household Income (in parentheses)

1. **Rice**
   - (27)
   - (33)
   - (36)
   - (43)
   - (35)

2. **Agri.L**
   - (22)
   - (17)
   - (14)
   - (16)
   - (14)

3. **Non L**
   - (14)
   - (9)
   - (11)
   - (11)

4. **Services**
   - (7)
   - (8)
   - (8)
   - (6)
   - (8)

**Other**
   - (30)
   - (33)
   - (31)
   - (24)
   - (32)

**Total**
   - (100)
   - (100)
   - (100)
   - (100)
   - (100)

#### C. Household Mean Returns per Hour from Labour Activities (Rp/hour)

<table>
<thead>
<tr>
<th></th>
<th>170</th>
<th>260</th>
<th>470</th>
<th>800</th>
<th>760</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Notes:</strong></td>
<td>(1) Agri.L : agricultural wage labour (working on others' rice crops).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) Non L : non-labour income: remittances, sawah rent, Govt pensions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Rice : own rice cultivation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4) Services: service sector work excluding trading.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: 1983 Cimanuk River Basin Survey, 309 households
important part of labour time only among the two poorer classes, trade only among the two wealthier. Other services were important to both the poorest and the wealthiest, but whilst members of poor households were mostly nightwatchmen/gardeners or becak drivers, members of wealthy households worked in jobs such as Government administration or teaching.

Data in Table 11.7 show that rice was the most important single source of income for all income classes, as it was for all individual desa and for all rice farmers. The figures also reveal differences in the second source of income as total income increased:

- (1) the importance of agricultural wage income and non-labour income (mainly remittances) declined
- (2) the importance of trading and other services grew.

17 households (6 percent of total) were estimated to be below subsistence, earning less than 180 kg m.r.e. per member. Most lacked the job multiplicity they needed to earn adequate incomes: 76 percent depended on a single source of income such as rice cultivation (small sawah size), agricultural wage employment or remittances from family members to provide at least half the total.

The observations made in this section emphasize the importance of job multiplicity in permitting rural households with insufficient rice sawah to eke out a living. Agricultural wage employment returned with the seasons but left slack periods with little demand for labour; most non-agricultural work was more remunerative but its procurement more uncertain. In order to be sure of survival, households sought employment in both sectors and the lower the
returns per hour in the activities in which they worked, the higher their job multiplicity.

11.2. REGRESSION ANALYSIS OF HOUSEHOLD TOTAL INCOME

Having described the constituents of income in general terms, a more rigorous analysis of the data was undertaken. In order to ascertain which were the crucial variables determining income-differences, multiple regression analysis was conducted using household total income as the dependent variable.

11.2.1. Method: Specification of The Regression Equation

Data were used on 301 of the 309 households surveyed. Eight households which earned more than 3 million Rp, and thus were extreme outliers relative to the rest of the Survey respondents, were excluded because would have distorted the observations. These eight households consisted of:

- three with large and profitable rice farms (average 5.6 hectares), two of whom were tenants;
- one with a large rice farm (4 hectares) and much poultry;
- three running large shops; and
- one whose head was a self-employed professional (unspecified) in the service sector.

A list of 35 possible determinants of household total income was drawn up (Appendix 11.1). After testing for multicollinearity between these potential independent variables, regressions were carried out with the aim of achieving the highest adjusted $R^2$. 


TABLE 11.8

THE DETERMINANTS OF HOUSEHOLD TOTAL INCOME (Regression Analysis)

Cimanuk River Basin, 1982/83

Dependent Variable: Household Total Income (Rp)

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Unit of Measurement</th>
<th>Mean for all Households</th>
<th>Regression Coefficient</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults per Household</td>
<td>(Number)</td>
<td>2.8</td>
<td>60,260</td>
<td>3.310</td>
</tr>
</tbody>
</table>

On-Farm Independent Variables:

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Unit of Measurement</th>
<th>Mean for all Households</th>
<th>Regression Coefficient</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice Sawah Size</td>
<td>Hectares</td>
<td>0.67</td>
<td>425,460</td>
<td>13.376</td>
</tr>
<tr>
<td>Percentage of Income from Own Rice</td>
<td>%</td>
<td>35</td>
<td>-1,310</td>
<td>-1.226</td>
</tr>
<tr>
<td>Percentage of Income from Palawija</td>
<td>%</td>
<td>5</td>
<td>5,500</td>
<td>2.829</td>
</tr>
<tr>
<td>Cattle Husbandry</td>
<td>Hours p.a.</td>
<td>14</td>
<td>370</td>
<td>2.385</td>
</tr>
</tbody>
</table>

Off-Farm Independent Variables:

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Unit of Measurement</th>
<th>Mean for all Households</th>
<th>Regression Coefficient</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice Harvest Employment</td>
<td>Hours p.a.</td>
<td>194</td>
<td>160</td>
<td>2.530</td>
</tr>
<tr>
<td>Trading Employment</td>
<td>Hours p.a.</td>
<td>388</td>
<td>120</td>
<td>4.675</td>
</tr>
<tr>
<td>Trading Returns per Hour</td>
<td>Rp/Hour</td>
<td>(330)</td>
<td>630</td>
<td>4.957</td>
</tr>
<tr>
<td>(Other) Services Employment</td>
<td>Hours p.a.</td>
<td>275</td>
<td>90</td>
<td>2.712</td>
</tr>
<tr>
<td>(Other) Services Returns per Hour</td>
<td>Rp/Hour</td>
<td>(310)</td>
<td>650</td>
<td>4.357</td>
</tr>
<tr>
<td>Receiving Sawah Rent</td>
<td>Dummy</td>
<td>(12%)</td>
<td>188,000</td>
<td>3.064</td>
</tr>
</tbody>
</table>

Constant: 116,700

Adjusted R²: .603

F-ratio: 42.407

Notes:
(1) Average Household Total Income = 769,400 Rp.
(2) Rice Sawah Size: sum of wet and dry seasons of 1982/83.
(3) Palawija: non-rice crops grown in fields.
(4) Cattle (buffalo): owned by 6 households (2 percent).
(5) Rice Harvest Employment: hours worked as hired labourers.
(3) Trading and Other Services Returns per Hour: means = only for households in such activities.
(3) Sawah Rent: "mean" = the percentage of households receiving rent.

Source: 1983 Cimanuk River Basin Survey, 301 households
(309 less 8 earning over 3 million Rp)
combined with the lowest number of statistically significant independent variables.

Although there was some evidence of positive heteroskedasticity (increased variance of the residuals as income rose), alternative, logarithmic forms of the dependent variable household total income only resulted in negative heteroskedasticity. Only about half the t-values for the independent variables were greater under these alternative functional forms and the adjusted $R^2$'s were slightly smaller. The dependent variable was therefore left in its original linear form.

Alternative functional forms of independent variables were also tested where this seemed reasonable. These alternatives were tested against both the linear and the logarithmic forms of the dependent variable, household total income. The logarithmic alternatives for independent variables, such as labour hours in various activities, resulted in lower overall $R^2$'s, smaller regression coefficients and smaller t-values. One variable (sawah rent received) had greater statistical significance and explanatory powers when in dummy form and was therefore included as such in the regression equation. Although other alternative functional forms were tested for other variables, such as $x^2$ for age of the head of household, this was not statistically significant in any form.

11.2.2. Results: Regression Analysis of Household Total Income

The results yielded 11 statistically significant independent variables which together explained 60 percent of variations in household incomes (Table 11.8). Of these eleven, one was directly related to household composition, nine to labour activities and one
to non-labour sources of income. Of the labour activity variables, four related to own farming, one to agricultural wage labour and four to non-agricultural work.

The independent variable with the highest level of statistical significance was the amount of rice sawah land cultivated by the households in the year covered by the Survey (1982/83). This explained 40 percent of variations in household total income. With the addition of another two independent variables - the number of household hours spent working in trading activities and the average returns per hour to (other) service activities - 52 percent of variations in household total income could be explained. The remaining eight variables contributed 8 percent to the adjusted $R^2$.

The fact that 40 percent remained unexplained, despite the many variables tested, points to the complexity of rural household incomes. There is the possibility that improvements to the data set and findings could be achieved with comparisons over time, a larger data set, wider spatial distribution and/or a more random selection of households.

11.2.2.á. Variables Relating to Own Rice Cultivation

As already mentioned, sawah size was by far the dominant variable, thus justifying its primary position in the literature on Java. Household total income rose by over 400,000 Rp for every additional hectare in rice sawah land cultivated by the household. This 400,000 Rp would make a significant contribution to the household's standard of living, being equivalent to 310 kg of milled rice per household member, which was well above the poverty line of 240 kg.
per member. Note, however, that average sawah size was less than one hectare (0.85 hectares per farm household).

Sawah dominated not only because rice was the most important single source of household total income (35 percent), but also because high incomes from some other activities were associated with large rice farms, as was the case for palawija crops, livestock and, in certain desa, trade (Chapters 7 and 10). This in turn explains the negative coefficient attached to the other variable relating to own rice cultivation (albeit at less than 90% statistical confidence), the proportion of household income earned from rice: once the effects of size of sawah had been taken into account, households more dependent on rice income earned lower total incomes.

Other variables which were related to rice cultivation, and which are often suggested in the literature as affecting rural households, were not statistically significant when tested for household total incomes in the Cimanuk River Basin Survey. These included variables such as:

- tenurial status (owner, owner-cum-tenant, tenant);
- tenancy contracts (renter, sharecropper);
- irrigation quality (technical, semi-technical, rainfed);
- rice seed variety (modern, traditional or some of both); and
- intensity of fertiliser use (urea, TSP).

Adding any of these to the regression equation simply lowered the adjusted $R^2$.

Given the disadvantages of tenancy enumerated in the literature (Chapters 5 and 6), it could be expected that tenancy might be negatively related to total income. In the Cimanuk River Basin
Survey, however, tenants on average cultivated more rice sawah than owner-operators and earned only slightly smaller net returns per hectare (Table 6.2). Tenancy was also positively and statistically significant with respect to earnings from agricultural wage employment, the second source of income in the Cimanuk River Basin (Table 9.1). These points help explain tenancy's lack of statistical significance.

11.2.2.b. Variables Related to Other Farming Activities

Two independent variables related to other farming activities, one to palawija crops and one to livestock farming. Although garden crops were the most important source of other farm income, no statistically significant independent variable was found, mainly because since the Survey data recorded only hours spent in and income from garden crops without any further detail.

As seen in Chapter 7, the type and therefore value of palawija crops cultivated by each household was partly related to its economic status. Regression analysis of household total income showed that this rose by 5,500 Rp (19 kg m.r.e.) for every one percent rise in the importance of palawija income in total income. Given the recent interest in smallholder non-rice food crops in Indonesia [Falcon et al. 1984, Alexander 1986, Barbier 1989, Tabor et al. 1989] this area may be one which merits further study.

The other statistically significant independent variable relating to other farm activities related to the possession of large livestock (cattle). This variable was statistically significant although only

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3. Note that all palawija crops were valued at sale prices, whether sold or not.
six households (2 percent) surveyed owning such livestock. For
every hour spent by a household member in caring for and working
with cattle, household total income rose by 370 Rp. Since livestock
need to be cared for every day and on average over 700 hours per
year was spent on them by cattle-owning households, this could
provide a reasonable addition to household income. However, it
should also be remembered that livestock can be a form of savings
(disposal of income) as well as income-generating capital, so that
the direction of causation between livestock and income may not be
clear.

11.2.2.c. Variables Relating to Agricultural Wage Employment

Agricultural wage employment was the most important single labour
activity and the second source of income in the Cimanuk River Basin
Survey. However,

- (1) returns per hour to agricultural wage labour were lower than
  for any other activity except livestock-care, string-making and
  wood-gathering.
- (2) Some pre-harvest labour hours were not paid wages (harvest
  labour was always paid).
- (3) Agricultural wage employment accounted for a declining
  proportion of income as household total income rose (Figure 11.3).
- (4) Only 8 percent of all households surveyed earned sufficient
  incomes from agricultural wage labour alone to support the family
  for the year (at least 240 kg of milled rice equivalents per
  household member).

These observations explain why there was only one statistically
significant independent variable related to agricultural wage
employment which explained variations in household total income and why this was specifically harvest wage labour. The regression analysis suggests that household total income rose by 160 Rp for every additional hour of employment in harvesting, much less than the 370 Rp for every additional hour related to livestock.

11.2.2.d. Variables Relating to Non-Agricultural Labour Activities

The rural households surveyed spent two-fifths of their remunerated labour time working in non-agricultural activities during 1982/83. In the Cimanuk River Basin Survey, trading and other services (service sector) were more important than cottage industry and industrial wage employment (industrial sector): the service and industrial sectors accounted for 24 and 15 percent of time and generated 19 and 8 percent of income respectively. This is a reflection of the relative importance of the two sectors at the national level (Chapter 1) and shows that services may deserve more attention than they have so far been given in the literature on rural Java.

In the regression equation of household total income in Cimanuk River Basin Survey, the only statistically significant independent variables associated with non-agricultural labour income related to the service sector. Industrial activities - cottage industry and industrial wage employment - were not statistically significant, probably because of the very wide range in cottage industries (simple string-making to skilled tailoring). As far as industrial wage employment was concerned, although returns per hour could be high, the number of hours worked was mostly small.
The Survey distinguished between two main groups of service sector activities, trading and other services. Variables constructed from both of these were statistically significant in the regression equation for household total income.

- (1) Trading was one of the three major sources of household income in every desa surveyed, although only 26 percent of households in the Cimanuk River Basin Survey were traders (Table 11.3). Households which reported trading spent more hours in this than any households in any other single activity. Traders also earned highest average returns per hour of any non-farming activity (Table 11.1).

- (2) The contribution of (other) service activities to raising rural incomes was also quite significant. Although the activities ranged widely (e.g. from becak driving to local administration), returns per hour were generally high, not much less than those from trading.

The number of hours worked in trading activities was the most important statistically significant independent variable in terms of explanatory power after sawah size 4. These two variables together could explain 46 percent of variations in household total incomes in the Cimanuk River Basin. The actual impact of trading hours worked on income was relatively small: this rose by only 120 Rp for every additional labour hour. The effect of other service labour hours was even smaller (90 Rp).

4. Note that in the regression analysis of household incomes, half of the large-scale traders were excluded from the regression analysis because they numbered among the eight wealthiest households.
However, returns per hour from both trading and other services were also statistically significant. A small rise of 1 Rp/hour in trade earnings (average 370 Rp/hour) raised household total income by 630 Rp. A similar rise in returns per hour to services (average 310 Rp/hour) raised income by 650 Rp.

To sum up, returns earned in the service sector had potentially large effects on rural incomes: in the Cimanuk River Basin, sawah size, trading hours, trading returns per hour and services returns per hour together could explain 55 percent of variations in the surveyed households' total incomes. More in-depth study of the interaction between rural households and service activities would benefit our understanding of rural households' survival strategies.

11.3.2.e. Variables Relating to Non-Labour Sources of Income

Households receiving sawah rent were likely to earn almost 190,000 Rp more in total income than those which did not. This was a large sum compared to the average total income and related to the 17 percent of households surveyed which leased out at least some of their sawah.

11.3.2.f. Location Effects

One of the central themes in this thesis has been the importance of location - agro-climatic zone and accessibility to urban areas - in affecting household incomes, yet location did not appear to be statistically significant in explaining variations in household income. This was because many of the statistically significant

5. Returns per hour and the number of hours were correlated in each case (.45 for trading, .36 for services), but the effect on the overall adjusted R² of eliminating either of each pair was large enough to justify including both in each case.
independent variables already included were directly related to
location. More specifically,
- (1) Sawah size cultivated and harvest wage employment were greater
in the lowlands than elsewhere in the Cimanuk River Basin Survey.
Sawah size was on average twice as large as elsewhere (1.3 and 0.6
hectares respectively) and lowlanders accounted for 85 percent of
harvest wage employment hours reported (Chapters 6 and 9).
- (2) Owning cattle and earning high returns to trade were
characteristics particularly of households in the two midland desa.
Two-thirds of households owning cattle lived there and returns per
hour from trading were 50 percent higher than elsewhere in the
Cimanuk River Basin Survey (Chapters 7 and 10).
- (3) High incomes from palawija crops were earned in the uplands.
Upland households earned on average 11 percent of their incomes from
palawija crops; lowland and midland households only 2.5 percent
(Chapter 10).

Location was relevant and is an important factor determining the
components of household incomes. However, its effects had been
captured already through other variables in the regression equation.

11.3.2.g. Variables Relating to Household Composition

The effects of household size on household incomes were also
captured through specific variables in the regression equation,
especially the labour variables. Although the number of adults in
the household was statistically significant, its effect (regression
coefficient) on household total income was small after account had
been taken of the other independent variables. Thus opportunity and
access to some form of income were more important than the household
labour pool in determining income. Such findings are not surprising considering the fact that households averaged only 48 hours of remunerated activities per week, insufficient to keep even 2 of their average 2.8 adults "fully employed".
APPENDIX 11.1

REGRESSION ANALYSIS OF HOUSEHOLD TOTAL INCOME:

List of Data Tested as Independent Variables
(Functional forms in parentheses)

Cimanuk River Basin, 1982/83

1. Household Characteristics

Household members, adults, children (numbers, ratios).
Women heads of household (dummy).
Age of head of household (x, x²).

2. Location

Lowland, midland, upland, ease of access to urban areas (dummies).

3. Rice Cultivation

Tenancy, owner-tenant, pure tenancy, sharecropping (dummies).
Sawah size (hectares).
Technical/rainfed irrigation (% of sawah).
Value of agricultural equipment (Rp, Rp/ha).
Use of modern seed varieties, traditional varieties, both (dummies, kg/ha).
Application of urea, TSP (kg, kg/ha).
Family labour (hours, hours/ha, hours relative to hired labour).
Rice crop yields (kg, kg/ha).
Percent of rice crop sold (%).
Percent of household total income from rice (%).

4. Other Farming

Palawija land area (hectares, relative to rice sawah area).
Mixed palawija cropping (number of crops).
Palawija staples cultivation and sales (Rp, Rp/ha).
Palawija material input costs (Rp, Rp/ha).
Family labour in palawija (hours, hours/ha).
Percent of palawija crop sold (%).
Palawija returns per hour to family labour (Rp/hour).
Percent of household total income from palawija (%).

Type of livestock: poultry, small ruminants, cattle (dummies).
Family labour caring for livestock (hours).
Livestock returns per hour to family labour (Rp/hour).

contd.
APPENDIX 11.1 contd.

5. Agricultural Wage Employment

Hours worked as hired labourers: total, land preparation, transplanting, maintenance, harvesting (hours).
Employment outside the home desa (hours, hours as % of total).
Labour contract for harvesting: borongan or cebokan (dummy).
Percent of household total income from agricultural employment (%).

6. Non-Agricultural Activities

Hours worked in cottage industry, trading, (other) services, industrial wage employment, gathering (hours).
Working in a city, in any urban area (dummies).
At least one household member working full-time (dummy).
Percent of household total income from the non-agricultural activities (%).
Returns per hour to the non-agricultural activities (Rp/hour).
Non-agricultural versus agricultural labour (ratio of hours, ratio of returns per hour).

7. Non-Labour Income

Percent of household total income from total non-labour income, rent, remittances (%).
Receiving remittances, sawah rent, Govt pensions (dummies).
The literature on rural employment and incomes in Java can mostly be divided into two types of approach: the literary and econometric. This thesis has attempted to bridge the gap by discussing and testing the claims of the literary approaches against a statistical analysis of a household survey carried out in one rural area of Java, the Cimanuk River Basin.

12.1. Representativity of the Cimanuk River Basin Survey

The extent to which the Cimanuk River Basin Survey data could be representative of rural Java certainly affects the value of the findings.

The sample population in this Survey was specifically limited in the following ways:

- (1) The data set was relatively small: 309 households.

- (2) It was also single-period and somewhat out-dated, covering the year November 1982 to October 1983. A follow-up survey could reveal changes and permit a more dynamic time series analysis.

- (3) The Cimanuk River Basin was geographically limited. On the other hand, households were drawn from six villages (desa) differing in accessibility, agro-climate and topography and it was shown that some sources of income were clearly influenced by agro-climatic
zone, whilst others related to the difficulty of access to urban areas.

- (4) Most importantly, the households were not selected at random (for the first Survey in 1976), but in order to analyse four equally numerous groups according to the area of rice sawah land they cultivated (Chapter 4). Whilst, the 1983 Survey data therefore do not represent the "average" rural Javanese household in terms of rice sawah, it was possible to analyse the households within each sawah size class.

Thus, despite the limitations, the Cimanuk River Basin Survey provided some detailed and useful analysis of rural employment and incomes in Java. Many features of household activities and sources of income could be explained in terms of location and/or sawah size. It would seem reasonable that such results could be extended to households in similarly-placed desa and/or cultivating similar areas of sawah elsewhere in rural Java.

12.2. Dualism in Rural Java

Despite its classic image of population pressure on land and the rapid growth of its cities, the findings of the Survey suggest that Java does not tally with the dualistic development models (reviewed in Chapter 2).

In the first place, these models assumed that dynamic development was principally in non-agriculture, but Javanese agricultural production, especially rice, grew faster than population in the 1980s (Chapters 3 and 6).
Secondly, it was thought that the growth would be mainly in urban manufacturing. In fact, it was the service sector which grew spectacularly in Java, and not only in urban areas. Moreover, most of Indonesian manufacturing is rural [McCawley 1983] and takes place almost entirely in small cottage industries. Even the oil boom did not create an exodus to the cities because the industry itself created little employment and the second-round effects created demand for labour in rural areas (Chapter 10).

A third assumption was people would move out of agriculture completely and permanently. In Java, on the contrary, much non-agricultural work remained seasonal and members of rural households returned to the countryside at times of peak labour demand (Chapter 9).

12.3. The "Push versus Pull" into Non-Agriculture Debate

Another type of dualism and hotly debated in the literature is whether rural households are "pushed" into non-agriculture by the lack of agricultural opportunities or "pulled" by more attractive prospects arising from Government expenditure on rural infrastructure and the increased wealth of rural areas through modern rice technology (Chapter 3).

The Cimanuk River Basin Survey did not provide conclusive evidence in favour of one school or another, but its findings suggested that both tendencies were at work and that more attention should be paid to desa location. In general:

- (1) Agricultural conditions determined the need for non-agricultural income. During slack rice periods, the agricultural unemployed tended to be "pushed" into other activities.
Access to urban areas determined much of the availability and profitability of the "pull" into non-agricultural employment, carried out both at home and in urban areas (for example, cottage industry goods and snack foods made in the desa still needed to be sold).

More specifically, both agricultural conditions and accessibility were unfavourable in upland M desa, where almost all non-agricultural work was "pushed" (Chapter 10). In contrast, in midland S, with similarly small sawah holdings but within easy reach of town, households were "pulled" into better paid non-agriculture (Table 10.2).

Agricultural conditions were relatively favourable in both upland G and lowland L; sizeable incomes were earned from rice cultivation, high-value palawija crops and agricultural employment in- and outside the desa (Chapters 6-9). Agriculture usually generated adequate incomes even for the few landless households, so that the "push" versus "pull" debate was hardly relevant.

In lowland W, agricultural conditions were also favourable, but only to those cultivating sawah. Landlessness was high and the agricultural incomes the landless earned were rarely adequate, so they were "pushed" into seasonal low-wage non-agricultural work (Chapters 9 and 10).

12.4. Location Factors in Agriculture

Location explained not only much of the relationship between agriculture and non-agriculture in each desa, but also many of the
characteristics of rice cultivation, agricultural wage employment and other farming in the Cimanuk River Basin Survey (Chapters 6-9).

For example, location differences could explain at least some of the effects usually attributed directly to modern rice varieties, because rice variety was partially determined by location. More specifically, from the rice farmer's point of view (Chapter 6), agro-climatic zone was a determinant in
- the demand for tractors and hence for land preparation labour,
- the use of inorganic fertilisers, and
- yields per hectare. Indeed, yields per hectare varied more by desa than by farm size.

In addition, accessibility to urban areas and thus to non-agricultural employment was important in explaining family labour intensity in rice cultivation (Table 6.7).

Even such aspects as tenancy and wage rates were influenced by location. More specifically,
- (1) Tenant contract terms were affected by the ease of access to non-agricultural employment (Chapter 9).
- (2) Sharecropping was more common in areas of greater production uncertainty because risks of production were shared (Chapter 6).
- (3) Additional incomes earned by sharecroppers to supplement their low rice incomes were location-specific: in the lowlands, agricultural wage employment; in the midlands, non-agricultural plus agricultural employment; and in the uplands, other farm crops.
From the hired labourer's point of view,
- (1) Daily (harian) wages were determined at the village level, depending on agricultural conditions, access to non-agricultural employment and the local rice price (Chapter 9),
- (2) Unpaid agricultural exchange labour (sambatan) was common only where access to non-agricultural employment was difficult (Chapter 9), and
- (3) Agro-climatic zone influenced the demand for pre-harvest labour versus the use of tractors (Chapter 6).

Finally, as regards farming activities other than rice:
- (1) Agricultural diversity (the number of farming activities) was inversely related to accessibility to urban areas and so to the range of off-farm employment opportunities available in the slack rice periods (Chapter 8),
- (2) Agro-climate - average temperatures and rainfall reliability - determined the range of possible other crops (Chapter 7), and
- (3) The prevalence of different types of livestock was affected by topography (Chapter 7).

The conclusion must be that studies of rice production, farming activities in general, the overall status of tenants and of the conditions of agricultural wage employment carried out without specific reference to location could be misleading.

12.5. Access to Land

In addition to location, the Cimanuk River Basin Survey differentiated between households according access to land and, in particular, size of sawah cultivated.
Access to land was of course a major factor in determining rural employment and income. Here, sawah size was statistically the most significant and important independent variable, explaining 40 percent of variations in household total incomes alone. The other ten variables taken together explained only another 20 percent of variations (Table 11.8).

Not only did sawah size determine a good deal of the major source of income, that is, rice cultivation, it was also positively related to other sources of agricultural income: garden crops, palawija crops (non-rice "secondary" crops cultivated in fields), livestock and agricultural wage employment (Chapters 7 and 9). As expected, households cultivating large areas of sawah were less dependent on income from off-farm activities (Chapter 11). It seems of equal interest that non-agriculture was vital to marginal farmers and landless households attempting to reach a reasonable standard of living.

However, as regards the differences between cultivators and non-cultivators, both marginal farmers and landless households were characterised by occupational multiplicity (Chapter 11). But whilst marginal farmers worked in part-time jobs fitting in with the demand for labour on their own rice sawah, the landless worked in "full-time" for short periods, moving from one job to another throughout the year.

In addition, the landless could be further divided into:
- households which earned most of their income from non-agricultural employment and were mostly cukupan, being full-time traders, public servants, and so on, and
- households which depended primarily on agricultural wage employment and often numbered amongst the poorest households surveyed (Chapter 11).

12.6. Tenancy

Much of the development literature is concerned with the adverse effects of tenancy, especially sharecropping, on the social and economic balance of power in rural areas, on production efficiency and on tenant-farmer incomes (Chapters 5 and 6).

Analysis of the Cimanuk River Basin Survey did not reveal marked divisions in the population between landowners and tenants, as there are, for example, in India or The Philippines. On the contrary, one-third of owner-operators were also tenants. This meant that, just as for access above, a simple division between owners and non-owners was not always as useful as might have been expected. Nevertheless,

- (1) Pure tenants managed their rice crops particularly efficiently, producing relatively higher yields from modern rice varieties (Table 6.4).

- (2) Tenants in general were more likely to work in agricultural wage employment than pure owner-operators (Chapter 9). With "interlinkages" between landlord and tenant, the tenants often earned higher agricultural wages than non-tenants. On the other hand, the tenants were probably forced to work as agricultural labourers and thus to forego better paid non-agricultural jobs.

Sharecroppers are thought to be among the poorer rural households due to large rent payments. Certainly, despite their production efficiency, 55 percent of sharecroppers in the Cimanuk River Basin
Survey failed to reach the poverty line in rice incomes (Chapter 6). Fortunately most found the needed additional income, so only 12 percent fell below the poverty line in terms of total income, hardly more than the average 11 percent for all households surveyed.

12.7. Agricultural Wage Employment

Due to small farm size of, time constraints and seasonality of labour demand, very few households could work full-time in rice cultivation: an adult member of a rice farming household worked on average only 120 hours per year on own sawah whilst more than half rice cultivation labour had to be hired (Chapter 6). Agricultural wage employment was the single most important labour activity and the second source of income (after own rice cultivation) in the Cimanuk River Basin (Chapter 11).

If this importance helps to explain the concentration of so much literature on the hired labourer's point of view, the findings of the Survey suggest that the owners' position should also be taken into account.

- (1) Farmers and labourers were often the same: two-thirds of households cultivating rice sawah had members working as agricultural labourers (Chapter 9). This echoes similar overlapping between owners and tenants.

- (2) Agricultural wage employment, an important source of income to labourers, was also a major item of expenditure for employers: labour costs accounted for over half of rice production costs for two-thirds of farmers surveyed (Chapter 6).

- (3) Increased tractor use in the lowlands was both cheaper for the farmer and a necessary response to tighter time constraints
Technological improvements lead to unemployment if they are labour-displacing without being income-augmenting; future studies on the use of tractors in Java should assess the spin-off effects of the lower farming costs on the demand for goods, services and leisure in rural areas and hence on the demand for labour.

12.8. Non Agriculture

The reasons for households participating in the non-agricultural sector were reviewed earlier. The effects of non-agricultural employment on rural households were threefold:

- (1) it brought rural and urban labour markets closer together (Chapter 10),
- (2) it influenced specific aspects of rice cultivation (Chapter 6), and
- (3) quite simply, it raised total incomes (Chapter 11).

Twenty percent of rural incomes were directly urban-derived: fifteen percent directly in cities and another five percent in remittances from permanent migrants. This suggests that a regional study of "rural" Java which specifically includes local towns and cities could shed more light on the overlap between urban and rural labour markets.

Results from the Cimanuk River Basin Survey also indicated that full-time non-agricultural employment for a household member (a year-round source of cash income) was a positive determinant of the intensity of inorganic fertiliser use in rice cultivation (Table 6.5). However, such employment was negatively related to the proportion of rice crop sold, because farmers preferred working in non-agriculture to selling their staple food as a source of cash.
- In the regression analysis of total income, the three most important independent variables after sawah size related to trading and services in the non-agricultural sector (Table 11.8). Households dependent on non-agriculture were not necessarily poor: those earning at least 50 percent of total income from non-agricultural employment earned above average total incomes, five times the poverty line, although they cultivated only 0.37 hectares of sawah. Thus non-agriculture certainly had a "mitigating effect on income differentials resulting from differences in land endowment", as Rietveld [1986, p.114] argued.

12.9. Other farming

Emphasis has been given throughout this thesis to the importance of other farming - garden crops, palawija crops (non-rice crops grown in fields), livestock and fish ponds (Chapters 7 and 8). These activities help ensure a nutritionally more balanced diet, employment during rice slack periods and cash income when necessary throughout the year.

The importance of other farming can be shown as follows:
- (1) It made up forty percent of total agricultural labour activity.
- (2) Households in other farming well outnumbered those in agricultural wage employment (280 and 200 respectively).
- (3) Forty percent of households in agricultural wage employment earned less from this than from other farming at home.
- (4) Two-thirds of "landless" households earned income from other farming (Chapters 7 and 11).
Some points of comparison with rice cultivation are of particular interest:

- (1) Other crops accounted for only 20 percent of land cultivated, but generated 40 percent of land-derived farm income.

- (2) For small areas of land, palawija absorbed as much family labour as did rice.

- (3) One-third of palawija crops were marketed, but only one-fifth of rice. This was partly due to consumer preferences: "secondary" palawija crops were often sold specifically in order to purchase the favoured staple food rice.

- (4) For high-value market-oriented palawija crops, both family and hired labour per hectare, as well as returns per hour and per hectare, were greater than for rice.

These results suggest that Government support for crop diversification in terms of pricing policies, availability of seeds and appropriate fertilisers could help raise rural households' incomes. Profitable non-rice crops could prevent some "pushing" into temporary, uncertain, or low-wage employment in the non-agricultural sector during slack rice periods. More studies of specific crops should be encouraged in relation to

- their suitability to particular soils and agro-climates,
- farmers' other labour demands, and
- marketability and transportability.

12.10. Total Employment and Income

Most of the households surveyed kept busy throughout the year, but an adult spent on average only 17 hours per week in remunerated
activities. Adding unremunerated time brought the total up to 30 hours, well short of "full-time" occupation (Chapter 11).

This underemployment did not necessarily entail poverty where activities were well-remunerated. Indeed, "average" household income was three times the poverty line, which is 240 kg milled rice equivalents per member (Table 11.1). 89 percent of households were cukupan, earning a total income at least equal to the poverty line \(^1\).

Rice farming was the major source of this income. However, only 60 percent of rice farmers earned at least 240 kg m.r.e. per member from rice (Chapter 6); other sources of income were necessary for 40 percent of farmers, let alone landless households, just in order to reach the poverty line.

Most households were therefore characterised by occupational multiplicity; on average there were almost five activities per household. Indeed, one household was employed in each of the ten labour activities! Job multiplicity among agricultural households is inevitable: "the occasions for... different sorts of labour returning with the different seasons of the year, it is impossible that one man should be constantly employed in any of them" [Adam Smith 1776, p.111].

In fact, the eleven percent of households which failed to reach the poverty line engaged in fewer activities than the average (well...

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1. However, because of the sampling techniques used, this average income was not representative of the population. Bearing in mind that around forty percent of rural Javanese households are landless [Booth and Sundrum 1981, p.189], that few of these are wealthy and that average farm size is 0.6 hectares [Manning 1987, p.55], a more representative average income would be roughly 600 kg m.r.e per member, 20 percent less than the Survey sample's.
under four). These *miskin* households were also mostly landless and/or from the lowlands, where the climate and the lack of demand for cattle draught power meant that other farm incomes were generally small and where almost all off-farm employment was seasonal. Thus lowland landless households were more vulnerable to poverty than similar households further up the river basin.

12.11. Conclusion

Hymer and Resnick [1969, p.503] warned over twenty years ago that "models which ignore the complex mosaic of agrarian life run the danger of underestimating the possibilities of reallocating work effort... within the rural economy". The scale of variety in an area of Java as small as the Cimanuk River Basin clearly shows the need for care and prudent interpretation, especially if analysis is carried out without specific reference to particular groups of households, especially by location. The concomitant interaction of a few important factors creates a complex pattern of rural life impossible to capture in a single or even a major "explanation". Rice cultivation is not enough, nor are agricultural labour contracts.

The Cimanuk River Basin Survey analysed in this thesis has provided concrete evidence of the many interwoven strands of work and income in rural life in Java. It must be hoped that a follow up will provide further clarification and furnish the basis for agricultural policy decisions to enhance the prospects of employment and income in Java, a land "of rice and men".
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