

เอกสารทางวิชาการ  
DISCUSSION PAPER SERIES

Number 74

The Cha-Am Road

Employment and Income Distribution Effects  
of Rural Road Construction

by

Christer Per Holtsberg  
Lily Kosiyanon



คณะเศรษฐศาสตร์  
FACULTY OF ECONOMICS

มหาวิทยาลัยธรรมศาสตร์  
กรุงเทพมหานคร

THAMMASAT UNIVERSITY  
BANGKOK

Number 74

The Cha-Am Road

Employment and Income Distribution Effects  
of Rural Road Construction

by

Christer Per Holtsberg  
Lily Kosiyanon

The papers presented in this series are intended to be tentative in nature and should not be quoted without the author's permission. Comments and Criticisms of papers presented are welcomed and will be included (if the commentor so wishes) with any subsequent dissemination of the corresponding discussion paper.

THE CHA-AM ROAD  
EMPLOYMENT AND INCOME DISTRIBUTION EFFECTS  
OF RURAL ROAD CONSTRUCTION

by

Christer Per Holtsberg

Lily Kosiyanon

Note: Working Papers are preliminary material circulated to stimulate  
discussion and critical comment

Copyright © International Labour Office, Geneva

## PREFACE

This is the sixty-sixth paper appearing in the Working Papers series of the Research Programme on Income Distribution and Employment. Within the framework of this programme, a number of studies are being undertaken in different parts of the world aiming at the elucidation of the various issues concerned with different types of income distribution and at exploring the relationship between income distribution and employment. This programme is also concerned with the instruments of Government redistribution policy, such as Government expenditure and taxation, with the area of wealth distribution and redistribution and with the problem of poverty and satisfaction of basic needs.

The study presented in this paper gives the results of an attempt to estimate the employment and income distribution consequences of construction of a rural road in central Thailand. For this purpose the area affected by the construction was studied before the existence of the road, during its construction and soon after its completion. The paper provides thus one of the rare examples of a micro-economic study of employment and income impact of a particular type of government expenditure.

The study was undertaken by Mr. Christer Per Holtsberg, associate expert, whose services were made available to the Income Distribution and Employment Programme by the Swedish Government together with Dr. Lily Kosiyanon.

Felix Paukert  
Income Distribution and Employment  
Programme, ILO.

## Table of Contents

	<u>Page</u>
INTRODUCTION .....	1
Chapter	
1 Area of Influence .....	5
2 Methodology and Selected Variables .....	10
1. Methodology .....	10
2. Selection of Variables .....	13
3 Benchmark Survey in the Sample Villages.....	24
3.1 Distribution of land and tenurial status.....	24
3.2 Cropping pattern .....	28
3.3 Cultivation technique .....	29
3.4 Commercialisation.....	34
3.5 Employment .....	36
3.6 Income.....	39
3.7 Summary .....	43
4 Distribution of Benefits during the Construction Process.....	47
4.1 Redistributinal consequences of public expenditures.....	49
4.2 Notes on construction cost.....	52
4.3 Immediate employment consequences .....	57
4.4 Indirect effects of the road construction.....	67
4.5 Summary.....	76

Chapter	<u>Page</u>
5 The Follow-up Survey.....	79
6 Conclusions.....	88

## List of Tables

<u>Table</u>	<u>Page</u>	
2.1	Number of households and distance to the main road for three village groups.....	13
2.2	Distribution of land and income in Thailand.....	14
3.1	Land holding variables by village group.....	25
3.2	Land tenure variables by village group.....	27
3.3	Percentage of cultivated area under selected crops.....	28
3.4	Expenditure on agricultural inputs.....	30
3.4b	Expenditure on agricultural inputs for rice cultivation.....	31
3.5	Percentage of land cultivated by draft animals and tractors.....	32
3.6	Commercialisation variables by village group....	34
3.6b	Distribution of the rice harvest by village group..	35
3.7	Distribution of working days per household and year by village group and type of employment....	37
3.8	Household net income and contribution from different sources in Baht and their shares in total net income.....	40
3.9	Non-farm income and farm size by village group (farming households).....	41
3.10	Household income from crop production in sample village.....	43
4.1	Construction budget.....	53
4.2	Wage rates for different categories of labour...	55

Table

4.3	Labour force by employment status.....	60
4.4	Main occupation of labourers and the labourers' household.....	62
4.5	Yearly income from wage employment, farm size, number of earners of various categories of temporary labourers' households.....	63
4.6	Labour requirements in producing and transporting construction material.....	73
5.1	Percentage of households using the road for different purposes and distance.....	81
5.2	Percentage of households using the road and reporting time saving.....	83
5.3	Percentage of households reporting increased mobility after the opening of the road.....	84
5.4	Percentage of households reporting increased number of visits by traders, salesmen, etc.	85



## ACKNOWLEDGEMENTS

This study would not have been completed without the assistance of many individuals and institutions. In particular Pirom Chantaworn rendered invaluable assistance throughout the field work.

However, the study could not have been even attempted without the willing cooperation of many officials from the Royal Irrigation Department and from the local administration. Among whom should be mentioned:

Vinij Patibatsorakij of the Feeder Road Division of the Royal Irrigation Department,

Roengchai Kanchari, Chief, Feeder Road Construction Unit, Kuon Peht,

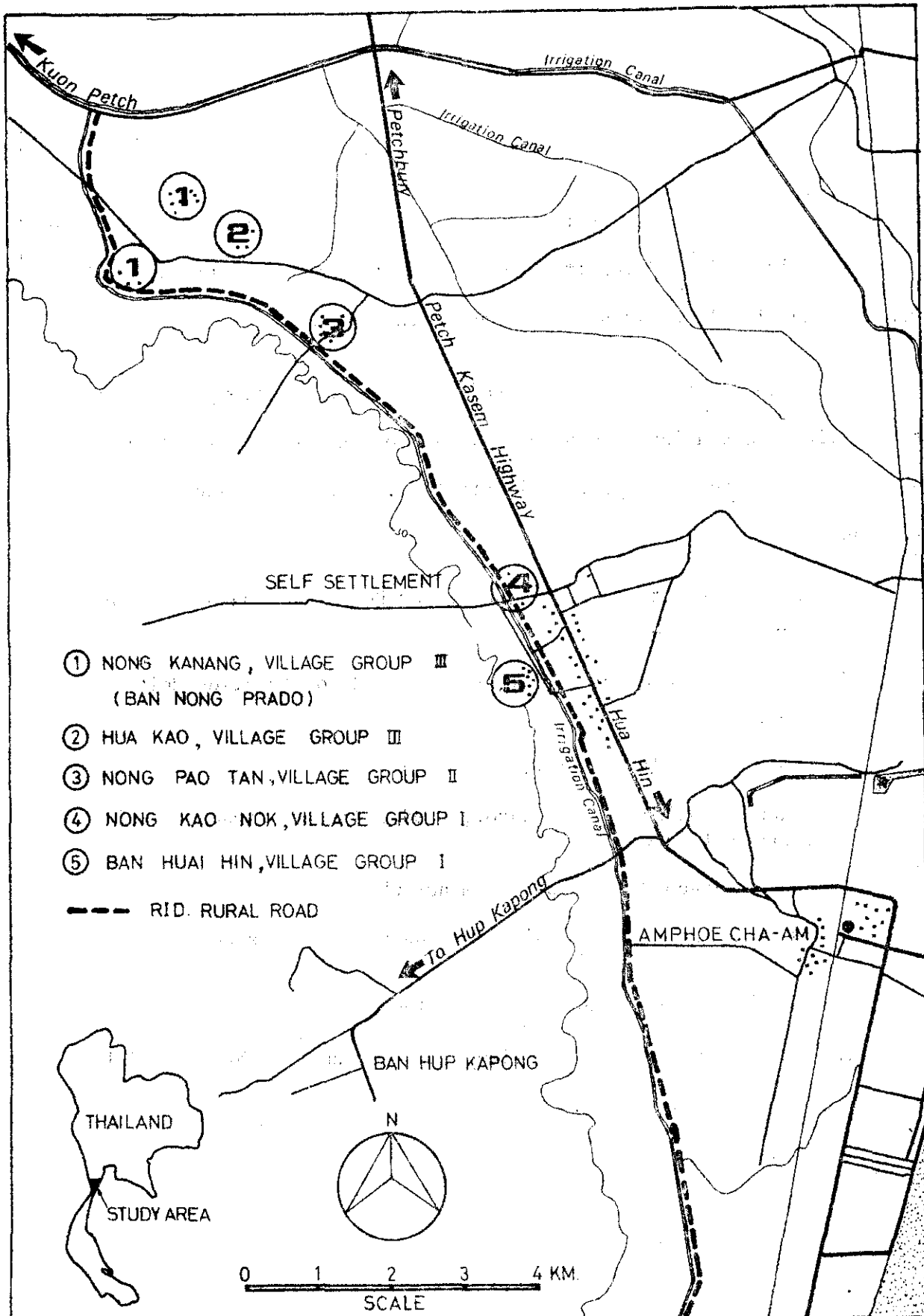
Prasat Pothiditi, Chief, Kang Kajan Dam,

Nuan Virapaisan, Coordinator, Feeder Road Construction Unit, Kuon Peht, and

Direk Tarapob, Nay Amphur, Amphur Cha-am,

Utai Sayanprasert, Puyai Ban, Nong Pao Tan, Cha-am.

In addition the considerable assistance given by the Asian Regional Team for Employment Promotion, and particularly by Colin Relf is very gratefully recognised.



MAP OF THE STUDY AREA

- SHOWING PETCH KASEM HIGHWAY, THE RID RURAL ROAD AND VILLAGE GROUPS

## INTRODUCTION

This Working Paper covers a study of the income distribution and employment effects of an individual rural road construction project in Thailand. The purpose of the study is to identify income groups which benefit either directly, (by making use of the newly-created asset or through employment in construction) or indirectly, (by benefitting from reduced farm to market transport costs and so on). It is obvious that the full effects of the road can only be measured some years after its construction but one premise has been that some substantial consequences will emerge during the construction process itself and immediately after the opening of the road. The current study concerns these immediate effects of the construction. It is hoped at a later date to review the longer-term consequences.

The present work has consisted of three surveys, i.e. a benchmark survey in the main area of influence undertaken about four months before construction started, a survey of labourers employed at the construction site and finally a third survey of the same area of influence some months after the road was opened for traffic. The paper thus appears in three sections. The first deals with the economic conditions in the area of influence of the road prior to its construction and aims at establishing a point of departure for

the rest of the study. The second part reflects the employment and income distribution implications of the actual construction, and the third covers the immediate effects of the road after its opening.

The conventional approach for evaluating road projects in developing countries puts a major emphasis on quantification of road user savings.<sup>1/</sup> As the approach is most applicable to highways and is less sensitive for rural roads, particularly those constructed in less developed areas of mainly subsistence farming, efforts have been made to broaden the approach. One of the first to do this was von Thunen by analysing the effects of transportation costs on agricultural production.<sup>2/</sup> Later, Walters studied benefits of feeder roads from the point of view of increase in area under cultivation.<sup>3/</sup>

In a recent World Bank paper Carneman et al have taken note of the different efforts to broaden the scope of rural road projects by developing a producer surplus approach for measuring the impact of a rural road project.<sup>4/</sup> The main stress has been put on estimating the incremental surplus generated from higher farm prices, lower

---

<sup>1/</sup> See Jan D. Weille, Quantification of Road User Savings, World Bank Occasional Paper No. 2, 1966.

<sup>2/</sup> Hall, P. 1966, von Thunen's Isolated State, Oxford, Pergamon Press.

<sup>3/</sup> Walters A.A. 1968 'A Development Model of Transport', American Economic Review, Vol. LVIII No. 2.

<sup>4/</sup> Carneman, Biderman and Bovet, The Economic Analysis of Rural Road Projects, World Bank Staff Working Paper No. 241.

production prices and improved market access. But other effects such as benefits to road users, changes in profit levels and such like have also been taken into account.

The present study of a rural road employs a methodology which comes close to the latter and stresses the inter-relationship between transportation, production and income. The effects of the road are studied at the household level. The object is not to make a complete evaluation of the road but to study the distribution of benefits among recipients and the way the people of different socio-economic strata respond to better transportation possibilities and lower transport costs.

The road in question passes through a number of villages with different degrees of year-round accessibility. The effect of the road was never expected to be similar all over the area of influence but to depend a lot on the current accessibility status of the villages. The development effects were thought likely to increase with growing remoteness. The main hypothesis to be tested thus holds that although the benefits of a road are slightly biased in favour of those with bigger assets (such as land) and subsequently may create a more unequal income distribution within each village, the income distribution disparities between different villages will be less than before. Chapter 1 below describes the extent of the road and defines the area of influence. Chapter 2 raises some methodological issues concerning the household survey and identifies

variables to be included in the analysis. These variables are quantified and the differences between villages with different degrees of accessibility are assessed in chapter 3.

The second part of the paper, consisting of chapter 4 examines the road construction from distributional and employment points of view. In chapter 5 some immediate affects on the travelling and transportation pattern of the households in the area of influence, shortly after the opening of the road, are examined. Chapter 6 contains the overall conclusions of the study.

## Chapter 1

### Area of Influence

The road in question has been constructed along the east bank of an irrigation canal in Changwat (Province) Phetchaburi, about 200 km south of Bangkok (see map) and replaces an only partially trafficable track. The road is 22 km long but will later be extended to a total length of 40 km. The existing road network in the area is dominated by Pethkasem highway, connecting Bangkok with the southern provinces. Another road runs westwards from Petchkasem, from a point 200 km from Bangkok, to Kuon Peht. Further south is another road going from Petchkasem to Hupkapong. Besides these two cross roads there are a number of smaller roads ending up in Pethkasem, most of them motorable only in the dry season.

The new road starts at a point along the Petchkasem - Kuon Peht road, some 8 km from Pechkasem itself. First it runs rather far away from the highway but gradually it comes closer. After 14 km it hits the Hupkapong road and here again the distance to Petchkasem grows bigger as the highway makes a sharp bend to the west.

The road is passing two amphurs (districts) - Amphur Tayyang and Amphur Cha am, each amphur comprises of a number of tambons<sup>1/</sup>

---

<sup>1/</sup> A tambon is a cluster of villages. For the country as a whole, the average population per tambon is just over 7,000.

which in turn are divided into villages, the smallest administrative unit in Thailand. Altogether there are 30 villages in the two amphurs but only 10 border on the new road. The number of households in each village varies considerably from 40 to 450. The average size is about 150.

The typical village consists of a cluster of houses, situated relatively close together. The land belonging to the households is distributed around the village. At some distance, but still administratively connected to the same village, are single, scattered houses with small pieces of land just around each house. The houses are of typical Thai country style, built on poles and, often thatched. Construction material is mainly wood but poorer households make use of plaited palm leaves.

Most of the shops are situated along Petchkasem Highway and provide a wide supply of goods and services including barbershops, dressmakers, workshops etc. At Petchkasem there is also a local market operating twice a week. Here households buy most of the fresh food they cannot produce themselves, and here too, the farmers from the area sell some of their surplus. Away from the highway there are only a few minor shops.

In the villages themselves there are also a number of primary schools while secondary schools are located in the immediate neighbourhood of Petchkasem Highway. Geographically, the area can be separated into two parts. Between Petchkasem Highway and the canal



the land is essentially flat with groves of palm and mango trees. About 75 per cent of the land is devoted to paddy fields. The rest is mainly under sugarcane and maize cultivation. West of the canal the land slopes slightly upwards towards the forest and here highland crops such as tapioca, sugarcane and maize predominate. Here too, most of the banana and lemon cultivation is to be found, as well as the production of pineapple. Even though an irrigation canal passes through the area, only a very limited part of the land is irrigated. Although water is available, double cropping seems to be the exception rather than the rule.

As in other rural areas, farming is the main activity for the majority of households, though non-agricultural activities also play a significant role in terms of income. The importance of this is greatest for households situated along or close to Petchkasem Highway where this is the only income source for a number of households, and diminishes with distance to the main highway. Around the highway, shop keeping is the dominant non-agricultural activity. Deeper in the area there are two other typical non-agricultural activities - charcoal-burning and roof making. Almost every household has a clay oven for burning charcoal for home consumption, but many households also do this on a commercial basis. Wood is collected from the forest nearby and carried to the compound where it is then burnt. Charcoal burning is to a great extent a business for the younger household members. Roof making actually means the construction of a kind of roof segment commonly used in the Thai countryside.

The process consists of wrapping a special type of palmleaf around bamboo-sticks. Both the leaves and the bamboo raw material have to be bought.

Husbandry is an important supplementary income source in the area. For home consumption most households keep one or two pigs and a number of chickens or ducks. Pig breeding on a larger scale does take place, but only in a few cases. On the other hand a number of households keep cattle. Herds of up to 25 animals can frequently be seen grazing in the area, watched by small boys. Cattle is a considerable business for landless households or small farmers as the animals can graze on unclaimed, vacant pasture land.

The area of influence of a rural used to be determined by the cost of transportation on and off the road and, sometimes, also by other cost factors associated with distance. Squire<sup>1/</sup> suggests that if farmers settle along the road, the distance of cultivation might be only 3-4 kilometers and in an evaluation of the Friendship Highway, the area within which the highway had influence was determined as being about 3 kilometers each side of the alignment.<sup>2/</sup>

In the case of the present road, the area of influence can not be exclusively considered from the point of view of the new road,

---

<sup>1/</sup> Lyn Squire, Optimal Feeder Roads in Thailand, the Journal of Development Studies, Jan. 1973.

<sup>2/</sup> Boonchuan Tantayanubuts 1968, Changes in Agricultural Land Use along Friendship Highway as Related to Terrain and Prior Development, Asian Institute of Technology, Bangkok, Thailand.

as the area is cut through by a number of tracks, minor roads and paths which are mainly going from Petchkasem Highway up to the canal where some stop and others continue over bridges further eastwards. Most of the roads and tracks are trafficable during the dry season only. The influence of the new road, therefore, depends not only on the distance between each village and the new road but also on their proximity to other existing roads. Patterns of usage of the entire network of roads and tracks also depend on the time of year. For the purpose of the present study, the area of influence was simply defined as an areas consisting of villages bordering the road, with the exception of the villages bordering the Hupkapong and Kuon Peht roads respectively, which were well served by all-weather roads already. In all, the area of influence consisted of 10 villages with a total population of about 1200 households.

## Chapter 2

### Methodology and Selected Variables

#### 1. Methodology

The current socio-economic condition in the area of influence was assessed by means of a sample survey. Five villages comprising about 650 households were selected and from each village 25 per cent of the households were drawn at random.

The five villages were then, on basis of accessibility and location, clustered in three groups, below referred to as village group I, II and III.

Village Group I consists of two separate small villages both located rather close to each other as well as to the main road - the Petchkasem Highway. The road connections from the villages to the main road were already of rather good quality, although some low areas are flooded during the peak of the rainy season. The land belonging to this village group is mainly located to the west of the canal.

The households in these villages are rather scattered with no significant village centre. There is one small shop in the village group, but most goods are purchased in the market or in the numerous shops along Petchkasem Highway. There is one primary school.

Village Group II consists of a single large village, which can actually be separated in two significantly different parts. The main part is situated along the east bank of the canal. The houses stand close to each other and in the village there is one small shop and a primary school. Across the canal the second half of the village is located on land that has recently been cultivated within the framework of a resettlement programme. The programme aims at supporting pineapple cultivation by offering a package of seeds, fertilizers, pesticides, extension services and favourable credits to the farmers.

The houses of the latter part of the village are scattered over a large area, but the road connections were already of reasonable quality, having been laid down as part of the resettlement programme.

Apart from these two distinct locations there are a few isolated groups of households in other parts of the village. The houses belonging to these households are rather poor and road access to them has always been difficult.

Village Group III consists again of two villages. Although they are not adjacent to each other, they share some common characteristics of relevance for this study. They are, in relation to the other villages, located furthest away from the surrounding all-weather roads. The quality of the roads leading to the villages was poor. They share the same cropping pattern with most of the land under paddy cultivation. Schools and shops are located outside the villages.

Some basic characteristics of the village groups are indicated in Table 2.1. Of specific importance for the analysis is the degree of accessibility - quality of existing roads used by the people for transportation of their produce and distance. As most of the produce for sale is agricultural and usually transported straight from the fields to the market, factories, mills and so on, distance and quality of the roads should most appropriately be measured from the fields. However, this turned out not to be practicable. The farmers, whose judgement the interviewers had to rely upon, and who in many cases cultivated more than one plot had some difficulties in estimating an average value.

This was not, in fact a critical problem, as concentrated villages tended to lie in the centre of their cultivated land. This was valid for more scattered settlements as well. It was decided, therefore, to take house-to-main road distance. The road quality is a subjective measure and was assessed simply by ranking the roads servicing each village group according to how long in the year they were open to truck traffic. These two factors making up the accessibility indicator turned out to rank the village group in the same order.

Village group I was most accessible from the main road both in terms of the distance and quality of the road leading to the village. Village group II came next. The distance to the main road was longer than that of group I, but although the road to certain parts of the village group were of rather high rural quality, accessibility

for the whole village group was judged to be slightly worse than for group I. In the case of village group III, both distance and quality of the roads definitely placed this village group behind the other two in terms of accessibility.

Table 2.1 Number of households and distance to the main road for three village group

Village group	I	II	III
Number of households (total)	130	320	204
Distance to main road (km) (average)	1.4	2.4	3.6
Distance to new road (km) (average)	0.7	0.9	0.9

## 2. Selection of Variables

The purpose of the benchmark survey was to establish a point of departure for a future examination of long-and short-term income distribution implications of a change in the road network in the area. Dependent variables are household income level and income distribution. The survey was restricted to include mainly socio-economic factors which are affected by degree of accessibility and at the same time in turn will affect household income level and income distribution in the area of influence.

Apart from the dependent variables, the following factors have been selected to be covered by the household survey: Distribution and

and Tenurial Status of Land, Cropping Pattern, Cultivation Technique and Production Cost, Commercialisation, Farmgate Price and Employment. Each factor is broken down in measurable variables. The selection of factors and variables are justified below.

Access to land to cultivate is for obvious reasons a major determinant of household income in a country where about 80 per cent of the rural income accrues from crop production. The relation between distribution of land and rural cash income is also indicated by Table 2.2.

Apart from distribution of land, two other variables related to use of land and with implications on income enter the analysis, namely tenurial status of the land and land use.

Table 2.2 Distribution of land and income in Thailand

Distribution of land <sup>1/</sup>			Distribution of rural cash income <sup>2/</sup>	
Percentile groups of operated land holdings	Percentage share of land	Percentile groups of households	Percentage of total income	
Bottom	20%	3.0	Bottom 20%	6.0
Bottom	40%	10.5	Bottom 40%	14.0
Top	20%	51.5	Top 20%	53.5
Top	10%	34.0	Top 10%	35.5
Top	5%	21.0	Top 5%	22.5

<sup>1/</sup> 1963 Agricultural Census.

<sup>2/</sup> 1962/63 Household Expenditure Survey.



Three kinds of tenurial status are distinguished, namely, ownership, cash renting and share cropping. Traditionally, most of the cultivated land in Thailand was owned by the tiller. But with higher population density, land speculation has increased and this has resulted in a growing number of tenants or farmers owning only part of the total area they cultivate. In 1971-72 the proportion of tenant farmers to the total number of land tillers varied between 40 per cent in the Central Region to about 3 per cent in the North East. The situation in the most fertile parts of the Central plain was even worse, with up to 84 per cent tenants.<sup>1/</sup> The implications of tenurial status on income are, of course, connected to the land rent. Share cropping means usually the highest rent. The most common rate is 50 per cent of produce with all costs covered by the tenant. Share cropping is most common in traditional rice cultivation. Renting for cash, which subsequently gives a more favourable land rent, is more related to up-land cropping.

A more apparent consequence of a new road is an increase in land under cultivation. This is also supported by Boonchuan in his study of the Friendship Highway, though he was reluctant to relate the increase in cultivation he observed to the road only.<sup>2/</sup> In this particular area, however, most land in the area of influence is already

---

<sup>1/</sup> Ministry of Agriculture, Agricultural Economics Division.

<sup>2/</sup> Boonchuan, op.cit.

under cultivation. Dramatic changes in cropping area as a result of the road are unlikely.

The relation between cropping pattern and both accessibility and household income lies mainly in the kind of transport facilities each crop requires. Low value/weight ratio crops are, for obvious reasons, most profitably transported by big trucks. If the roads or tracks leading to the fields cannot carry them during the harvest season or have to go half loaded only, this obviously discourages the farmers from cultivating these kinds of crops although under certain conditions they may be more profitable. Crops requiring heavier transport facilities are mainly upland crops such as sugar, tapioca, pineapple and to a lesser degree, maize. The average yield of sugarcane in Thailand is, for instance, about 5 tons per rai, while tapioca, and pineapple produce about 2.8 tons and 2.2 tons respectively.

The corresponding figure for paddy is about 0.4 tons per rai. Consequently, both sugar and tapioca are most economically transported by heavy trucks. Pineapple is seen transported either by large or small trucks, while maize and most other crops, including paddy, are transported by pick-up trucks.

For the purpose of this study, the crops cultivated in the area have been grouped in the following categories by their transport requirements: - paddy, upland crops such as sugarcane, tapioca and maize, pineapple and treecrops including lemon, banana and coconut.

Another constraint on transportation is the duration of the harvest season. For some of the above-mentioned crops, the harvest season is rather limited, which means that big quantities have to be transported within a short time period. Sugar is particularly sensitive as it has to reach the factory as soon as possible after the harvest. For most tree crops, however, harvesting goes on over a longer period. As the fruit cannot be stored for any length of time, market trips are frequent. Other kinds of crops cultivated in the area - including some vegetables - have less specific requirements on transportation facilities.

Cultivation technique is in the following used as a summarising concept for both the degree of mechanisation and the application of agricultural inputs in farm operations as a means of increasing productivity. Mechanisation is mainly a question of techniques for land preparation and irrigation. Most other farm operations such as planting, weeding and harvesting are still performed exclusively by hand. Previously, draft animals, either one buffalo or a couple of bullocks, were the only means of assistance for land preparation. The last 10 years, however, have seen draft animals increasingly being replaced by different kinds of tractors. There are several reasons for this. One is that the introduction of tractors saves labour during peak seasons, when labour shortages often occur.

There are basically two types of tractors on the market in Thailand, viz two-wheel and four-wheel tractors. The two-wheel

tractor is usually owned by the farmer himself and is replacing draft animals mainly in paddy fields, though it is also used for upland cultivation. Bigger tractors too, are hired and being used on upland fields.

Regarding irrigation, the range of techniques is very wide. As indicated above, the vast majority of land in the study villages is not irrigated. But in those cases where land is irrigated, simple pumps are used for lifting the water into paddy fields.

Agricultural inputs are taken to include all kinds of seeds, manure, chemical fertilizers, pesticides and so on used in farm operations. It is commonly accepted that their application is of critical importance for increasing yields - hence farm income. However, the use of fertilizers and pesticides in Thailand is still rather low, even compared to other countries in the region. There may be several reasons for this. One is the relative abundance of fertile land in the country, which has not forced the farmers to increase its productivity. Another is that farming in Thailand until recently has been based on subsistence cropping to a considerable extent. A third factor is related to the price of the produce. The depressed price of rice has long been regarded as a severe constraint on the use of (relatively expensive) chemical inputs. Most productive inputs thus have gone to the cultivation of export crops, which have had much higher economic return. In the light of increasing land shortage and a growing involvement by the farmers in the market economy, there is

shift from rice to cash cropping and an increasing awareness of the productivity of land. This in turn does seem to be leading to a steadily increasing use of modern farm inputs. To what extent accessibility is a constraint on the adaptation of modern farm practices does not seem to have been well-researched so far. The tentative hypothesis entertained here has been that not only do higher prices resulting from higher transport costs restrict the use of productive inputs in less accessible areas, but also that non-economic factors such as information, traditions and general inertia are also important. In the area of influence, therefore, it is plausible to expect that the use of modern farm inputs and higher degree of mechanisation will be the highest in village group I and will decrease with distance from the main road.

The application of farm inputs has been measured by means of production cost per rai.

The concept of commercialisation refers to the degree of involvement of the farmers in the monetised economy. This is related to household income insofar as the poorer rural households depend on income in kind to a much higher extent than those that are better off, Meesook<sup>1/</sup> has shown that income in kind represented about 60 per cent of total income for the lowest income group in the 1960s, while the corresponding figure for the highest was less than 5 per cent

---

<sup>1/</sup> Oey Astra Meesook: Income Inequality in Thailand, 1962/6 and 1968/69.

The degree of involvement in the monetised economy depends to a great extent and for obvious reasons not only on the possibilities of transporting produce from the villages, but also on factors such as cropping pattern, traditions and so on. Rice is the main subsistence crop in Thailand and consequently income in kind is most important in rice-growing areas.

On the expenditure side, payments in kind are mostly made to hired labourers and in repaying loans. Payment in kind is partly a hangover from the pre-monetised days of the rural economy - but it is a practice which is perpetuated by the liquidity shortages farmers face, especially at harvest time. The hypothesis is that payments in kind to hired labour thus are more frequent in traditional farming. Loans repaid in kind are more common in traditional societies too, where the ordinary credit institutions are few or where the farmers, for administrative or other reasons, cannot meet the formal requirements for credit.<sup>1/</sup> Degree of commercialisation is measured by percentage of yield sold, percentage of yield for home consumption and percentage of payment for hired labour in kind.

Regarding farm prices, the consequence of a decrease in transport cost will theoretically be a combination of increase in the price of the farm output and a decrease in consumer price. The more transport-intensive the output is the greater will be the effect

---

<sup>1/</sup> Pantum Thisyamondol, Virack Arromdee and Millar Long, Agricultural Credit in Thailand - Bangkok, Kasetsart University, 1965.

on the price. Empirically, however, only a part of the cost saving is passed on to the farmers (and, for that matter, to consumers). The portion not passed on represents increased income of transporters, middle men etc. In areas where there is no or little competition in the transport sector, the prospects of passing on the road-user savings to the farmers (and consumers) will generally be weak.<sup>1/</sup> In other countries middle men have captured a major part of the cost saving.

Although it is reasonable to assume that farm prices are related to the degree of accessibility and will be affected by changes in transportation possibilities, this factor could not be measured in the current study. A major reason for this was the extraordinary diversity in cropping pattern of the villages; only rice was found to be cultivated by sample households in all village groups. Rice, like sugar, was moreover under minimum price legislation - a factor which often works against passing over transport cost savings to the farmers. In the area the price of rice was practically the same in all sample villages.

Another complication in comparing farm prices in the wide range of relationships between the merchant and the farmer. Particularly for upland crops such as sugar it is very common that the merchant provides labour for harvesting and sometimes also for planting. In

---

<sup>1/</sup> See Herman G. van der Tak and Jan de Weille, Reappraisal of a Road Project in Iran, World Bank Staff Occasional Paper, No. 7, 1969.

other cases the agreement between the merchant and the farmer includes a package of fertilizers, etc. Of course, the cost of these services is calculated in the price of the produce. The result is a very mixed price pattern which the size of the sample did not allow us to examine fully.

Employment has been taken into consideration by means of the share of working time spent on different activities. Four different activity groups are distinguished, mainly self-employed farming, self-employed non-farming, wage employment in agriculture and wage employment in non-agricultural work. In rural Thailand about 70 per cent of the total working time is spent on agricultural activities, mainly within the framework of the household farm. The size of the landholding is subsequently an important determinant of the occupation of rural households.

Although agricultural activities dominate the employment pattern in rural areas, off-farm work plays an important role.

The incidence of non-agricultural activities is, however, not likely to be evenly distributed. There are reasons to suppose that access to non-farm work decreases sharply with increasing distance from more populated areas where economic activity is more diversified. This is especially the case if the road connections are poor. Villages located closer to the main road can be expected to show a more diversified employment pattern than others, though the



bulk of employment can still be expected to be performed within the farm enterprise. The implications of wage employment on household income hinge on the relatively high daily earnings it generates, which means that the contribution to cash income is bigger than its share of employment working time.

## Chapter 3

### Benchmark Survey in the Sample Villages

In this chapter, the variables identified as critical for describing differences between village groups are quantified. The quantification is based on the benchmark survey outlined above. The data collection was carried out by interviewing mainly the head of each selected household. The reference period was the most recent full year's agricultural cycle, starting from the principal rice harvest (i.e. beginning of February).

#### 3.1 Distribution of land and tenurial status

The sample yielded an average per household cultivated area - including land rented in - of 23.2 rai. The most recent data with which this figure can be compared are those from the 1963 Agricultural Census. This showed an average per household land holding of 22.1 rai for the Central Region (of which Petchaburi is one of the most southerly Provinces) and 21.7 rai for the Kingdom as a whole. However, due to the 13 years difference in time between the census and the present benchmark survey, the figures are difficult to compare. A steady population growth causing an increased pressure on the land has most likely further diminished the average farm size since 1963. This should indicate an above average farm size in the survey area compared with that to be expected for the country as a whole and for the rest of the region.

Differences between villages in terms of selected land variables are set out in Table 3.1 below.

Table 3.1 Land holding variables by village group

Village group	I	II	III
Average farm size (in rai) <sup>*1/</sup>	33.9	22.1	19.4
Share of land cultivated by bottom 20 per cent of the households (%)	5.0	7.6	6.6
Share of land cultivated by top 20 per cent of the households (%)	47.5	38.0	48.6
Percentage of households with no operated land	11.1	5.2	4.4

\* Difference between group I and III significant at 1 per cent level.

The survey discloses firstly a significant variation in average farm size between village groups - from 30.1 rai per household in group I to 18.2 in group III. The differences may tentatively be traced back to differences in accessibility between the village groups by means of differences in pressure on the land and increasing marketing constraints with growing distance to the market. Village group I is situated close to the market where the people have access to a wide range of non-farm job opportunities. In this group the average

<sup>1/</sup> Standard deviation 29.5, 14.2 and 17.2 for village groups I, II and III respectively.

land holding is biggest. When forming new households, it is subsequently not necessarily to split the basic land holding, as the new households have incentives to move or may settle down in the villages with non-agricultural occupations. In this village group consequently the highest proportion of non-farming household is found.

Village group III represents the most remote villages with poor road-connections. The location of the villages may have been a severe constraint on agriculture and the average size of farm may reflect the difficulties of marketing the output derived from cultivating a bigger landholding. Job opportunities outside the farm are also rare. Since very little new land is available when new households are formed as they have to move away from the villages. The proportion of non-farming households is small.

The two measures of land distribution shown in Table 3.1 - namely land cultivated by the 20 per cent of the households most well-endowed and least well-endowed respectively - show no significant relation to accessibility. Groups I and III have almost the same degree of concentration of land holdings while the distribution of land is more uniform in group II. A tentative reason is that this group includes the resettlement project, in which the land has been distributed in equally sized pieces.

As to tenurial status, slightly less than 30 per cent of the average area cultivated per household was rented in for the sample as a whole. Of this, a dominant part - 56 per cent - of that land was

share cropped. The situation in both these aspects varied, however, considerably between village groups, as shown in Table 3.2. Dependence on rented land was heaviest in village group I and decreased with distance to the main road - a trend which supports the hypothesis of a relation to accessibility.

In village group III almost all rented - 98 per cent - and in group II 60 to 65 per cent of rented land was found to be share cropped, while in group I it all was cash rented. The differences in status of the rented land, may be explained by differences in cropping pattern. Share cropping is the traditional form for renting land and is especially common in rice cultivation. In the area of influence village group III represented the most traditional farming and subsequently had the highest rate of share cropped land.

Table 3.2 Land tenure variables by village group

Village group	I	II	III	I	II	III
				Standard deviation		
Average area rented in per household (rai)*	10.2	6.4	3.7	16.03	10.25	5.78
Area rented in as a proportion of operated land holding (%)	33.4	25.9	22.6	40.96	36.82	34.24

\* Difference between Village groups I and III significant at 1 per cent level.

### 3.2 Cropping pattern

The single most important crop in all the area of influence was paddy. Approximately 50 per cent of all land was found to be under rice cultivation with 65 per cent of the sample households devoting at least a part of their landholding to this crop. Upland crops, such as sugarcane, tapioca and maize accounted for 20 per cent of the cultivated area and two tree crops, banana and lemon, for another 8 per cent. A newly introduced crop - **pineapple** - has, supported by extensive credit schemes, rapidly become popular, and was being grown on 9 per cent of the cultivated land. The rest of the land was devoted to a number of other minor crops.

Table 3.3 Percentage of cultivated area under selected crops

Village group	I	II	III	I	II	III
				<u>Standard deviation</u>		
Rice <sup>*</sup>	3.3	55.2	64.9	13.73	44.47	30.68
Upland crops <sup>1*</sup>	55.7	10.0	11.8	40.65	21.90	23.53
Tree crops <sup>2**</sup>	4.0	4.9	12.0	10.24	18.73	18.08
Pineapple	-	16.9	0.8	-	35.40	5.6
Yam beans	27.6	-	-	-	-	-
Other	9.4	13.0	10.5			
Total	100	100	100			

\* Difference between group I and III is significant at 5 per cent level.

\*\* Difference between group I and III is significant at 1 per cent level.

<sup>1</sup> Sugarcane, tapioca and maize.

<sup>2</sup> Lemon, banana and coconut.

Table 3.3 indicates some significant differences in cultivation of selected crops between the three village groups. In group I, sugar, tapioca and maize were dominant with rice accounting for only a small fraction of the land. Group II was characterised by a high share - more than 50 per cent of the land - under rice cultivation and a considerable share for pineapple. In Group III again rice was the most important crop. But here some tree crops accounted for a relatively large share of the cultivated area.

In general, villages closer to the main road were characterised by a higher degree of cash cropping than more remote villages. This in turn may depend at least partly on proximity to the market. Differences in areas devoted to rice, the main subsistence crop, are, however, also a consequence of differences in the type and quality of the soil. Village group I consisted mainly of uplands where rice is traditionally not cultivated, while both groups II and III to a greater part consist of low land, well suited for rice cultivation.

### 3.3 Cultivation technique

Table 3.4 gives the average expenditures for different kinds of agricultural inputs. The total expenditures vary between Bht. 312<sup>1/</sup> per rai in village group II and Bht. 124 per rai in group III. Looking at the different kinds of inputs, only expenditures on hired labour

---

<sup>1/</sup> Bht. 20.15 = US\$ 1.00.

vary significantly with accessibility. The prevailing high values of all expenditure groups for village group II may be explained by the pineapple farming going on there. The programme under which pineapple is cultivated includes a package of extension services, credit, supplying of seeds, fertilizers, pesticides and so on allowing above average expenditures on farm inputs (for example Bht. 590 per rai for seeds, Bht. 570 per rai for fertilizers and Bht. 70 per rai for pesticides). If pineapple cultivation, which actually represents a fairly sophisticated type of farming, is excluded, the expenditures on the different items in the second village group are reduced to values lying between those of group I and III, thereby giving a rather mixed pattern. The expenditures on seeds were almost the same for the three village groups. Fertilizers were used more the closer to the main road the village group was located, though the use of pesticides showed the opposite pattern. Only expenditure on hired labour tended to decrease monotonically with accessibility.

Table 3.4 Expenditure on agricultural inputs (Bht. per rai)

Village group	I	II	III	Standard deviation		
				I	II	III
Seeds	23.9	110.5	24.9	36.79	211.34	29.39
Fertilizers	23.5	77.3	18.9	37.15	188.95	76.59
Pesticides, etc.	6.9	20.1	11.3	23.73	63.53	32.78
Hired labour*	118.4	104.0	69.0	119.36	141.18	76.56
Total	172.8	312.4	124.1	151.14	453.88	153.94

\* Difference between groups I and III is significant at 5 per cent level.



Table 3.4.b Expenditure on agricultural inputs for rice cultivation

Village group	I	II	III	I	II	III
				Standard deviation		
Seeds	15.0	35.8	35.1	21.2	45.2	58.4
Fertilizers	0.0	1.5	0.1	-	5.2	0.2
Pesticides	1.9	4.0	2.4	2.7	15.4	10.0
Total	16.9	41.3	37.5	23.9	51.2	58.9

Table 3.4.b shows expenditures on selected agricultural inputs for rice production only. Labour inputs are excluded as they could not be broken down by crop. The figures indicate a very low use of productive inputs for the limited rice cultivation in village group I, both in absolute terms as well as in relation to village groups II and III.

The expenditures on inputs of the other two groups are about Bht. 40 per rai, compared to less than 20 Bht. for group I. The above figures can be compared with the average rice yield of the three village groups which amounted to 344, 380 and 408 kg. per rai for groups I, II and III respectively. The low expenditures on inputs for village group I subsequently correspond to the lowest yield. Again, the differences between village groups II and III are small with a slightly higher yield for group III. The higher yield, in spite of a slightly

lower value of agricultural inputs for group II compared to group III, can probably be explained by a higher labour input.

Table 3.5 Percentage of land cultivated by draft animals and tractors<sup>1/</sup>

Village group	I	II	III	I	II	III
				<u>Standard deviation</u>		
Draft animals**	12.0	37.6	32.8	30.4	45.5	41.9
Two-wheel tractor**	21.3	26.4	33.4	39.6	42.4	37.7
Four-wheel tractor*	55.5	21.2	14.3	46.67	38.27	28.13

\* Difference between groups I and III is significant at 1 per cent level.

\*\* Difference between groups I and III is significant at 5 per cent level.

Table 3.5 shows differences in the types of motive power for cultivation amongst the three village groups. Draft animals, although still popular, are quickly being replaced by tractors. Differences in land preparation techniques between the village groups otherwise seem mainly to reflect differences in cropping patterns.

<sup>1/</sup> The columns do not sum up to 100 as part of land was cultivated with perennial crops. This represented, in the three village groups, 11, 15 and 20 per cent respectively of the cultivated land.

The use of four-wheel tractors follows the cultivation of highland crops, given that part of this consisted of second year sugar which does not demand extensive land preparation. In group I, upland crops, including beans, were being cultivated on about 83 per cent of the area. The share of land prepared by four-wheel tractors accounted for about 56 per cent. In group II, the corresponding figures are 217 per cent (including pineapple cultivation) and 21 per cent respectively. In group III four-wheel tractors were being used on 14 per cent of the land while upland crops covered 12 per cent of the cultivated area.

For paddy the choice is between draft animals and two-wheel tractors and the use of these two alternatives follows rather closely the cultivation of rice. Rice cultivation in village group III was undertaken on about 65 per cent of the area while draft animals and two-wheel tractors were used on 66 per cent. Corresponding figures for group II are 55 per cent and 64 per cent respectively. In group I, draft animals and two-wheel tractors were used mainly on non-paddy land.

Summarising the different aspects of cultivation technique, there seem to be rather weak relations to accessibility. In terms of farm inputs in general, only expenditures on hired labour suggest more advanced farming when approaching the main road. The use of other kinds of inputs seems more to be determined by tradition regardless of location. Levels of mechanisation, too, varied very little with

accessibility. Here, the type and quality of soil are stronger determinants. Uplands, whatever their location, were cultivated generally using four-wheel tractors.

### 3.4 Commercialisation

Table 3.6 gives some average values of variables measuring different aspects of commercialisation in the three village groups. The trend is clear and corresponds to the hypothesis that the degree of commercialisation decreases with distance from the road, though a number of other factors such as cropping pattern, contribute to this. The percentage of yield sold is biggest in village group I which is closest to the market and where most of the land is devoted to cash crops. With increasing distance from the market, cultivation practices tend to become more subsistence-oriented.

Table 3.6 Commercialisation variables by village group

Village group	I	II	III	I	II	III
				Standard deviation		
Percentage of output sold *	88.7	46.5	37.5	20.5	35.9	29.3
Percentage of output for home consumption *	2.5	19.8	36.2	7.8		
Percentage of output for other purposes	8.7	31.5	25.9	16.6	23.8	25.8

\* Difference between village groups I and III is significant at 1 per cent level.

A corollary of the above hypothesis would be that the share of agricultural production for sale will decrease with increasing distance from the market and this does seem to be borne out by the data. In village group III, less than half of the yield - in terms of value - is sold while the corresponding figure for group I is almost 90 per cent.

The measure of composition of consumption in kind was also found to vary between village groups. In group I, the small part of the yield not sold is mainly used for repayment of loans. Only rice, representing just 4 per cent of the value of the production, was home-consumed. In group II, about 20 per cent of total yield was used for home consumption, while the rest was divided between debt repayments and rents. Finally, in group III, about 35 per cent was home-consumed. The rest was used for payments of rents - share cropping being more common here - with small shares set aside for repayment of loans.

Table 3.6.b Distribution of the rice harvest by village group

Village group	I			II			III		
	Percentage			Standard deviation					
Sold for cash	-	17.6	17.2	-	19.8	23.2			
- for home consumption	57.4	36.5	48.4	53.6	24.4	30.2			
- for rent payments	-	18.8	10.0	-	18.9	16.3			
- for payment of debts	0.0	12.4	8.1	0.0	11.7	18.1			
- for seed	3.5	3.3	5.8	1.6	2.7	15.3			
- for other purposes <sup>1/</sup>	39.1	11.3	10.5	55.2	18.9	20.5			
Total	100.0	100.0	100.0	-	-	-			

<sup>1/</sup> Includes yield stored for future sale, payment of labour in kind, etc.

Since rice has long been the most important subsistence crop in Thailand, it is of particular interest when considering the degree of commercialisation. The distribution of the rice yield is shown in table 3.6.b. It is interesting to see how small a part of the harvest actually is marketed. The little rice cultivated in village group I is consumed at home, although apparently, at the time of the survey, a part was being kept in store for future use. Even in village groups II and III less than one-fifth of the rice crop was marketed. In those two village groups from 20 to 30 per cent of the rice crop was used to pay debts and rent.

The use of payment in kind for hired labour was another factor which differed substantially between villages. It was most common in village group II where about 30 per cent of the payment was in kind. In village group III, slightly less than 20 per cent and in group I only 3 per cent was in kind.

### 3.5 Employment

The employment pattern is shown in table 3.7. The figures reveal considerable differences between, on the one hand, village groups I and II, and on the other hand, village group III. In the former villages the yearly average household employment was around 390 working days while in the latter the corresponding figure was 205.

However, a part of the difference may be explained by the fact that the figures do not take into consideration the exchange of

labour. Traditionally, exchanging labour is most common in rice cultivation, particularly during planting and harvesting. But it does occur occasionally even during sugar and tapioca harvests. The actual number of working days for the villages mainly involved in rice cultivation (i.e. group III, and to a lesser extent, group II) are probably higher than indicated here.

Breaking down the working days by different employment categories, discloses a number of interesting differences between village groups. Generally, village group I showed the most diversified employment pattern, with a successive narrowing of the pattern with decreasing accessibility. Self-employed agricultural activities accounted for under 50 per cent of total recorded working time in group I, while the corresponding figures for groups II and III were 64 per cent and 77 per cent respectively. Employment as hired labourers showed the opposite trend. It does seem, therefore, that better access to more populated areas, with more developed and diversified production systems has been affecting the employment patterns. This would certainly explain to a large extent aggregate differences in wage employment levels between village groups as the number of days per year falls off from 180 in group I to about 100 in group II and 30 in group III.

The decrease in non-agricultural wage employment from 93 days per year in group I to about 12 in group III (see table 3.7) is a further indication of the relationship between village accessibility and both the number and diversity of employment opportunities.

Table 3.7 Distribution of working days per household and year by village group and type of employment

Village group	I		II		III		I	II	III
	Days worked	Percent- age of total	Days worked	Percent- age of total	Days worked	Percent- age of total	Standard deviation		
Self-employed farming	163.2	(41.8)	253.4	(64.3)	159.3	(77.5)	174.66	234.06	123.50
Self-employed non-farm activities	47.4	(12.1)	41.6	(10.6)	15.3	(7.5)	134.87	184.42	66.86
Employment as hired agricultural labourers	86.4	(22.1)	70.2	(17.8)	18.5	(9.0)	201.70	157.81	52.00
Employment as non-agricultural labourers	93.3	(23.9)	28.8	(7.3)	12.5	(6.1)	247.22	97.15	60.58
Total	390.4	(100)	394.0	(100)	205.5	(100)	36.95	36.27	15.29



Looking at time spent on self-employed farming, the number of working days per year is considerably higher in group II, than in groups I and III, although the average farm size in group I is about 50 per cent higher than in either of the other groups. This is shown another way below where the number of days performed by all household members per rai is recorded.

Village group	I	II	III
Number of working days per rai per year	5.6	12.1	8.8

The high figures for group II can again be attributed to the labour intensive pineapple cultivation in that area. The differences between groups I and III otherwise support the contention that the input of labour increases with smaller landholdings. This is shown in another way below where the number of working days per rai for different farm sizes are presented regardless of village groups.

Area cultivated per household (rai)	Number of working days per formed by all household members per rai per year
Less than 15	13.7
15 - 30	10.3
More than 15	7.2

The time spent on non-agricultural household activities was about the same for households belonging to groups I and II and slightly less in group III. Among these non-farm activities, charcoal burning was most important.

Summarising the above, there seems to be a clear relation between accessibility and employment. The access to a more diversified and developed labour market for village groups I and II increases the level of employment considerably. Furthermore, it changes the pattern of occupation towards greater emphasis on non-farm work. The self-employed farmers in these groups, on the other hand, utilise fewer household member working days per rai, but compensate this by employing hired labour to a greater extent. Households in village group III show a more traditional occupational pattern with the bulk of employment performed within the framework of the household farm enterprise, with a relatively low degree of participation in outside employment.

### 3.6 Income

Income has been measured at the household level, taking into account income and expenditure in cash as well as in kind. Five different income components have been separated, namely, crop production, husbandry, non-agricultural household activities, wage employment and miscellaneous. This last component includes a number of intermittently occurring items such as remittances, rents and such like that could not conveniently be referred to other categories. On this basis, the average annual net household income (cash and kind) in the sample villages was in the order of Baht 21,000 as shown in Table 3.8.

As indicated, household income varies considerably between village groups, with income in group III less than half the income in group I.

Table 3.8 Household net income and contribution from different sources in Baht and their shares in total net income

Village group Income source	I		II		III		I	II	III
	Baht	in % of total	Baht	in % of total	Baht	in % of total	Standard deviation		
Crop production	18,286	(62.1)	12,891	(56.2)	11,038	(74.3)	32669.16	18159.62	14170.84
Husbandry	2,432	(8.3)	1,038	(4.5)	894	(6.0)	11363.68	4295.23	3352.78
Non-agricultural household activities	611	(2.1)	2,617	(11.4)	342	(2.3)	7557.69	8296.91	1606.32
Wage employment	6,579	(22.3)	3,440	(15.0)	860	(5.8)	13114.38	8260.01	2497.14
Miscellaneous	1,544	(5.2)	2,958	(12.9)	1,718	(11.6)	3987.22	9246.35	4617.61
Total net income	29,452	(100)	22,944	(100)	14,852	(100)	32425.63	23643.75	14357.19
Total net income per household member of economically active age <sup>1/</sup>	5,797		5,087		3,702		6951.90	5744.97	3823.23

<sup>1/</sup> The average number of household members, 11-60 years of age, was in village group I, 5.1; group II, 5.2; and group III, 4.4.

Two main components of household income may be distinguished, namely, income from self-employed farming and other income. The former refers to crop production and husbandry and the latter to non-agricultural household activities, wage employment and miscellaneous. It is to be recalled that the latter component includes some income derived from agriculture such as wages from employment as hired agricultural labourers. In total about 65 per cent of net income derives from self-employed farming. The relatively low share of income from farming for households in village groups I and II is mainly accounted for by the high incomes from wage employment.

For group II in particular, a high average income from non-agricultural household activities boosts the total non-agricultural income level. Another indicator of the importance of non-farm income is the number of landless households. These are 11 per cent of the total number of households in group I and about 5 per cent in group II. The relationship between non-farm income and farm size is shown below. The relations turn out to be rather weak, suggesting perhaps that non-farm income does not necessarily always compensate for low farm income.

Table 3.9 Non-farm income and farm size by village group  
(Farming households)

Village group	Average farm size in rai	Non-farm income in Baht	Non-farm income in total income (%)
I	30	8734	30
II	21	9016	40
III	18	2920	20

Income from non-farm sources was almost the same in groups I and II although there were big differences in farm size between them. Hence the non-farm contribution is relatively more important for group II. Group III had the smallest average farm size and also the smallest contribution from non-farm sources. Here the location of the villages seems to have been a disincentive to household members to taking jobs outside the farm.

Disaggregating farm income in terms of income from husbandry and crop production shows that the importance of husbandry differs only slightly between village groups. In group I, husbandry contributed about 11 per cent of the net farm income while in both village groups II and III it accounted for 7 per cent. Income from crop production is in turn disaggregated in Table 3.10, taking into consideration households cultivating land only. The net income per household and village group then becomes slightly higher than is indicated in table 3.8, as the landless households a lower than average income. But the ranking between groups is still the same with the highest income in group I and the lowest in group III.

Looking at net income per rai, however, the ranking between village groups changes. Income in group I is still the highest but next comes group III. Taking expenditure per rai the ranking again changes. Village group II had the highest operating cost followed by group I, with group III third.

Table 3.10 Household income from crop production in sample villages  
(in Baht)

	Village group		
	I	II	III
Gross income	35,693	25,581	18,365
Cost of cultivation	15,121	11,984	6,591
Net income	20,572	13,597	11,744
Net income as percentage of gross income	57.6	53.2	63.9
Gross income per rai	1,185	1,132	1,007
Total operating cost per rai for crop-production	502	530	362
Net income per rai from crop-production	683	602	645

### 3.7 Summary

Clearly, although the three separate village groups were located in a fairly limited area, a number of important differences emerged in respect of many, if not all, of the selected variables. Village group I, situated nearest the main road, was characterised by the most developed and diversified production pattern of the three studies. 90 per cent of the households were cultivating land, with 34 rai per household on average. Self-employed farming accounted for only about 40 per cent of total working time recorded. Most of the remainder derived from wage employment both in non-farm and farm work. The balance (of some 10 per cent) was made up of employment in household

non-agricultural activities. In terms of total income, village group I clearly emerged with an above average level for the area. Farm production, including husbandry, contributed about 70 per cent of the total income, with a considerable share - 22 per cent - coming from wage employment.

Upland crops such as sugar and tapioca account for the majority of total agricultural production. The little rice that is grown is mainly for home consumption. Farming techniques range from some quite modern methods to essentially traditional techniques. About 55 per cent of the land was tilled using four-wheel tractors while only 12 per cent was ploughed by draft animals. The use of modern farm inputs (fertilizers, pesticides, etc.) was rather low, however, amounting to about Baht 30 per rai on average. To compensate for household members working as hired labourers outside the household enterprise, some households hire labour.

Most of the produce was sold for cash. Only about 10 per cent was set aside for repayment of loans in kind and for home consumption.

Village group II was also characterised by a rather complex production pattern, although not to the same extent as group I. The income per household was significantly less than in group I but much higher than in group III. 60 per cent of the average net income, however, came from household farm operations. 15 per cent was made up of income from wage employment. Non-agricultural household enterprises contributed another 10 per cent on average.

In terms of occupation, the distribution of working time between different activities followed the income shares rather closely, indicating a fairly constant rate of return for the labour factor. But the number of working days spent on farm operations was much higher in this group than in the others. This is related to the fact that about 16 per cent of the land was cultivated with pineapple, which has high requirements of inputs both in working time as well as other farm inputs. Pineapple cultivation contributed subsequently to an above average operating cost per rai although the net income per rai regardless of crop cultivated was comparatively low.

In terms of its share of total cultivated area, paddy was found to be the most important crop, accounting for about 50 per cent of the land, while upland crops were only cultivated on about 10 per cent. The technique for land preparation reflects a more traditional kind of farming carried out in this village group compared with group I. Some 35 per cent of the land - and about 50 per cent in the case of paddy fields - was ploughed by draft animals. Four-wheel tractors were used on 20 per cent of the land. Even the degree of commercialisation indicates a more traditional kind of farming as more than half the yield was directly consumed. The non-agricultural household activities in this village group consisted mainly of charcoal burning.

Village group III finally represented in many respects the most traditional pattern of the three groups, and this coincides with its more remote location.



Self-employed farming was the dominant occupation in this group, accounting for some 77 per cent of total working time per year and contributing in the order of 75 per cent of total household income. The average farm size was around 19 rai. Rented land accounted for only 22 per cent of average area cultivated per household. Almost all rented land was share cropped. Rice was the dominant crop, but upland and other crops were also cultivated. In spite of a low gross income per rai, the net income was close to the average for the area, probably because of the relatively low application of modern farm inputs.

Cultivation techniques were traditional to about the same extent as in group II villages. Draft animals were used on about a third of the land. Two-wheel tractors were operating on about the same area. 63 per cent of the yield was consumed in kind, the biggest share for home consumption, but a considerable part in the form of payment of rents. Household members working outside the family enterprise were mainly employed as hired agricultural labourers.

In this chapter we have discussed the major findings of the benchmark survey. In Chapter 6 we shall attempt to draw some tentative conclusions from these data bearing in mind the hypotheses advanced in Chapter 2.

## Chapter 4

### Distribution of Benefits during the Construction Process

This chapter examines the flow of benefits generated by the rural road investment during the construction process. This involves examining the spending of the investment capital and its distribution among groups of recipients.

The aim has been to include not only the construction process itself but also to take into consideration backward linkages through the supply of intermediate inputs. The justification for this approach is that concentrating on the final step of a production process only, ignores the dynamic and inter-sectoral economic and employment implications of any public investment.<sup>1/</sup>

Two different but interrelated spending patterns have been distinguished. One relates to the distribution between wage earners and capital owners, the other to the geographical distribution of the spending.

Income from capital is an important source of income inequalities and the distribution of the spending between wage earners and capital owners thus is a measure of the redistributive capacity of

---

<sup>1/</sup> Krishnamurty, Indirect Employment Effects of Investment. Bhalla (ed)., Technology and Employment in Industry, ILO, 1975.

the investment. The geographical distribution of the spending has been examined in order to determine how big a portion of the rural investment is filtering back to urban areas generally and Bangkok/Thonburi particularly.

The distribution of investment capital both geographically and between different kinds of wage labourers on one hand and capital owners on the other is regarded as highly dependent on the choice of technology. This is valid as long as there is indeed a choice to produce a given asset/product by means of different factor mixtures, each with specific income distribution implications. The choice of technology is not always based on pure economic considerations but is also affected by institutional and educational factors and so on. In principle, labour-intensive construction leads to a smaller share of the spending going to capital owners, while a capital-intensive technology not only gives a greater part of the investment capital to the capital owners, but also implies reliance on mechanical equipment which most likely has had to be brought in from other places.

The road which forms the base of the study was constructed by a government agency. It was financed through the agency's regular budget, which, like that of most other government agencies in Thailand, has its source in taxation. Thus, the basic income distribution process, generated by the road investment, subsequently takes place between taxpayers on the one hand and recipients such as skilled and unskilled labourers, manufacturers and suppliers of intermediate construction inputs

on the other. Section 4.1 contains some general notes on redistribution consequences of government expenditures in Thailand. In 4.2 the factor prices facing the constructor will be examined and some implications of the accounting practices will be made. The actual choice of technology will then in 4.3 be compared to intermediate or labour-intensive alternatives and in section 4.4 the magnitude of the direct employment creation will be assessed and its income distribution effects will be examined by relating the labourers to different socio-economic strata of the population. Finally in 4.5, the backward linkages from the road construction to sectors of the economy producing construction inputs are examined, with special emphasis being put on estimating the employment effects.

#### 4.1 Redistributive consequences of public expenditures

The magnitude of the redistribution generated by public investment such as that in question here depends on the incidence of taxes and duties for different strata of the population, and the composition of the recipients. However, the tax incidence for different income groups in Thailand is not known and, furthermore, lies outside the scope of this study to assess. Thus, hypothesising on the income redistribution capacity of governmental spending in Thailand has to be based on some general considerations regarding the structure of the Thai fiscal system. This, like that of many developing countries, is characterised by a high degree of indirect taxation. In 1975/76 only about 15 per cent of the total revenue came from direct taxes, (10 per cent from income taxes and 5 per cent from property taxes). The dominant

share - 72 per cent of the total tax revenue - fell on domestic consumption with import duties forming about 30 per cent. Production taxes including export taxes finally accounted to about 11 per cent of the total revenue.

The incidence of consumption taxes depends on two major factors, namely the propensity to consume and the tax rates attached to different consumer goods. The propensity to consume is commonly regarded as falling with increasing income, (i.e. lower income groups consume a greater portion of income than the higher). Presupposing a uniform consumption pattern and homogenous tax level, the tax incidence thus will increase with falling income. This regressive tax effect will, however, be more or less balanced by a system of varying tax rates, whereby the highest are used for imported goods and most basic consumer goods have no tax at all. With a demand for high taxed consumer goods, which is anticipated to increase with income, this tax element has a progressive effect. Other progressive components of the Thai fiscal system are the direct income and property taxes. But both in volume and progressiveness, these are rather limited, hence their combined effect on total revenue is rather small. Production taxes finally may theoretically have both progressive and regressive effects depending on their design.

Whether the progressive components of the Thai fiscal system do in fact fully balance the likely regressiveness of a tax system which is so heavily dependent on consumption taxes cannot be decided on the

basis of such a short review as this. Suffice it to say that other more rigorous studies have concluded that the system is, on the whole, regressive.<sup>1/</sup>

In terms of redistribution between regions, the lack of data again makes it difficult to draw definitive conclusions. Government household expenditure surveys for different years, however, distribute consumption by region and by urban-rural areas in each region. The surveys disclose an above average per capita consumption primarily in Bangkok/Thonburi and secondly in all urban areas taken together regardless of geographical location. Adapting the concept of increasing tax incidence with falling income in the rural/urban context, the rural population can be expected to pay relatively more tax than the urban. However, a factor that may contradict this is the clear differences in consumption pattern between rural and urban households. Rural households according to the expenditure surveys tend to consume more basic commodities with low tax content than urban households of the same income level, which further decreases the rural tax incidence compared with the urban.

Taxes that affect rural areas more significantly are some export duties on agricultural commodities, particularly on rice. The tax is in principle the difference between the domestic and the world

---

<sup>1/</sup> See Jay Asklin. Tax Progressivity in Thailand, Bangkok, Thammasat University, Faculty of Economics, Discussion Paper Series No. 24, and G.A. Marzouk, Economic Development and Policies, Case Study of Thailand, Rotterdam University Press, 1972, Chapter 14.

market price of certain products, which implies that the farmers producing these products contribute indirectly to the Treasury in a way that increases their real tax incidence compared to nonfarming households.

However, whether these taxes will lead to an overall higher tax incidence in rural areas can be determined only after a more thorough analysis which it is beyond the reach of this study to do. But taking into consideration the importance of income in kind and the differences in consumption patterns between urban and rural areas, a plausible assumption about rural/urban differences in tax incidence can be established implying that the tax incidence of urban households probably exceeds that of rural. This leads forward to the hypothesis that the main income redistribution potential of a public rural investment, irrespective of the way the investment capital is distributed, lies in urban/rural redistribution.

Whether the urban/rural redistribution actually will take place and, secondly, whether the public spending will give rise even to a redistribution between income groups depends heavily on the way the investment capital is actually spent.

#### 4.2 Notes on construction cost

The rural road which was the focus for the study was built by the Royal Irrigation Department (RID), was financed through its regular budget and formed part of a larger programme of feeder road construction in the Petchburi river basin. The total length of the

road now constructed is about 22 km. but this will later be extended by another 18 km. The road has been constructed for the dual purpose of facilitating the maintenance of the irrigation canal on whose bank it is built and improving transportation possibilities.

According to official accounts, the total cost of the 22 km. road amounts to around Bht. 9.2 million, implying just under Bht. 420,000 per kilometer. A breakdown of the construction budget is made in Table 4.1. The official budget, however, does not reflect real total construction costs. The main reason for this is that, because of accounting practices, the cost of equipment used in the construction was based on service and operation expenditures only, where the former includes expenditures on fuel, oil and the like and the latter spare parts and such like. Such costs as the amortisation of RID equipment were not taken into consideration.

Table 4.1 Construction budget

	<u>Million Baht</u>	<u>Percent</u>
Labour cost <sup>a/</sup>	2.8	30.4
Construction material	3.3	35.9
Spare parts, fuel, tools, etc.	2.7	29.3
Administrative overhead cost	0.4 <sup>a/</sup>	4.3
Total	9.2	99.9

<sup>a/</sup> including overtime.



This system leads to underestimating the cost of equipment, which must surely bias the choice of technology towards more capital-intensive techniques.

An alternative way of calculating the cost of heavy equipment is to use the notion of an hourly rental rate. This has been defined by McCleary as the hourly sum which compensates for the cost of owning and operating each piece of equipment over its lifetime.<sup>1/</sup> McCleary calculated in his Thai study rental rates for a wide range of construction equipment in Thailand. The equipment used in the present road construction, however, does not correspond item for item but, based on horse-power and capacity measures, it has been possible to apply these rates to the fleet of equipment, which gives a cost of equipment in the order of Bht. 4.5 million as opposed to the Bht. 2.7 million in the official budget. The difference is thus about 1.8 million baht giving a total construction cost of 11 million baht, an increase of about 20 per cent.<sup>2/</sup>

---

<sup>1/</sup> McCleary, Equipment versus Employment, ILO, 1975.

<sup>2/</sup> McCleary calculated rental rates on basis of the 1973 price level after the increase in oil prices. The present construction started in the middle of 1976. Since 1973 the wholesale prices of vehicles and petroleum products had gone up some 15 and 5 per cent respectively. This will of course affect the rental rate and in consequence, the total construction cost of the road, but in the absence of more appropriate data, it is probably justified to use McCleary's figures.

The second budget item, and one which must be carefully considered because of its employment implications, is the actual cost of labour. Wage rates for different categories of labour working at the construction site are indicated below in Table 4.2.

Table 4.2 Wage rates for different categories of labour

	<u>Baht per day</u>	<u>Baht per hour</u>
Unskilled labourers	30.75	4.39
Operators	43 - 62	6 - 9
Foremen	48 - 84	7 - 12

Including payment for overtime (calculated on basis of a rate of one day's normal payment per three hours overtime), average daily earning amounted to about Bht. 60. Whether the wage rates are a true reflection of supply and demand or are institutionally determined is difficult to say. But these rates are certainly higher than the legal minimum rate (Bht. 20 per day) applicable to non-agricultural wage employment in the region. For agricultural labourers no minimum wage legislation is in force and the daily income, in cash and kind is most likely a bit further below the minimum wage of non-farm workers. The benchmark survey indicated a wage rate of about Bht. 16 per labourer, which is almost half that of the unskilled labourers working on the road.

However, these great differences in wage rates between construction and other kinds of wage employment (for which the required skill can be regarded as about the same) do not necessarily indicate that the wage rates are not market-determined. There are a number of factors which restrict the supply of labour and contribute to a segmentation of the local labour market. As the main economic activity in the area is household farming, a factor that restricts the supply of unskilled labourers is the degree of seasonality in farming. This in turn depends on the cropping pattern. Of the crops in the area, rice has the most distinctive season with peaks in July-August for planting and January for harvesting. Other crops have different cycles which spread the peaks more evenly over the year. That the peak construction season coincides with the busy rice planting season is a factor that must affect the supply of labour. Another factor which generally restricts agricultural labourers from taking up non-farming wage employment is the set of more or less visible costs connected to the employment such as cost of food, transport, accommodation, etc., and the unmeasurable cost of working outside the household enterprise.

Finally, the labour force engaged in construction is generally categorised as skilled or unskilled labourers. Skilled labourers - forming only a small fraction of the total labour force - include machine operators, foremen, etc. All others are in the unskilled category, which, however, is not as homogeneous as sometimes may be assumed. Among the "unskilled" there are workers with great variation in experience

which probably affects their productivity and thus attractiveness on the labour market. This means that when demand for construction workers is static or increases only slowly, the labourers tend to be recruited from a "pool" of those people, who have acquired a certain amount of skill in previous employment. These workers tend to form a rather closed group where the condition for access is kinship.

Summarising the above there are obviously great differences in wage levels between different types of wage employment and for those labourers whose alternative to a construction job is wage employment in agriculture, the change in income must be considerable. But on the other hand, access is not completely free. This in turn will affect the supply of unskilled labourers and makes it difficult to say whether the wages are market-determined or not.

#### 4.3 Immediate employment consequences

The immediate employment generated by the investment is defined as that relating to the labour force directly engaged in the construction of the road. Neither labourers employed by contractors and engaged in transporting construction material and supplies to the site, nor the administrative staff working with the project have been included. The former will be taken into consideration in the next section. The latter have been ignored mainly because it was difficult to distinguish the time they spent on the road in question from others that they were working on at the same time. The purpose of the following analysis is to assess the socio-economic status of the labour force

in order to determine in which way the investment capital is distributed among recipients - here labourers. The information regarding the labourers was obtained from a labour survey, carried out at intervals during July-August 1976, in which the major stress was put on assessing the household status, occupational background, location of residence, etc. of the labourers themselves and their households.

As mentioned, labour costs amounted to Bht. 2.8 million - about 30 per cent of the total expenditures on the road. This generated about 35,000 working days. Calculated on a yearly basis and thus assuming each labourer is working 250 days a year, the direct employment creation was about 140 man-years. Based on the real cost of the road, each man-year required an investment of about Bht. 80,000.

The average working day, of which 7 hours were ordinary working hours, turned out not to fall below 10 hours. Using less overtime could theoretically have increased the labour force by up to 30 per cent.

Some 90 per cent of the labourers were recruited strictly locally from the area around the construction site, limited by the two Amphurs Tay-yang and Cha-am. 25 per cent of the workers were female, a comparatively low figure for Thailand, where construction work traditionally attracts numerous female unskilled workers.

The number of labourers actually employed varied considerably over the construction period. At its start in October 1975 about 50 labourers were engaged and as the construction went on the labour force

was successively expanded reaching a peak in April-August 1976 when just over 200 labourers were engaged simultaneously. Construction was completed in September 1976. On average about 100 labourers were engaged full time and in total about 230 were involved in the construction for shorter or longer periods.

Within the skilled-unskilled categories, there were two other groups of labourers - permanent government employees and casual workers. Government employees have a high degree of job security and can be dismissed only under unusual conditions. This group comprised the foreman, most skilled workers such as machine operators and some unskilled labourers. The second group - casual workers - can in turn be separated into two groups, one consisting of workers who had already been working with the project for a number of years on a short-term basis yet more or less continuously but who still had not attained the status of permanent labourers. These semi-permanent workers were relatively experienced in construction work and most of them anticipated further employment in other projects. The other group consisted of labourers employed on a real short term basis. It is this latter group which constituted the incremental employment generated by the investment. According to Table 4., which separates the permanent and semi-permanent labourers from the temporary, the latter group accounted for around 9,500 working days - about one-third of the total number of days worked. Their average working period was just over 3 months per person.

Table 4.3 Labour force by employment status

Employment status	No. of labourers engaged	No. of working days performed
Permanently and semi-permanently employed	130	25,500
Temporarily employed	100	9,500
Total	230	25,500

When determining the socio-economic status of the labourers, there are compelling reasons to consider the permanent workers separately from the semi-permanent and temporary ones. The permanent labourers are professional construction workers who have given up farming as a main activity years ago, although most of them still belong to self-employed farming households. The great majority of these labourers were male and heads of households, thus implying that family farming was carried out by the other household members.

Their yearly income from full time employment as an unskilled labourer is about Bht. 13,000, which constitutes a rather high rural per capita income. Taking into consideration their income from farming - which may be estimated on basis of the net income per rai given by the benchmark survey - Bht. 654 - the total average household income of those with any land added up to slightly above Bht. 20,000 per year.

This indicates a near average yearly household income, which in the benchmark survey was about Bht. 21,500. The permanent labourers

belonging to non-farming households had a much lower total household income - just about Bht. 13,000.

Semi-permanent and temporary labourers represented about 70 per cent of the total labour force and about 50 per cent of the total number of working days performed. Although there are reasons to assume that the two groups of labourers differed in a number of respects, it was not possible to separate them in the labour survey, and they are grouped together in the subsequent discussion.

In all, this group consisted of about 150 labourers of which 100 were really temporary, with an employment period of about 3 months during the peak construction period from April/May to August. The semi-permanent labourers worked for this project for about 6 months on average, generally being transferred from other projects in the same feeder road programme. The occupational background of all labourers in this category, semi-permanent and temporary, is shown in Table 4.4. The criteria for ranking between occupations was the size of the annual income it generated. The ranking was made by the labourer himself. Almost 50 per cent of the labourers regarded wage employment in construction as their main occupation. This group included not only the semi-permanent workers but also a large share of the temporary workers. Less than 40 per cent regarded farming - either as family workers or wage labourers - as their main activity.



Table 4.4 Main occupation of labourers and the labourers' household  
(in percentage share of total income)

Kind of occupation	Main occupation of the labourer	Main occupation of the labourers' household
1. Self-employed farming	26	52
2. Wage employment in agriculture	13	8
3. Wage employment in construction business	47	29
4. Wage employment in other kind of non-agricultural activities	12	7
5. Self-employed in non-agricultural activities	2	4
Total	100	100

The working patterns of the labourers were rather static, at least judging by information on previous jobs and on their expectations for the future. 40 per cent of the workers were transferred to the road in question straight from other short-term construction work, while 33 per cent come from self-employed farming activities and the rest from other kinds of wage employment. Future plans were generally vague with about 23 per cent of the labourers saying they were unsure what to do. But still 17 per cent expected to go on in the construction business, with more short-term employment. 43 per cent regarded self-employed farming as a likely employment alternative when the present construction was finished.

Turning to the labourers' households, the occupational pattern was more fundamentally agrarian. About 50 per cent were regarded as self-employed farming households and another 8 per cent had wage employment in agriculture as main occupation.

The income pattern of the semi permanent and temporary labourers' households is indicated in Table 4.5.

Table 4.5 Yearly income from wage employment, farm size, number of earners of various categories of temporary labourers' households

Category of households	Average yearly income from wage employ.	Share of total income (%)	Nr. of wage earners	Percentage of non-farming households	Average farm size (rai) for households with land
1. All households	14,430	-	1.9	38	15.2
2. Farming households	14,240	-	2.0	-	18.2
3. Construction workers' households	15,510	-	1.7	75	1.0
4. Other non-farming households	13,350	-	1.8	68	1.8
5. Bottom 40%	6,300	17.7	1.5	31	17.2
6. Middle 40%	14,000	39.1	1.7	40	14.4
7. Top 20%	31,700	43.3	3.0	27	12.5

The average yearly income from wage employment of the labourers' households, which engaged on average two members per household for a longer or shorter time period, amounted to about Bht. 14,400. As many as 38 per cent of the households did not cultivate land at all, a surprisingly high figure compared to the 6 per cent given by the benchmark survey. About 11 per cent represented small-holders with an average of 5 rai to cultivate. Most of these households had members more or less fully engaged in construction but some considered wage employment in agriculture as their main activity. The total income of the landless households, regardless of main activity, amounted to about Bht. 15,700 which certainly was below the average of the benchmark survey, but still high enough to indicate that the demand for wage labourers is sufficient to give many rural households a reasonable living standard. However, the income of landless households did not seem to come up to the level of most farming households whatever their main activity may be, when taking into account the income from farming. The average wage income of basically farming households was 14,200. Estimating again the farm income on the basis of the net return per rai given by the benchmark survey - Bht. 654 - the income from cultivating an average 18 rai will push the total income of the households with land to cultivate to some Bht. 26,000, which in turn is above the average of the benchmark survey.

The income of households which regarded short time wage employment in construction as their main activity was about Bht. 15,500, clearly below the average income of self-employed farming households. For the

other non-farming households, average annual income amounted to Bht. 13,350, clearly below the average of the sample. Most of them - 68 per cent - were landless and the rest cultivated on average not more than about 2 rai. 25 per cent of the total labour force belonged to this group.

Although the occupational backgrounds of the temporary labourers' households were rather mixed, the income from wage employment was fairly equally distributed, as shown by a concentration ratio of 0.37. The income distribution measures of Table 4.4 show that the inequalities, to a great extent, could be referred to the **extremities** of the distribution as the bottom 40 per cent of the households got 18 per cent and the top 20 per cent of the households got more than 40 per cent of the total income. The middle 40 per cent almost received its exact share of income. The data furthermore indicate that the average farm size of households with cultivated land was falling with increasing income from wage employment. In other words, low land holding tends somewhat to be compensated by more wage employment. This in turn should indicate that for farming households, income distribution may turn out to be more equal when considering also the income from non-farming.

For the total sample there are other reasons to assume that the main income inequalities may be explained by the access to land. The category with the lowest income consisted mainly of landless households engaged in agriculture. Also, those landless households reporting construction work as their main income source mostly fall clearly below

the average household income of the sample. As farm income was not covered by the survey of labourers it is not possible to quantify the effects of land on income distribution, except by broad imputations.

Summarising the above, the direct employment effects of the road construction were calculated to be about 35,000 working days, distributed among about 230 labourers. The bulk of working days were performed by more or less professional construction workers who had been working in construction for a number of years. Nevertheless, the road project did attract some 100 temporary unskilled labourers for an average working period of about 3 months per person. About half of the individual labourers regarded wage employment in construction as their main occupation while the rest was divided between self-employed farming and other kinds of wage employment. The occupational background of the labourers' households was more agrarian with a clear majority considering self-employed farming as their main activity, but still almost 30 per cent considered construction work as the principal household activity. In spite of the dominance of farming, the labourers' households from an occupational point of view seemed to represent a rather atypical sample of rural households. Self-employed farming households were clearly under-represented. The benchmark survey indicated only about 6 per cent of households with no cultivated land against 38 per cent in the labour sample. Furthermore, over 40 per cent regarded other occupations than self-employed farming as their main income source although some of these were cultivating small pieces of land.

The importance of wage employment in the sample implies that there is a constant demand for non-agricultural labour in the area, especially for construction. This in turn seems to have generated a new rural class of households more dependent on wage employment although self-employed farming for many of them still seems to be the economic backbone. The household members are divided between farming and different kinds of wage employment. It is, of course, not very unusual among small and medium size farming households to look for non-agricultural occupations during slack seasons in order to boost farm income. For a great part of this group of households, however, wage employment tends to dominate. Furthermore, there seems to be a more articulated specialisation between household members. Whether this pattern is a consequence of shortage of land or whether household members have switched from farming to non-farming activities for other reasons cannot easily be determined on the basis of the present data. The fact that a quarter of the labourers of self-employed farming households reported that they had to be replaced in the household business, makes it plausible to assume that the higher income from non-farm wage occupations - which generally are under minimum wage legislation - has been a significant factor in diversifying occupational patterns.

#### 4.4 Indirect effects of the road construction

Of the total cost of the road construction, expenditures on construction material, spare parts, fuel, etc. accounted to about

Bht. 6 million, just over 65 per cent of the total construction budget. The inputs represented a huge number of disparate items ranging from imported spare parts and domestically produced steel bars, cement and such like to locally manufactured baskets, wipers, etc., and more or less unprocessed material such as laterite, sand, stone and wood. The methods of producing these inputs ranged from highly capital-intensive techniques (steel bars and cement) to traditional labour-based techniques used by village craftsmen.

The purpose of the following is to determine broadly the links between the road construction scheme itself and sectors providing intermediate inputs and to examine the labour requirements of producing and delivering those inputs. The sectors providing inputs into the construction process have been distinguished by their technological base and geographical location. This was felt to be interesting as it represents a microcosm (albeit imperfect) of the much-talked of distinction between the traditional and modern sectors of an economy such as that of Thailand. Indeed, this case presented an opportunity to assess to what extent the investment capital of the rural investment is diverted from the immediate rural to urban areas. The labour requirements of producing and delivering inputs for the scheme in question finally will be examined by geographical location.

As noted earlier in this chapter, the road was built using generally (and typically for Thailand) capital-intensive techniques.

But this is rather too crude a label for the purposes of this study, implying as it does a preponderance of imported equipment and a low level of employment generation. More interesting is to look at the key inputs in order to find out what proportion is locally produced, hence what 'hidden' or indirect employment is supported or generated. Beyond this, a supplementary question is to what extent such indirect employment benefits urban areas, given that Thai industry and commercial activities are heavily concentrated in the larger towns in general and in Bangkok/Thonburi in particular. It must be remembered, however, (see Table 4.1) that although construction material constituted the largest single item in the (RID) budget, much of this comprised such items as sand, laterite, wood and so on - items which are inevitably rural in origin and which may generate significant rural employment. In assessing the geographical origin of the construction inputs, three areas have been distinguished. The first is rural areas with associated commercial centres, often the site of the amphur administration. The second covers urban areas outside Bangkok/Thonburi and the third Bangkok/Thonburi itself.

Apart from fuel, oil and lubricants (which were delivered through a state-owned distribution company) and some specific parts supplied by general agencies of certain foreign manufactures, parts and construction material were bought from ordinary shops in the region. In terms of value, shops located in rural areas delivered about 40 per cent of all construction materials used. Another 42 per cent were bought



from the local urban centre of Petchaburi, located some 20 km. from the construction site, and the remaining 18 per cent came directly from Bangkok/Thonburi.

The local rural suppliers represented a rather traditional type of small scale family based shopkeeping. In all, 12 different shops were used. The labour force, mainly consisting of household members and other relatives amounted about 5 per shop on average. The project was in most cases the single biggest customer and the value of sales to the project represented in many cases a considerable share of the total yearly turnover. This share seems to have been fairly stable over the last years, as the RID road programme as a whole is completing roads to a certain length each year and seems to return to the same shops.

The other suppliers, located in Petchaburi and Bangkok, represented more varying enterprises such as general agencies, big contractors and a state-owned distribution company. The volume of business involved here was considerably more and sales to the project thus only represented a very small share of the total turnover of these larger agencies.

Tracing the construction inputs one step beyond the retail stage to the production and wholesale level respectively, inputs produced in rural areas accounted for as much as 50 per cent of total expenditure on materials. The main items were laterite, sand, aggregate,

cement, and wood. A major part came from the immediate vicinity of the construction site. Apart from a few per cent, the remaining inputs, consisting mainly of fuel, lubricants, parts, and tools came from the Bangkok/Thonburi area.

The imported items required in the construction process consisted of heavy equipment, spare parts, some tools, etc. Petroleum products, including all lubricants and about 40 per cent of the diesel consumption were also imported. Some other items were domestically manufactured but at the same time were more or less dependent on imported raw material, i.e. iron scrap or iron ore for steel bars, etc. Finally, most of the machinery used for extracting or making the various locally-supplied materials was also of foreign origin. In total, the value of imported goods and materials directly used in the construction amounted to about Bht. 1 million. The import bill itself roughly accounted for about 50 per cent of this value, the rest going in taxes, duties, marketing and distribution costs, profits and so on.

Cement, steel bars and diesel fuel - accounting for about 15 per cent of total expenditure on materials, parts etc. - are produced in a few big technically sophisticated capital-intensive industries. Semi-processed material such as wood and aggregate, accounting for another 8 per cent, are produced in a large number of saw mills and crushing mills all over the country. The production technique varies considerably but generally the primary processes tend to be mechanised, though materials handling is more labour-intensive.

Laterite and sand, accounting for more than 30 per cent of the expenditure on material, are used in the road construction as excavated. Even so, the excavation and loading operations are highly mechanical. Most sand comes from the rivers and is usually dredged from the bottom. Laterite is abundant in hilly areas in many parts and is excavated and loaded on trucks by means of different kinds of front loaders. For the road under study the sand was sucked from a river nearby, loaded on barges and brought to the river bank where it was unloaded by means of a system of conveyor belts to a steel hopper from which the trucks were automatically loaded. The site of the laterite was some 10 km. from one end of the road. The laterite was simply scraped from the ground and loaded on trucks by means of a front loader. In both cases the production must be regarded as highly mechanised.

For an insignificant number of items such as baskets, containers, brooms, etc., the production was mainly carried out by local craftsmen. The value of these items, however, was very small.

The inescapable conclusion is thus that backward linkages from the construction were strongest with either a few technically sophisticated industries (cement, steel bars, etc.) or with rather mechanised although decentralised production units supplying semi-and unprocessed material. The links to industries involving more traditional techniques were negligible.

The labour requirements of producing and delivering construction materials used in the road construction are shown in Table 4.6.

The sources are mainly interviews with representatives of companies actually engaged in supplying materials to the road combined with official statistical data. Taken into consideration is the labour force engaged in production, marketing and transportation of material, parts and tools in Thailand. Excluded is the labour force engaged in producing intermediate inputs and government officials occupied in customs clearance and so on.

Table 4.6 Labour requirements in producing and transporting construction material

<u>Item</u>	<u>Number of working days</u>
Laterite, sand, etc.	1,500
Wood, stone, etc.	200
Concrete, steel bars	50
Petroleum products <sup>1/</sup>	50
Marketing, selling, etc.	500
Total	2,300

<sup>1/</sup> Refers to domestic production and delivering.

Bearing these restrictions in mind, the labour requirement of producing inputs used in the road construction was assessed to be about 2,300 days. Looking at the different inputs, the biggest employment requirement was for the sand and laterite, creating about 1500 working days, the absolute majority going in transportation. Excavating laterite, for instance, only engaged one machine for a 4-week period. The production and delivery of semi-processed material such as stone and wood required another 200 working days, again a substantial part involving transport operations. The employment implications of the processed construction material such as steel bars and cement were rather limited. Under 20 man-days were needed for producing the required quantities and another 30 man-days for transportation. Marketing and selling finally engaged another 500 man-days.

Thus, in aggregate terms, materials handling and transportation accounted for the lion's share of indirect employment. The main reason for this is that unloading is generally carried out in a rather labour-intensive way. Observations on the construction site revealed that the average time for unloading a 10-wheel truck loaded with laterite was 30 minutes for a crew of 5 labourers.

The bulk of employment - about 70 per cent - could be traced to rural areas, in this case, limited to a relatively narrow area around the construction site, while the rest was generated in urban areas, mainly Bangkok/Thonburi. For rural employment, the production of sand, laterite,

stone, wood and so on was carried out by full-time workers, although some of them were laid off during the rainy season. Because of the high degree of mechanisation, labour requirements were small. Transportation including loading and unloading generally attracts numerous short-term unskilled labourers. About 50 labourers were, for instance, engaged in transporting laterite to the construction site over a four-week period. A survey carried out on this labour force indicated, that all these labourers came either from self-employed farming or agricultural labourers' households. The average farm size of these farming households was about 12 rai, and the average annual income from wage employment amounted to just under Bht. 7,000. For the 26 per cent non-farming households, the income from wage employment amounted to about Bht.10,000. Apparently, these labourers' households in terms of income and access to land not only fall below the average of the area as it is reflected in the benchmark survey - but also below the average of the temporary workers attached to the road construction itself. Also, the daily wage of the transportation labourers was lower - Bht. 20 compared to the Bht. 30 paid to the construction workers. Although both groups of labourers came from the same limited geographical area, these differences between them suggest a rather segmented labour market. The working of such segmentation and, indeed, its content, cannot however be determined without further studies. The rest of the indirectly engaged labourers were generally more skilled, working in process industries, and in the marketing and retailing business.

#### 4.5 Summary

The total cost of the 22 km. rural road amounted to Bht. 9.2 million according to official accounts, giving a cost per km. of just under Bht. 420,000. Taking into consideration the amortisation of the heavy equipment engaged in the construction by means of market rental rates increases the total cost to about Bht. 11 million and the cost per km. to about Bht. 500,000.

The construction technique used is clearly highly capital-intensive. Apart from different kinds of trucks for the delivery of construction material, heavy equipment such as loaders, scrapers and graders were used for a total of more than 3,000 hours. The bulk of the labour force was actually engaged in constructing the three bridges which were part of the scheme.

Using the official cost of the road as a point of departure, the expenditures on labour, including allowance for overtime, amounted to Bht. 2.8 million - about 30 per cent of the total cost. More than 200 labourers were engaged for shorter or longer periods making some 35,000 man-days. The labour requirements for producing, marketing and delivering construction materials parts, tools, fuel, etc. needed in the construction accounted for another 2,300 man-days, pushing the total employment generated by the construction to about 37,000 man-days, out of which only around 5 per cent involved producing material, etc.

About 10 per cent of the labour force was employed by the project on a permanent basis. The rest were either semi-permanent or casual labourers. Some from farming households had been continuously working with the project for years (though still on a short-term basis), and were thus rather experienced in construction. About 50 per cent of the casual labourers regarded wage employment in construction as their main activity. Another 25 per cent mentioned self-employed farming as their main source of income. The main activity of the labourers' households was more agrarian with more than 50 per cent of households regarding self-employed farming as main activity with an average farm size of 15 rai, a little below the average for the area.

The average wage income of the labourers' households was Bht. 14,000 with a relatively equal distribution, indicated by a concentration ratio of 0.37. Households with farming as main occupation had a wage income close to the average income, with construction workers' households somewhat above average and other wage labourers' households below average. All this gives added weight to the contention that land ownership is the key factor in rural income distribution.

The labourers engaged in production, marketing and delivering material, etc. for the project showed marked disparities in terms of employment status, skill and geographical origin. A large part of the indirect employment was generated in the neighbourhood of the construction site, particularly through the delivery of laterite and sand.



These labourers, who worked on a casual basis, all came from small-scale farming households. From a household income point of view, these households clearly must be placed below the construction workers households. This implies a segmentation of the rural labour market in the area. The better paid construction workers were also members of better off households, while the lower paid transportation jobs attracted members of already low income households. Other indirectly engaged labourers were professional workers in saw-mills and stone quarries, skilled labourers in modern process industries, employees in retail and import business and such like. Geographically, 95 per cent of the direct and indirect employment in terms of man-days was spent in rural areas mainly by labourers coming from the two amphurs linked by the road, the rest being performed by employees in the Bangkok/Thonburi area. Out of the initial investment of Bht. 9.2 million, about 60 per cent remained in the immediate rural area while the rest went back to urban areas.

## Chapter 5

### The Follow-Up Survey

About six months after the completion of the road, another survey was carried out to examine the immediate effects - on the transport and personal travelling patterns - of households in the area. The survey was again on a random sample basis and included the same villages covered in the original benchmark survey. The sample size was, however, only half that of the original survey and while most households covered were the same, some other households from other villages in the immediate proximity of the road were included. This latter group, comprising 25 households is referred to as Village group IV.

In all, the sample consisted of 77 households, all of which with easy access to the new road, though some were also close to other good roads. The six months since the opening of the road had coincided with the dry season. This probably affected the utilisation of the new road as a number of dry season earth roads, which pass through the area starting from the highway, have been trafficable most of the time. As the new road runs more or less parallel to the highway, it has not been necessary for the households to go all the way to the end, but only from the village or the field along the new road as far as one of these earth roads leading straight to the highway. This explains how it is that the average distance the new road is being used does not exceed 2.5 kms., although the total length of the road is about 22 kms.

Nevertheless, since the road was completed all but one of the sample households, have used the road for one or more purposes. In Table 5.1 the use of the road is broken down by purpose and village group. Not surprisingly, the proportion of households using the road for different purposes, generally increases when moving from village group I to IV. In village group IV, which consists of households located just along the road only, an average 60 per cent of the households are using the road for the different purposes. In village group I the corresponding figure is less than 50 per cent. The degree of utilisation, however, varies with purpose within the village groups. Apart from "seeing friends", which is important in all areas, in village group I the road is used for transporting produce and going to work outside the household enterprise. In village group II shopping and marketing is most important. In village group III a big proportion of households are using the road when going to the market and when going to the fields too. In village group IV transporting produce becomes very important.

The frequency of using the road varies with the purpose. Shopping trips and going to the fields generally take place several times a week while going to work outside the household enterprise and to visit relatives are less frequent. Transporting produce finally takes place fairly irregularly.

As already mentioned, the average distance over which the road was used per trip did not exceed 2.5 kms. Subsumed within this

Table 5.1 Percentage of households using the road for different purposes and distances

Village group Purpose of using the road	I		II		III		IV	
	House- holds (%)	Distance (kms)	House- holds (%)	Distance (kms)	House- holds (%)	Distance (kms)	House- holds (%)	Distance (kms)
Going shopping/marketing	15	1.0	65	3.1	68	3.1	22	2.2
Going to work outside the household enterprise	62	3.7	59	3.1	36	1.8	68	1.3
Going to the fields	15	1.0	41	1.6	72	0.8	36	1.6
Transporting produce	69	6.1	29	1.0	68	1.4	80	2.6
Seeing friends, relatives	77	2.3	71	2.5	68	2.0	96	2.4
Average	48	3.6 <sup>1</sup>	53	2.6 <sup>1</sup>	62	1.6 <sup>1</sup>	60	2.1 <sup>1</sup>

<sup>1</sup>Weighted average

average figure, however, are some interesting between - and within-village differences which are borne out in Table 5.1. The between-village differences can be seen horizontally. The distances at the bottom of the table are weighted averages, where the proportion of households using the road for each purpose is the weight. The figures thus do not take into consideration the fact that the frequency of travelling varies with purpose.

The average distance, regardless of purpose, decreases steadily when moving from village group I to IV. The households in village group I, which already had good road connections, turn out to use the road for an average distance of 3.6 km., while those of group III, which was considered the most remote one, is using the road only for 1.6 km. in average. This somewhat unexpected result of the survey can be explained by the fact that the households, of village group III, through the new road, were given a shortcut to a hard surface road at a distance of about 2 km. from the villages, with easy access to the highway (see map).

Although the new road is mainly used for only short distances, the households generally report substantial time saving compared to the earlier situation. This is borne out in Table 5.2, showing that in Village groups I to III, 80 to 90 per cent of all travelling and transportation is reported to take a shorter time when using the new road.

Differences between purpose of using the road and village group are marked and furthermore somewhat contradictory. Generally, however,

Table 5.2 Percentage of households using the road and reporting time saving

Purpose of using the road \ Village group	I	II	III	IV
Going shopping	100	82	80	75
Going to work outside the household enterprise	50	90	75	65
Going to the fields	50	71	69	78
Transportation produce	78	100	67	75
Seeing friends, relatives	100	68	100	92

the incidence of saving time is higher when going shopping and visiting friends and relatives than for other alternatives, but even here the picture is not completely clear.

Table 5.3 indicates percentage of households reporting increased mobility since the new road has been used. In spite of the fact that the survey covered only the dry season, many households seem to have responded to the new road by an increased frequency of trips. Generally, village group IV (consisting of households along the new road but outside the previously selected villages) and village group III have generally responded most consistently regardless of purpose. For village

Table 5.3 Percentage of households reporting increased mobility after the opening of the road

Purpose of using the road	Village group			
	I	II	III	IV
Going shopping	15	53	46	64
Going to work outside the household enterprise	54	29	23	40
Going to the fields	8	12	32	48
Transporting produce	54	6	36	32
Seeing friends, relatives	46	53	36	72

groups I and II the pattern is mixed. In group I a majority of households indicated more frequent transportation of produce and travelling to find jobs outside the household, and in village group II a majority of households have responded to the road by more frequently going shopping and visiting friends while for most of households their more commercial activities have not changed.

The survey also measured the increase in activities by officials and commercial dealers. A number of categories of officials and traders were identified but only in a few cases had the households noticed any changes in number of visits. These are indicated in Table 5.4. The flow of government officials and traders in agricultural inputs

such as fertilizers, tractors, etc. was at the same level as before. The limited response by the latter categories of merchants may be explained by the fact that the survey covered the harvesting season for important crops when chemical applicants and tractors are being used only to a small extent and on less important crops.

Table 5.4 Percentage of households reporting increased number of visits by traders, salesmen, etc.

Village group Category	I	II	III	IV
Traders of durable consumer goods	23	53	77	36
Merchants selling foodstuff	46	94	82	96
Merchants purchasing household produce	69	77	59	80

Of those traders who have apparently increased their activity in the area (according to Table 5.4), merchants purchasing household produce have had most significance for the households as between 60-80 per cent claim an increased number of visits. Merchants selling foodstuff have stepped up their business in village groups I to III according to a majority of households, while the impact of traders of durable consumer goods such as TV, radios, etc. is less substantial.



In addition to the above, a number of questions were asked concerning the future plans of the household enterprises. The purpose was to compare these plans with the present performance and try to identify changes which might be attributable to the new road. However, although a number of households disclosed plans to change their cropping pattern and the application of different kinds of farm inputs, the survey failed to yield consistent results. The only item to which the households responded significantly was the use of labour. Whatever the changes in production pattern during the coming agricultural year might be, a great number of households believed they required more labour in the future and that the increased demand has to be satisfied mainly through the increased use of hired labour. In village groups I, II and IV about 70 per cent of the households expect an increased future demand for labour in the household enterprise while the corresponding figure for village group III is just over 30 per cent.

Summarising the immediate effects of the road, it must be stressed again that the survey covered only a 6-month period coinciding with the dry season. A more complete study must necessarily cover a full year's cycle. During the dry season a number of small earth roads and tracks are in any case motorable and this must have contributed to the fact that the new road was being used over rather short distances - about 3 kms. - although the full length of road was about 22 kms. In any

event the response to the road has been favourable. It is true that no public transportation had started within 6 months but a number of households nevertheless report increased travelling and transportation activities since the road opened and in a majority of cases the households now save time compared to before. Many households furthermore were convinced the new road will increase the exchange of labour with other areas. About 40 per cent of the households thought that the new road will facilitate the possibilities for villagers to find jobs outside the village. Of people coming into the villages, only some commercial dealers have so far responded with an increased number of visits.

As far as household production is concerned, the survey failed to pick up any significant changes. The time since the road had been opened for traffic was too short to allow changes in cropping patterns and application of productive inputs to materialise. The short-term effects such as they were seem to have been biggest for village group I but, on the other hand, it is village group III whose access to a major road has been improved most significantly, implying that the long-term effects will benefit their village group more than the others.

## Chapter 6

### Conclusions

The purpose of the present study is the examination of the income distribution and employment effects of a rural road construction project in Thailand, i.e. an identification of income groups which benefit directly or indirectly from the road being constructed.

Access to appropriate village-to-market roads is generally regarded as a prerequisite for the development of any area. It seems reasonable to assume that villages at increasing distances from all-weather roads show a decreasing degree of development indicated by less modernisation, less commercialised farming and limited access to non-farm employment, which in turn lead to lower incomes. The development effects of a road linking villages of different degrees of remoteness will thus never be assumed to be equally distributed in the whole area of influence of the road but will increase with the distance from existing all-weather roads.

The benefit of a road is expected to appear not only as time-savings when transporting produce, but also in terms of improved market access which might affect the level of production. These forces will be stronger the more remote places the road is going through and the basic hypothesis of the study thus holds that a rural road in an area with

a poorly developed road network will positively contribute to a more equal income distribution in the whole area of its influence. On the other hand, there is in general no reason to assume that a road alone will improve the income distribution within the as opposed to between villages. Within the villages, households with bigger land-holdings will almost certainly, at least in the short run, benefit more than smaller landholders.

When considering the effect of the road it must be recalled that the road construction site selected for this study is located in the Southern part of the Central Region which means that the land is basically flat, although it slowly slopes upwards towards the forest range in the West. The land around the road may well be flooded during the rainy season but the flat and open landscape also means that it is easy to build and maintain tracks and simple earthroads, which in the dry season can in many places bear heavy trucks from the fields. This means also that the villages can be reached by at least minitrucks for the greater part of the year and serious problems of transporting produce will appear mainly during the rainy season. Nevertheless, most produce is transported in the dry and not in the wet season.

When considering the effects of the road it must also be kept in mind that the road selected had a joint purpose of not only providing a number of villages with all-weather road connections, but also of facilitating the maintenance of an irrigation canal traversing the area.

The road, which in fact replaced a small track, was constructed on the bank of the irrigation canal going almost parallel to the main highway. It linked up a number of villages with two other secondary, hard-surface roads which, in turn, were leading to the Highway (see map). The new road consequently did not follow the natural routes of the villages - as straight as possible to the highway - which means that the households in villages along the road will only use the new road up to the point where they can make a short-cut to the highway.

The study covers a time-period beginning a few months before the construction work started and ending five months after its completion. It thus only considers the immediate consequences of the road construction.

The household survey undertaken in the area of influence before the road construction started, gave some support to the hypothesis of a positive relation between incomes and accessibility of villages located at different distances from the main road and with a different quality of existing road connections. The villages closest to the highway showed an average household income double that of the most remote villages. The higher incomes could to a certain extent be explained by a bigger average land-holding but also by factors which are closely related to the quality of road network, such as cultivation of more profitable cash crops and a more modernised system of land cultivation. A contributing factor to the higher average income - clearly a consequence of better road connections - is also the higher share of non-agricultural employment in total employment of the households.

The results of the survey support the hypothesis above that the road construction may lead to a more equal income distribution in the area of influence as soon as households start taking advantage of the new situation. Possible factors contributing to income equality after the road is put to use include faster modernisation (in terms of better use of productive inputs and motive power) and changed cropping patterns from rice to more profitable cash crops, when these often heavier crops can be more easily transported. The new road will no doubt also give access to a wider non-agricultural labour market. This will clearly benefit villages which had previously the poorest road connections, as they show the lowest share of non-agricultural employment, which generally gives a higher return than employment in the household farm or as hired agricultural labour.

The survey undertaken some five months after the completion of the road, supported the original impression that household members use the road only for rather short distances, from about two up to four kms., which means only as far as to the nearest acceptable earth track leading straight to the Highway. Now, it must be borne in mind that the time of reference of the survey only covers the dry season, when these tracks are in a fairly good shape. A survey during the wet season would definitely give another result.

The absolute majority of households of all villages reports time-savings when using the new road and, in spite of the short time which

has elapsed since the new road opened, many households reveal increased mobility. Of particular significance is that between one-fourth and half of the households report that household members are more often going to work outside the household enterprise. Salesmen and merchants of different kinds seem to have responded quickly to the opening of the road. The majority of households report more frequent visits from these commercial dealers since the road opened. What consequences this will have on income and employment in the villages is difficult to say. An increased competition may lower consumer prices, but whether the savings for merchants buying farmer's produce will be passed on to the farmers cannot be said on the basis of this survey.

Summarising the above, it is obvious that the road so far is mainly regarded as a supplement to the other roads in the area. Nevertheless, the households have responded favourably and report time-saving and increased mobility. More elaborate conclusions cannot however be drawn until a one year cycle has passed, covering also the rainy season.

The examination of the construction process showed the use of highly capital-intensive techniques. Heavy equipment such as scrapers and graders were used for more than 3,000 hours. The official accounts did not take into consideration the amortisation of the machinery. A calculation based on market rental rates should increase the total cost with 20 per cent, giving a cost per km. of about Bht. 500,000.

In all, 35,000 man-days were performed by a little over 200 labourers, the majority of whom were engaged in constructing three bridges which were part of the scheme. The labour force could be divided into three groups: permanent, semi-permanent and casual labourers. Only 10 per cent of the labour force were permanent labourers. The rest were more or less casual. The semi-permanent labourers had generally been working as construction workers for years - but always on a short-term basis - and were quite experienced in construction work. The semi-permanent and casual labourers were generally coming from the area around the road which had been covered by the benchmark household survey. The labourers, however, represented a rather atypical household type for the area. Certainly, a majority of the labourer's households could be classified as self-employed farming households but almost 30 per cent considered construction work as their principal activity.

The income of households specialised in wage employment in the construction business, however, clearly fell below the average found in the household survey, while the households which combined farming with wage employment came out with incomes higher than the average.

The peak construction period coincided partly with the busy rice planting season. It can thus be assumed that the supply of casual labourers was limited but this apparently did not affect the recruitment of construction workers because, as we have noted, the constructor could



rely on a fairly stable workforce. Many of the temporary labourers had been working in construction for years. This was also reflected by the fact that, according to the labour survey, a number of households in the area were specialised in wage employment in construction with no or little land to cultivate, a first sign of the development towards a more specialised or structured labour market.