CHAPTER VI

THE ROLE OF FEEDER ROADS IN AGRICULTURAL DEVELOPMENT

This chapter is concerned with the results of the research that was described in Chapter V. All of the principal variables that seem to influence incomes were studied to understand their correlation.[1] In other words, the chief aim of farmers and others in capitalist countries is to raise their own level of income. The present research defined annual net farm income as the sole dependent variable. Other factors which have been mentioned were taken as the independent variables. The relationship between each pair of variables led to an understanding of the role each factor, or group of factors, played in the pattern of development. The modes of transportation of the farmers and various aspects of the movement of agricultural inputs and outputs were studied to understand the impact of feeder roads in the study areas.

Owing to the limitations of the information obtained for the project areas, some factors were weak in the comparisons made with the other study areas. However, in the present research,

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[1] Correlation = mutual relationship. This definition is used generally throughout this report. Where the statistical definition of correlation is intended, it is so stated.

attempt was made to overcome these deficiencies to provide an understanding of the relationships between the project areas and the non-project areas, and to compare the two projects with each other. Some other sectors--such as major-crop yields, soil quality, income per rai, production problems, marketing problems, farmers' cooperative shares and deposits--were also taken into consideration. The achievement quotient analysis was used to compare the degree of achievement of project with non-project areas. Other important variables were studied to understand their effects in development in the non-project areas.

Comparison of Net Farm Income Between Four Study Areas

The mean values of net farm income and net total income of each study area were computed from the stratified sample data for each groups; dispersions were indicated by means of the standard deviations, coefficients of variations, and the coefficients of variation of the mean. Alternative pairs were compared by using the Student's t test. Comparison of the income distributions of farmers in each type of study area for 1974-5 is shown in Table 38. As nearly all of the coefficients of variation and the coefficients of variation of the mean were much higher than 0.15 and 0.05, respectively, it can be seen that the incomes of the farmers in the study areas were highly dispersed. An aim of the project for the project farmers is to have a compact distribution of income.

Table 38 - Comparison of the Income Distributions of Farmers in Each Type of Study Area for 1974 - 5

Type of comparison	Area of study	Type of study area	Income (baht/year)						
			Frequency	Mean (baht/year)	Standard deviation (baht/year)	Standard error of the mean (baht/year)	Coefficient of variation	Coefficient of variation of the mean	Student's t value
Net farm income	Cha Am	Project	119	6,896	12,739	1,168	1.85	0.17	0.98^{ns}
		Non-project	61	5,159	7,285	933	1.41	0.18	
	Hua Hin	Project	78	17,170	8,524	965	0.50	0.06	11.09^{**}
		Non-project	85	4,223	6,189	671	1.47	0.16	
	Cha Am vs Hua Hin	Project	119	6,896	12,739	1,168	1.85	0.17	6.23^{**}
		Project	78	17,170	8,524	965	0.50	0.06	
	Cha Am vs Hua Hin	Non-project	61	5,159	7,285	933	1.41	0.18	0.68^{ns}
		Non-project	85	4,223	6,189	671	1.47	0.16	
Net total income	Cha Am	Project	119	13,907	16,196	1,485	1.16	0.11	1.06^{ns}
		Non-project	61	11,477	10,116	1,295	0.88	0.11	
	Hua Hin	Project	78	19,581	9,297	1,053	0.47	0.05	5.50^{**}
		Non-project	85	11,294	9,778	1,061	0.87	0.09	
	Cha Am vs Hua Hin	Project	119	13,907	16,196	1,485	1.16	0.11	2.79^{*}
		Project	78	19,581	9,297	1,053	0.47	0.05	
	Cha Am vs Hua Hin	Non-project	61	11,477	10,116	1,295	0.88	0.11	0.11^{ns}
		Non-project	85	11,294	9,778	1,061	0.87	0.09	

ns = Non-significant difference at 5 % level of significance

* = Significantly different at 1% level of significance

** = Significantly different at 0.1% level of significance

From Table 38, the income distribution of the Hua Hin Land Development Project farmers was the most compact of the income distributions studied.

For convenient reference, the values of net farm income and net total income from Table 38 have been arranged in descending rank order in Table 39.

Table 39 - Rank Order Array of Net Farm Income and Net Total Income for 1974-5

Area of study	Mean net farm income (baht/year)	Mean net total income (baht/year)	Difference (baht/year)
Hua Hin Project	17,170	19,581	2,411
Cha Am Project	6,896	13,907	7,011
Cha Am non-project	5,159	11,477	6,318
Hua Hin non-project	4,223	11,294	7,071

It can be seen that the mean net farm income of Hua Hin Project farmers was far higher than that of farmers in the other three study areas. This value, as shown in Table 38, is significantly different to net farm incomes in the three other study areas. In contrast, the income distribution of the farmers in the Huptapong Rural Development center (the so-called Cha Am Project) and that of the non-project farmers in Cha Am are not significantly different at the 95 percent level of confidence.

The mean income of the Cha Am Project farmers was somewhat higher than those of the non-project areas. Comparison of the net farm income distributions of Hua Hin and Cha Am Projects, showed these to be different at the 99.9 percent level of confidence, and the net total income distributions of the two projects were significantly different at the 99 percent level of confidence. Table 39 shows that the farmers in the Cha Am Project earned much more non-farm income than those in the Hua Hin Project. Interestingly, the differences between net total incomes and net farm incomes for the four study areas show approximately equal non-farm income levels for the three study areas: Cha Am Project, Cha Am non-project, and Hua Hin non-project areas.

The principal variables that might affect the distribution of net farm income of each study area were evaluated for the following sectors: transportation facilities, cultivated area, income per rai, land value, number of residents in the family dwelling units, financial affairs, farm yields, markets, agricultural advisory service, fertilizer, pesticides, seed, farm labour, farming equipment, production problems, marketing problems, soil quality, availability of water, and transportation facilities.

Transportation Facilities: Road Density

Both the Huptapong and the Hua Hin-Nong Plub feeder roads were rebuilt with soil aggregate surfaces in 1969. Other feeder

roads have been built to serve scattered villages in the non-project areas, and to every farm in the project areas. The total length of roads of all classes which exist in each of the four classified areas were compared with the amount of land in each area. These comparisons are shown in Table 40. It should be noted that the areas tabulated exclude any mountainous sections. The resulting quotients are the road density for each study area. From Table 40, the road density of the Cha Am Project is the highest value (2.92 km/km^2), and the road density of the non-project area in Cha Am is the lowest of the four study areas (0.30 km/km^2). However, the road density in each of the two project areas is substantially higher than those of the non-project areas. From the data shown in Tables 38 and 40, comparisons of the project areas with the non-project areas in Cha Am and Hua Hin indicates a correlation between road density and the mean net farm income. The two other pairs of comparisons failed to show a positive correlation between road density and level of income.

Table 40 - Road Density in the Study Areas: 1974-5

Area of study	Type of study area	Area (km^2)	Existing roads (km)	Existing road/area (km/km^2)
Cha Am	Project	13.3	38.8	2.92
	Non-project	210.	62.	0.30
Hua Hin	Project	47.	88.6	1.89
	Non-project	179.	96.	0.54

Transportation Facilities: Transport Problems

Farmers interviewed in the non-project areas were asked about the problems of transportation associated with their routine activities. The results are summarized in Table 41. Transportation associated with medical emergency cases, such as injuries or severe sickness, led to different decisions depending on whether the emergency occurred in the day-time or night-time. The incidence of farmer decisions in such emergencies in the non-project areas is shown in Table 42.

In the project areas, each farmhouse was close to a feeder road and the condition of the these roads was fairly good. Farmers in the project areas generally sold their produce to the cooperatives. As cooperative vehicles were used to carry these products, there appeared to be no difficulties in transporting these commodities. There were mini-buses operating through both projects, but these did not directly serve every farmhouse. In case of an emergency trip to the district town, project vehicles were found to be available for the project farmers' use.

From Table 41, it appears that about 84 percent of the non-project farmers did not complain about the roads connecting their houses to the nearest road, their houses to the farms, and the farms to the nearest road. The differences between the two Districts (Hua Hin and Cha Am) are probably not significant in

Table 41 - Farmer Movement and Transport Problems of the Non-Project Study Areas: 1974 - 5

Route	Farmers' attitude	Cha Am		Hua Hin	
		f	%	f	%
House to road [1]	No problem	55	88	73	90
	Bad road condition	6	10	6	7
	Lack of vehicle	1	2	2	3
	Total	62	100	81	100
House to farm [1]	No problem	83	88	105	82
	Bad road condition	10	11	15	12
	Lack of vehicle	1	1	8	6
	Total	94	100	128	100
Farm to road [1]	No problem	75	87	96	73
	Bad road condition	11	13	26	20
	Lack of vehicle	0	0	9	7
	Total	86	100	131	100
En route [2]	No problem	12	14	37	28
	Bad road condition	33	37	38	29
	Lack of vehicle	43	49	56	43
	Total	88	100	131	100

[1] All respondents reported "walking" as the only mode of transport.

[2] Nearly all respondents travelled to the district town by mini-bus on trips to buy food or to sell farm produce.

Table 42 - Incidence of Decisions of Farmers in the Non-Project Study Areas in Medical Emergencies

Time	Emergency-trip decision	Cha Am		Hua Hin	
		f	%	f	%
Day	Mini-bus	35	60	71	84
	Wait until morning	0	0	0	0
	Walk to health station	4	7	5	6
	Hire car	19	33	4	5
	Driving own car or M/C	0	0	4	5
	Total	58	100	84	100
Night	Mini-bus	0	0	0	0
	Wait until morning	8	14	22	26
	Walk to health station	1	2	3	3
	Hire car	48	81	54	64
	Driving own car or M/C	2	3	6	7
	Total	59	100	85	100

view of sampling ratios which led to these results. With respect to travel on the nearest feeder road itself, nearly half of the farmers complained of the lack of a vehicle. Likely, the reason that the farmers did not complain of transport problems in getting from their houses to the farms, from the farms to the road, or from their houses to the road was that most of them walked on these three route segments, but travelled by mini-bus on road itself.

From Table 42, it appears that better mini-bus service was available in the Hua Hin non-project area than in the Cha Am non-project area as fewer people in the Hua Hin non-project area had to hire a car than those in the Cha Am non-project area for day-time medical emergencies.

It can be concluded that the road facilities in the Cha Am non-project area were better than those in the Hua Hin non-project area, and vehicles were more readily available than in the Hua Hin non-project area. Comparing Table 38 with Tables 41 and 42, there appears to be some correlation between incomes with road facilities and availability of vehicles for hire.

Cultivated Area

Values of the average cultivated area per family for each income interval for the four study areas in 1974-5 are tabulated in Table 43. As the information for the Cha Am Project area was

Table 43 - Average Cultivated Area (rai) Per Family in Each Income Interval in the Study Areas for 1974-5

Income interval(baht/year)	Cha Am						Hua Hin					
	Project[1]			Non-project[2]			Project[2]			Non-project[2]		
	f	%	Average cultivated area, rai	f	%	Average cultivated area, rai	f	%	Average cultivated area, rai	f	%	Average cultivated area, rai
Less than 5,000	11	9.32	17.6	40	66	17.1	5	6	22.3	60	71	17.4
5,000 - 14,999	58	49.16	20.1	16	26	22.8	27	35	23.1	17	20	26.0
15,000 - 24,999	23	19.49	20.3	4	7	39.2	31	40	22.3	7	8	30.3
25,000 - 34,999	14	11.86	21.8	0	0	0	14	18	21.1	1	1	47.0
35,000 - 44,999	7	5.93	28.4[3]	1	1	35.0	0	0	0	-	-	-
More than 44,999	5	4.24	33.7[3]	-	-	-	1	1	22.5	-	-	-
Total	118	100	21.2[4]	61	100	20.3[4]	78	100	22.4[4]	85	100	20.5[4]

[1] Distribution of total income

[2] Distribution of net farm income

[3] Project farms are stated to be limited to a total of 25 rai (18 rai for non-irrigated crops and 7 for irrigated crops). There seems to be no explanation for the values shown being larger than the limiting total land area.

[4] Weighted average.

available only for "total income" intervals, the relationships between the average cultivated areas in the four study areas could only be tenuously evaluated. The present research attempted to understand the relevance of cultivated area to net farm income. From Table 42, it can be seen that, generally, the greater the cultivated area, the higher the income was. For the Hua Hin Project the cultivated areas were all nearly equal so no correlation with the varying level of income existed.

A comparison of Tables 38 and 43 shows that, generally, the greater the cultivated area, the higher was the mean net farm income.

Income Per Rai

The average income per rai in each income interval for each of the four study areas for 1974-5 is shown in Table 44. The higher the income level, the higher was the income per rai of land for all study areas. Comparing these results with average amount of land shown in Table 43, shows that generally the larger was the land per family, the higher the income per rai. This was true for three of the study areas, but not for the Hua Hin Project. Small increments of land per family are associated with very significant increases in the income per rai. The reasons are probably the insignificant increment of farm expenditure for the larger land areas, and having--

Table 44 - Average Income (baht/year) Per Rai for Each Income Interval in the Study Areas: 1974 - 5

Income Interval (baht/year)	Cha Am						Hua Hin					
	Project[1]			Non-project[2]			Project[2]			Non-project[2]		
	f	%	Income (baht/rai)	f	%	Income (baht/rai)	f	%	Income (baht/rai)	f	%	Income (baht/rai)
Less than 5,000	11	9	180	40	66	81	5	6	138	60	71	69
5,000 - 14,999	58	49	495	16	26	385	27	35	464	17	20	294
15,000 - 24,999	23	20	914	4	7	483	31	40	852	7	8	605
25,000 - 34,999	14	12	1,373	0	0	0	14	18	1,332	1	1	613
35,000 - 44,999	7	6	1,403	1	1	1,237	0	0	0	-	-	-
More than 44,999	5	4	2,345	-	-	-	-	-	2,306	-	-	-
Total	118	100	784[3]	61	100	206[3]	78	100	777[3]	85	100	165[3]

1 Distribution of total income

2 Distribution of net farm income

3 Weighted average

numbers of farm residents more nearly appropriate to suited the larger amounts of cultivated land.

Land Value

Usually the value of land is high when it is near to a road, convenience to transportation, near a market, or producing higher yields if it is a farm. As the land for both the Hua Hin and Cha Am Projects belongs to H.M. the King and the Royal Thai Government, it is impossible to determine a money value to those lands. To estimate this value, the approximate purchasing prices of non-project lands were found; the average land value for each net farm income interval in the non-project areas in 1974 - 5 is shown in Table 45. This shows the tendency that higher land values are associated with higher levels of net farm income.

From Tables 38 and 45, a comparison of the mean values of cultivated land with the mean values of net farm income for the two non-project study areas shows a negative correlation: the Cha Am non-project area had the higher net farm income, but the Hua Hin non-project area had the higher land value.

Family Residents

The average number of family residents associated with each income interval in the four study areas in 1974 - 5 is shown in Table 46. There was found no relationship between

Table 45 - Average Land Value (baht/rai) for Each Net Farm Income Interval in the Non-Project Study Areas for 1974 - 5

Net farm income interval (baht/year)	Cha Am			Hua Hin		
	f	%	Average land value	f	%	Average land value
Less than 5,000	38	66	1,252	50	68	1,789
5,000 -14,999	14	25	2,036	16	22	2,281
15,000 - 24,999	4	7	1,875	7	9	1,957
25,000 - 34,999	0	0	0	1	1	2,500
35,000 - 44,999	1	2	3,000	-	-	-
More than 44,999	-	-	-	-	-	-
Total	57	100	1,519[1]	74	100	1,921[1]

[1] Weighted average

Table 46 - Average Family Residents[1] for Each Income Interval in the Study Areas for 1974 - 5

Income interval (baht/year)	Cha Am						Hua Hin					
	Project[2]			Non-project[3]			Project[3]			Non-project[3]		
	f	%	Average family residents	f	%	Average family residents	f	%	Average family residents	f	%	Average family residents
Less than 5,000	11	9.32	5.75	40	66	6.02	5	7	5.20	60	71	6.13
5,000 - 14,999	58	49.16	6.17	16	26	6.50	26	34	5.04	17	20	6.71
15,000 - 24,999	23	19.49	6.17	4	7	6.00	31	40	4.48	7	8	6.29
25,000 - 34,999	14	11.86	6.17	0	0	0	14	18	5.29	1	1	3.00
35,000 - 44,999	7	5.93	6.71	1	1	5.00	0	0	0	-	-	-
More than 44,999	5	4.24	7.00	-	-	-	1	1	5.00	-	-	-
Total	118	100.0	6.26[4]	61	100	6.13[4]	77	100	4.87[4]	85	100	6.22[4]

1 Number of people residing in each family dwelling unit

2 Compared to total income

3 Compared to net farm income

4 Weighted average

the number of family residents and net farm income level in the Hua Hin Project. The average number of residents in a family was nearly constant, but their net farm income levels varied greatly. Therefore, it can be concluded that the net farm income is not affected by the number of family residents. Perhaps, the reason is that more than half of the family residents were less than 20 years old, or more than 59 years old, shown in Table 47, Thus, only half of the residents in a farm dwelling unit were probably able to work on the farm.

From Tables 38 and 46, all pairs were compared --except project and non-project areas in Cha Am--and showed no correlation between the number of family residents and the levels of mean net farm or mean net total income. For the pair in Cha Am (project and non-project), there was a difference of about 20 percent in the levels of mean income but the difference in number of family residents was only 2 percent.

Financial Affairs: Debt

Financial debt per farm family for each income interval of the study areas for 1974-5 is shown in Table 48. Whilst the evidence is far from conclusive for the three study areas for which data were available, there appear to be trends of greater debt being associated with larger income. Erratic data points occur in two of the analyses, and it would be unwise to

Table 47 - Incidence in Age Intervals of the Family Residents in Each Family Dwelling Unit in the Non-Project Study Areas for 1974 - 5

Age Interval (years)	Cha Am		Hua Hin	
	f	%	f	%
Less than 10	96	25.8	134	25.4
10 - 19	110	29.6	165	31.2
20 - 29	66	17.7	58	11.0
30 - 39	20	5.5	57	10.8
40 - 49	40	10.7	53	10.0
50 - 59	24	6.4	43	8.2
More than 59	16	4.3	18	3.4
Total	372	100.0	528	100.0

Table 48 - Average Debt[1] (baht) per Farm Family for each Income Interval in the Study Areas for 1974 - 5

Income interval (baht/year)	Cha Am						Hua Hin					
	Project			Non-project			Project			Non-project		
	f	%	Average[2] debt, baht	f	%	Average[3] debt, baht	f	%	Average[3] debt, baht	f	%	Average[3] debt, baht
Less than 5,000	10	9	5,100	40	66	1,531	5	6		60	71	2,217
5,000 - 14,999	56	51	7,183	16	26	1,069	27	35		17	20	2,735
15,000 - 24,999	21	19	10,048	4	7	1,750	31	40		7	8	5,357
25,000 - 34,999	12	11	10,500	0	0	0	14	18	NA	1	1	20,000
35,000 - 44,999	7	6	7,857	1	1	0	-	-		-	-	-
More than 44,999	4	4	11,375	-	-	-	1	1		-	-	-
Total	110	100	8,098[4]	61	100	1,399[4]	78	100	NA[5]	85	100	2,788[4]

1 Average debt per farm family.

2 Compared with total income.

3 Compared with net farm income.

4 Weighted average.

5 NA = not available.

formulate a general conclusion in this matter. Comparing the corresponding study areas, using the mean values debt and income shown in Tables 48 and 38, respectively, there is no evidence of any correlation between debt and net farm income.

The incidence of the sources from which the farmers in the two non-project areas borrowed money is shown in Table 49. In both non-project areas, substantial fractions of the farmers (41 percent in Cha Am, 35 percent in Hua Hin) had borrowed money from customers who buy their agricultural produce. Nearly half of the farmers in the Hua Hin non-project area, and 41 percent of those in the Cha Am non-project area had borrowed money from the cooperatives or a bank. Few of the non-project farmers had borrowed money from their relatives and neighbours.

The incidence of debt occurring in each study area for 1974-5 is shown in Table 50. It appears that about 90 percent of the farmers in the Cha Am Project owed money to others, but about half of the farmers in each of the two non-project areas owed money (44 percent in Cha Am, 51 percent in Hua Hin). From Tables 38 and 50, there appears to be no relationship between farmers' debts and their incomes. Of the total sample of 265 interviews, 8 farmers both had credit from having lent money to others and owed money; 5 of those were residents of the Cha Am Project, 2 in the Cha Am non-project area, and 1 in the Hua Hin non-project area. There were no observations of this parameter for the Hua Hin Project farmers.

Table 49 - Incidence of Sources from which Farmers in the Non-Project Study Areas Borrowed Money, 1974 - 5

To whom owed	Cha Am		Hua Hin	
	f	%	f	%
Customer (merchant in town)	11	41	15	35
Cooperative or bank	11	41	21	49
Relatives	3	11	4	9
Neighbour	2	7	3	7
Sub-total	27	100	43	100
Did not borrow	34	56[1]	42	49[1]
Total	61	-	85	-

[1] Incidences of not borrowing were not included in the calculation of percentage incidence of source.

Table 50 - Incidence of Debt, Credit, Shares, and Deposits Occurring in Each Study Area for 1974 - 5

Area of study	Type of study area	Number of samples	Debt		Credit		Shares		Deposits	
			f	%	f	%	f	%	f	%
Cha Am	Project	119	110	92	14	12	NA	NA	96	81
	Non-project	61	27	44	3	5	3	5	6	10
Hua Hin	Project	78	NA	NA	NA	NA	77	99	44	56
	Non-project	85	43	51	1	1	15	18	25	29

Financial Affairs: Credit, Shares, and Deposits

The incidence of credit, shares, and deposits occurring in each study area for 1974-5 is shown in Table 50. It evident that few farmers in the two non-project areas had enough money to lend to others. Only 12 percent of the farmers in the Cha Am Project lent money to other farmers; however, the incidence of having funds on deposit by the Cha Am Project farmers is high (81 percent), and half of the Hua Hin Project farmers (56 percent) had funds on deposit.

From Table 50, it appears that nearly all of the Hua Hin Project farmers had a share in the cooperative. This is the result of a project regulation that every project farmer must be a number of the cooperative. In the two non-project areas, only a few of the farmers had a share in the cooperative (5 percent in Cha Am, and 18 percent in Hua Hin). Comparing the incidence of shares held, as shown in Table 50, with the incomes shown in Table 38, there does not appear to be any relationship between farmers owing shares and their incomes.

Deposits of the farmers in banks and cooperatives are shown in Table 50. Clearly, there were more project farmers depositing their money in banks or cooperatives than there were non-project farmers. Few non-project farmers (6 percent) in Cha Am have deposits in banks or cooperatives. Meanwhile, few of these farmers had credits or shares. From Table 50, it

can be seen that the Cha Am Project displayed a greater tendency to circulate money than other three study areas. In comparing deposits from Table 50 with the incomes shown in Table 38, there appears to be a weak correlation between farmers' deposits and their incomes, for both project with non-project areas in Hua Hin and Cha Am. However, there was no evidence of relationships between farmers' deposits for non-project with non-project areas, and project with project areas.

Average amounts of credit, shares, and deposits per family in the four study areas for 1974-5 are shown in Table 51. Irrespective of the absence of data for two cells of the table, totals have been shown. Comparing Tables 38 and 51, the outstandingly high level of income of Hua Hin Project farmers is seem to be associated with the highest total credit per family in this study area. Apart from this highest performance by Hua Hin Project farmers, there is little in Table 51 to indicate helpful correlations.

Yield

The yields of some major crops in the study areas for 1974 - 5 are tabulated in Table 52. Comparing Table 38 with Table 52, the yield seems to be generally related to the net farm income. The very high performance of sugarcane farmers in the two Hua Hin study areas is of interest. However, the striking

Table 51 - Average Credit, Shares, and Deposits per Family in the Study Areas for 1974 - 5

Area of study	Type of study area	Numbers of sample	Credit[1] (baht)	Shares[2] (baht)	Deposits[3] (baht)	Total of credit, shares and deposits (baht)
Cha Am	Project	119	194	NA	66	379
	Non-project	61	98	32	264	455
Hua Hin	Project	78	NA	337	2,950	3,365
	Non-project	85	47	28	788	948

1 Money borrowed by other farmers or relatives

2 Shares in cooperatives

3 Deposits in banks or cooperatives

Table 52 - Yield (kg/rai) of the Major Crops in the Study Areas for 1974 - 5

Crop	Cha Am				Hua Hin			
	Project		Non-project		Project		Non-project	
	f	Yield	f	Yield	f	Yield	f	Yield
Sugarcane	65	4,300	1	1,176	40	8,984	3	7,515
Maize	38	162	31	110	74	258	50	210
Pineapple	-	-	12	1,116	-	-	11	1,079
Paddy	-	-	15	222	-	-	14	254

Source: Field survey for non-project areas and project reports for project areas.

ratio of sugarcane yields between Hua Hin Project farmers (nearly 9,000 kg/rai) compared with Cha Am non-project farmers (1,200 kg/rai) is astounding. In its magnitude, this ratio of yields (7.6:1) emphasizes the strength of the Hua Hin Project farmers and relative weakness of the Cha Am farmers (both project and non-project). This relationship should be kept in mind as further analysis appears. The yields of upland crops in Hua Hin District and Cha Am District as reported by the District Agricultural Officers are shown in Table 53.

Marketing

The choice of agricultural product selling place with its reasons, and the choice of mode for transporting the products, are shown in Table 54 for the two non-project study areas. From this table it can be seen that most of the Cha Am non-project selling occurred at farmers' houses. The reason was because of the convenience for the farmers themselves. Selling in district towns was sometimes necessary because the farmers had borrowed money from merchants in these district towns.

The dominant transport mode for the first stage in Cha Am was the bicycle (77 percent), though nearly a quarter of the farmers carried their products from farm to road or house by sheer man-power. When the produce was stored in their houses ready to sell, the merchants usually used their own trucks to carry the produce from the farmers' houses.

Table 53 - Upland Crop Yield (kg/rai) in Hua Hin and Cha Am

Upland crops	Hua Hin			Cha Am		
	1973	1974	1975	1973	1974	1975
Maize	250	300	310	200	250	↑
Pineapple	2,000[1]	7,600	7,100	1,500	1,500	
Castor seed	167	165	160	120	120	
Soyabean	150	150	160	80	80	NA
Paddy	365	NA	295	270	270	
Ground nut	120	165	191	150	150	
Sugarcane	9,000	9,500	11,000	4,000	4,000	
Cassava	NA	4,000	4,000	2,000	2,000	↓

[1] Excluding Dole Company and Thai Pineapple Company.

Source: District Agricultural officers, Cha Am and Hua Hin.

Table 54 - Incidence of Agricultural Output Selling Places, Transport Mode, and their Reasons in the Non-Project Study Areas for 1974 - 5

	Facts and farmers' attitude	Cha Am		Hua Hin	
		f	%	f	%
Selling place	District town[1]	9	16	58	71
	Other district town	11	20	0	0
	Farmer's house	36	64	19	23
	Cooperative	0	0	5	6
	Total	56	100	82	100
Reason for selling there	Better price	5	9	4	5
	Near and convenient	27	48	55	67
	Necessary[2]	23	41	8	10
	No other market	1	2	10	12
	Membership	0	0	5	6
	Total	56	100	82	100
Transport mode from farm to road	Mini-bus	0	0	2	2
	Bicycles	43	77	45	55
	Carried by humans	13	23	34	42
	Truck	0	0	1	1
	Total	56	100	82	100
Transport mode from road to market	Mini-bus	16	28	63	77
	Carried by humans	1	2	0	0
	Truck	39	70	19	23
	Total	55	100	82	100
Reason for using that mode	Merchants' vehicle	38	68	14	17
	Cooperative's vehicle	0	0	3	4
	No other mode	18	32	61	75
	Convenient	0	0	2	2
	Cheaper	0	0	2	2
	Total	56	100	82	100

[1] District town of district in which farm is situated.

[2] Farmer borrowed money from merchant, for instance.

In contrast to the proceding, most of the farmers in the Hua Hin non-project area sold their products at Hua Hin district town, largely because of convenience. The farmers in the Hua Hin non-project area transported their products from farm to the road by bicycle (55 percent of the farmers) or human power (42 percent). To transport produce to the district town, most of the farmers loaded their production onto mini-buses or trucks.

It appears that the marketing arrangements in Cha Am and Hua Hin are quite different for the two groups of non-project farmers. Perusal of Table 54 leads one the believe that in Cha Am the local merchants call on farmers, buy at the farm gate, and transport the produce in their own vehicles. In the Hua Hin non-project area, it appears that farmers sell largely in the district town, having transported their produce there by mini-bus (77 percent) or by truck (23 percent).

For both the Cha Am and Hua Hin Projects, most farmers sold their agricultural products to the cooperatives, but a few of these farmers sold small amounts of produce at district towns. The cooperatives' vehicles were used to carry these products so the farmers had not to spend any money for transportation. Therefore, comparing the information from Tables 38 and 54, we can say there is some correlation between transport facility in production and marketing with the net farm income.

Agricultural Advisory Services

In both the Cha Am and Hua Hin Projects, there were many agronomists working at the project centers. Providing readily available agricultural advisory service to the project farmers was one of their chief duties. For non-project areas, the percentage occurrence of this service is shown in Table 55. Only about 35 percent of the farmers in each non-project area received visits by agricultural advisors; these specialists came about twice per year. When comparing these figures with the net farm income in Table 38, there seems to be positive correlation between the availability of regular agricultural advice and the farmers' income from farming operations.

Fertilizer

From common sense, one usually thinks that the more fertilizer that is used, the more the yield that will be obtained. Therefore, the average cost of fertilizer per rai per family for each net farm income interval in the non-project areas for 1974-5 was studied; these data are tabulated in Table 56. It appears that the higher the cost of fertilizer per rai, the higher the net farm income became. The farmers who did not purchase and use fertilizer in the two non-project areas had lower net farm incomes. Comparing Tables 38 and 56, fertilizer appeared to have some influence on the mean net farm income of

Table 55 - Percentage Occurrence of Agricultural Advisory Services and Farm Inputs Purchased or Hired by Farmers in the Non-Project Study Areas for 1974 - 5

Type of study area	Area of study	Percentage occurrence					
		Agricultural advisory services	Fertilizer purchased	Insecticide pesticide or herbicide purchased	Seed purchased	Farm labour hired	Farm equipment hired
Non-project	Cha Am	34[1]	51	57	56	41	92[3]
	Hua Hin	36[2]	33	45	75	62	74[4]

1 With the mean numbers of agricultural advisor visits = 2.2 times/year

2 With the mean numbers of agricultural advisor visits = 1.7 times/year

3 One farmers out of 61 purchased a farm tractor with credit.

4 Five farmers out of 85 owned water pumps.

Table 56 - Average Annual Cost of Fertilizer Per Rai Purchased per Family, and Incidence of Farmers Who Did Not Purchase, for Each Net Farm Income Interval in the Non-Project Study Areas for 1974 - 5

Net farm income interval (baht/year)	Cha Am					Hua Hin				
	Farmers who purchased			Farmers who did not purchase		Farmers who purchased			Farmers who did not purchase	
	f	%	Average fertilizer cost baht/rai	f	%	f	%	Average fertilizer cost baht/rai	f	%
Less than 5,000	40	66	13.3	29	91	60	71	6.6	44	78
5,000 - 14,999	16	26	28.7	3	9	17	20	7.7	10	18
15,000 - 24,999	4	7	18.6	-	-	7	8	34.0	2	4
25,000 - 34,999	0	0	0	-	-	1	1	42.5	-	-
35,000 - 44,999	1	1	17.9	-	-	-	-	-	-	-
More than 44,999	-	-	-	-	-	-	-	-	-	-
Total	61	100	17.8[1]	32	100	85	100	9.5[1]	56	100

[1] Weighted average

both non-project areas. The percentage occurrence of the purchase of fertilizer in each non-project areas, shown in Table 55, had some correlation to the net farm income in the non-project area, as shown in Table 38.

Incidence of fertilizer buying place with its reason, transport mode of fertilizer, and reason for first using the fertilizer is shown in Table 57. In the Cha Am non-project area, most of the farmers went to nearby district towns, rather than to Cha Am district town. The reasons mentioned by the farmers were that these places were near, convenient and sold cheaper. Also, some of the farmers had to buy there because they had borrowed money from merchants in these towns. As chemical fertilizer is relatively light, most farmers (86 percent) transported this by mini-bus. Generally, natural fertilizer (manure) had to be carried by truck because it is heavy and smelly. In the Hua Hin non-project area, most of the farmers went to Hua Hin district town to buy fertilizer. The principal reason given was it was near and convenient to buy there. The farmers usually carried it on mini-buses (92 percent). In both non-project areas it was first used in 1971-72. About 40 percent of the farmers in the Cha Am non-project area used fertilizer by following the practice of their neighbours, but those in the Hua Hin non-project area used it because the soil was of low fertility.

Table 57 - Incidence of Fertilizer Buying Places, Transport Mode, and their Reasons for the Non-Project Study Areas for 1974 - 5

	Facts and farmers' attitudes	Cha Am		Hua Hin	
		f	%	f	%
Buying place	District town*	1	3	17	68
	Other district towns	25	87	5	20
	Farmer's house	2	7	1	4
	Neighbour	1	3	2	8
	Total	29	100	25	100
Reason for buying there	Cheaper	5	17	3	12
	Near and convenience	18	62	20	80
	No other market	2	7	1	4
	Borrowed money from merchant	4	14	1	4
	Total	29	100	25	100
Transport mode	Mini-bus	24	86	23	92
	Bicycles	2	7	1	4
	Truck	2	7	1	4
	Total	28	100	25	100
Reason for first used	Since first planted	9	33	10	40
	Followed neighbour	11	41	4	16
	Low fertility	7	26	11	44
	Total	27[1]	100	25[2]	100

[1]Average first use in 1971.

[2]Average first use in 1972.

*District town of the district in which the farm is situated.

The occurrence of purchasing fertilizer for both non-project areas is shown in Table 55. It appears that half of the farmers in the Cha Am non-project area used fertilizer, but only one-third of the farmers in Hua Hin used it. The comparison the yield of major crops shown in Table 52 indicates that Cha Am study area yields were lower than those of the Hua Hin areas. The average cost of fertilizer per rai shown in Table 55 compared to the yields shown in Table 52 would indicate that application of fertilizer failed to increase the yields of the major crops. A possible explanation is that farmers usually used fertilizer for vegetable plots, rather than for field crop areas. If this were true, then the soil in Hua Hin study areas was likely more fertile than that in the Cha Am study areas. It was reported by the Assistant Project Director that the farmers in the Hua Hin Project did not use any fertilizer and did not generally plant vegetables for sale. The Cha Am Project farmers bought some fertilizer from district towns for their vegetables.

Insecticide, Pesticide, and Herbicide

The average cost of insecticide, pesticide, and herbicide (I.P.H.) per rai used by farmers for each net farm income interval in the non-project areas for 1974-5 is shown in Table 58. In each area, there seems to have resulted a greater net farm income when these agricultural chemicals were used. The farmers who did not purchase and use I.P.H. seem to have had low net farm

Table 58 - Average Annual Cost of Insecticide, Pesticide, and Herbicide Per Rai Purchased Per Family, and Incidence of Farmers Who Did Not Purchase , fot Each Net Farm Income Interval in the Non-Project Study Areas for 1974 - 5

Net farm income interval (baht/year)	Cha Am					Hua Hin				
	Farmers who purchased			Farmer who did not purchase		Farmers who purchased			Farmer who did not purchase	
	f	%	Average I.P.H.[1] cost baht/rai	f	%	f	%	Average I.P.H.[1] cost baht/rai	f	%
Less than 5,000	40	66	9.3	25	96	60	71	13.1	38	78
5,000 - 14,999	16	26	14.3	1	4	17	20	38.6	11	22
15,000 - 24,999	4	7	15.8	-	-	7	8	91.2	-	-
25,000 - 34,999	0	0	0	-	-	1	1	46.8	-	-
35,000 - 44,999	1	1	42.9	-	-	-	-	-	-	-
More than 44,999	-	-	-	-	-	-	-	-	-	-
Total	61	100	11.6[2]	26	100	85	100	25.0[2]	49	100

[1] I.P.H. = insecticide, pesticide or herbicide

[2] Weighted average.

incomes. The quantity per rai in Cha Am was less than that which was used in Hua Hin. This may be because there were more insects, pests or weeds in Hua Hin than in the Cha Am non-project area in 1974-5.

The occurrence of using insecticide, herbicide and pesticide in the Cha Am non-project area was somewhat higher (57 percent of the farmers) than in the Hua Hin non-project area (45 percent), as shown in Table 55. Comparing to Table 38, there appears to be some correlation between the use of I.P.H. and net farm income for the non-project areas. In contrast, more Cha Am non-project farmers used smaller amounts (in terms of cost/rai) of insecticide, pesticide and herbicide than the Hua Hin non-project farmers, but the yield of major crops in the Hua Hin area was higher than those of the Cha Am area, as shown in Table 55, 58 and 52, respectively. One probable reason was because insecticide, pesticide and herbicide are usually used only for vegetables. Therefore, the yield of crops was not affected by these chemicals.

The incidence of insecticide, pesticide, and herbicide buying place and their reasons, their transport mode, and reason for first use are shown in Table 59. It is evident that Cha Am non-project farmers (92 percent) bought these chemicals in nearby district towns which were near and convenient. Three-fourths of the Hua Hin non-project farmers bought them from Hua Hin district town, largely because it was near and convenient. Both groups

Table 59 - Incidence of Insecticide, Pesticide, and Herbicide Buying Places; Transport Mode; and their Reasons in the Non-Project Study Areas for 1974 - 5

	Facts and farmers' attitudes	Cha Am		Hua Hin	
		f	%	f	%
Buying places	District town[1]	1	3	27	75
	Other district town	32	92	9	25
	Farmer's house	2	5	0	0
	Total	35	100	36	100
Reason for buying there	Cheaper	5	14	4	11
	Near and convenient	26	74	24	67
	No other market	4	12	8	22
	Total	35	100	36	100
Transport mode	Mini-bus	32	91	36	100
	Carried by humans	3	9	0	0
	Total	35	100	36	100
Reason for first used	Since first planted	8	23	12	33
	Pests occurred	20	57	15	42
	Followed neighbour	7	20	7	19
	Too many weeds	0	0	2	6
	Total	35[2]	100	36[3]	100

1 District town of the district in which the farm is situated.

2 Average of these farmers first used in 1972.

3 Average of these farmers first used in 1973.

of non-project farmers carried the chemicals on mini-buses. It was learned from the interviews that farmers in both areas first used them in 1972-3 because pests occurred.

For both project areas, the farmers buy insecticide from the cooperatives on credit.

Seed

The average cost of seed purchased per rai per family in each net farm income interval in the two non-project areas for 1974-5 is shown in Table 60. It appears that there was no correlation between the cost of seed purchased and the net farm income interval. The average cost of seed purchased per rai seems to have no relevance to the net farm income in either non-project area. However, the farmers who did not purchase seed seem to have had lower net farm incomes than those who purchased. The percentage of farmers in each non-project area who bought seed, which is shown in Table 55, seems to have a negative correlation with the net farm income shown in Table 38.

The incidence of seed buying place, with the reason for the choice, and the transport mode are shown in Table 61. In the Cha Am non-project area, nearly all of the farmers bought seed in district towns because they were near, convenient, and there were no other markets. The seed that they purchased was transported by mini-bus (48 percent of the farmers) if it were

Table 60 - Average Annual Cost of Seed Per Rai, and Incidence of Farmers Who Did Not Purchase, for Each Net Farm Income Interval in the Non-Project Study Areas for 1974 - 5

Net farm income interval (baht/year)	Cha Am					Hua Hin				
	Farmers who purchased			Farmers who did not purchase		Farmers who purchased			Farmers who did not purchase	
	f	%	Average seed cost baht/rai	f	%	f	%	Average seed cost baht/rai	f	%
Less than 5,000	40	66	15.9	22	82	60	71	30.9	17	81
5,000 - 14,999	16	26	52.4	3	11	17	20	14.5	3	14
15,000 - 24,999	4	7	28.1	2	7	7	8	55.1	1	5
25,000 - 34,999	0	0	0	-	-	1	1	31.5	-	-
35,000 - 44,999	1	1	46.9	-	-	-	-	-	-	-
More than 44,999	-	-	-	-	-	-	-	-	-	-
Total	61	100	26.8[1]	27	100	85	100	29.6[1]	21	100

[1] Weighted average.

Table 61 - Incidence of Seed Buying Places and Transport Mode for the Non-Project Study Areas for 1974 - 5

	Facts and farmers' attitudes	Cha Am		Hua Hin	
		f	%	f	%
Buying place	District town[1]	10	32	32	51
	Other district towns	19	61	7	11
	Farmer's house	0	0	2	3
	Nearby villages	2	7	19	30
	Cooperatives	0	0	3	5
	Total	31	100	63	100
Reason for buying there	Cheaper	2	6	5	8
	Near and convenient	19	56	38	59
	No other market	13	38	16	25
	Membership	0	0	3	5
	Borrowed money from merchant	0	0	2	3
	Total	34	100	64	100
Transport mode	Mini-bus	15	48	45	73
	Bicycle	1	3	9	14
	Carried by humans	2	7	6	10
	Truck	13	42	2	3
	Total	31	100	62	100

[1] District town of the district in which the farm is situated.

in small, compact units, and by truck (42 percent) if the units were large (such as pineapple plants). For Hua Hin non-project area, about 60 percent of the farmers bought seed from district towns, and about 30 percent of the farmers bought seed from nearby villages. The reason stated was that these places were near and convenient, rather than lower prices or better seeds. Most of the farmers in the Hua Hin non-project area transported the seeds to their houses or farms by mini-bus.

In both project areas, the farmers bought seed from the cooperatives on credit. The cooperatives' vehicles were used to carry it to the farm, if the loads were too heavy for the farmer to carry.

Farm Labour

The average farm labour cost per rai hired by the farmers in each net farm income interval in the non-project areas for 1974-5 is tabulated in Table 62. There is some indication that higher farm labour costs per rai are associated with higher levels of net farm income.

From Tables 38 and 62, a comparison of the mean costs of farm labour per rai with mean values of net farm income for the two non-project study areas shows a negative correlation: the Cha Am non-project area had the higher net farm income, but the

Table 62 - Average Annual Farm Labour and Farming Equipment Costs (baht/rai) Hired by Each Family in Each Net Farm Income Interval for the Non-Project Study Areas for 1974 - 5

Net farm income interval (baht/year)	Cha Am						Hua Hin					
	f	%	Average farm labour cost baht/rai	f	%	Average farming equipment cost, baht/rai	f	%	Average farm labour cost, baht/rai	f	%	Average farming equipment cost, baht/rai
Less than 5,000	40	66	11.3	40	66	67.3	60	71	63.3	60	71	109.4
5,000 - 14,999	16	26	16.4	16	26	73.4	17	20	93.0	17	20	83.7
15,000 - 24,999	4	7	9.6	4	7	86.2	7	8	239.5	7	8	185.0
25,000 - 34,999	0	0	0	0	0	0	1	1	170.2	1	1	148.9
35,000 - 44,999	1	1	48.6	1	1	84.3	-	-	-	-	-	-
More than 44,999	-	-	-	-	-	-	-	-	-	-	-	-
Total	61	100	13.1[1]	61	100	70.4[1]	85	100	85.0[1]	85	100	111.0[1]

[1] Weighted average.

Hua Hin non-project area had the higher average farm labour cost per rai. It is interesting to note that in the Hua Hin non-project area, farmers spent much more money for farm labour per rai (85 baht/year) than did those of the Cha Am non-project area (13 baht/year).

Both Hua Hin and Cha Am Project areas hired farm labour to work on the farm chiefly during the planting and harvesting seasons. The average annual man-power used for cultivation per family of the Land Development Project (the so-called Hua Hin Project) is shown in Table 63. It appears that the man-days used by each group of power source were not significantly different between 1973 - 4 and 1974 - 5. The man-power of the farmer himself and people in the family remained constant all three years. Hired man-power, which was higher in 1972 - 3 (37 percent), decreased to about 24 percent for the two following years. The decreasing hired man-power was replaced by other families who came to help on the basis of exchanging man-power. Perhaps the reason that limited the use of man-power of the farmer himself and the people in the family was the short period of time suitable for cultivating. However, the total man-power usage per family in 1974 - 5 was higher than the two previous years. This was probably caused by a change in the kinds of crops being planted.

The percentage occurrence of hiring of farm labour by the farmers in non-project areas is shown in Table 55. It appears that more Hua Hin non-project farmers hired farm labour to help on the farm than the Cha Am non-project farmer did. From Tables 38 and 55,

Table 63 - Average Annual Man-Power Usage for Cultivation per Family on the Hua Hin Land Development Project

Kind of power	1972 - 3		1973 - 4		1974 - 5	
	Total power (man-days)[1]	%	Total power (man-days)	%	Total power (man-days)	%
Farmer himself	19	14.2	16	14.8	27	16.1
People in family	38	28.4	28	25.9	41	24.4
Other families	27	20.1	38	35.2	59	35.1
Hired	50	37.3	26	24.1	41	24.4
Total	134	100.0	108	100.0	168	100.0

[1] 1 day = 8 hours

comparison of percentage occurrence and mean net farm income shows a negative correlation.

Farming Equipment

In the Hua Hin Project, tractors were available to project farmers. In the Cha Am Project area, the farmers had to hire farm tractors; these were available from the cooperative on credit. The farming equipment cost per rai in each net farm income interval for both non-project areas for 1974 - 5 is shown in Table 62. It appears that the tendency is that a slightly higher farming equipment cost per rai is associated with higher levels of net farm income, though there is generally little variation in average cost within a project. However, Hua Hin non-project farmers typically spent more for hiring equipment than did Cha Am non-project farmers.

From Tables 38 and 62, a comparison of the mean costs of farming equipment per rai with mean values of net farm income for the two non-project study areas shows a negative correlation: the Hua Hin non-project had the higher farming equipment cost per rai, but the Cha Am non-project had the higher net farm income.

The percentage occurrence of farming equipment hired by the farmers in both non-project areas is shown in Table 55. It appears that more Cha Am non-project farmers hired farming equipment than did the Hua Hin non-project farmers. Comparison

between Tables 38 and 55 shows a positive correlation between percentage occurrence of hiring farming equipment and mean net farm income.

Production Problems

Farmers' attitudes on their production problems in the study areas were recorded. Each farmer was encouraged to tell the interviewers of any problems that existed in the past year. The incidence of problems that affected their production is shown in Table 64. In the Cha Am Project, the most common complaint (38 percent of the farmers) was the inadequacy of water. In the Cha Am Project, each family occupied three rai of irrigated land. The project center (using three pumps) could supply an average of 7.2 m^3/rai of water in a day to those irrigated plots which were chiefly used to grow vegetables; but this was not enough. Other causes of problems were pests and floods due to sudden rainstorms. The reason that the project farmers complained of depression flooding was probably because vegetables need more water than field crops, but not too much at a time. Many of the Cha Am non-project farmers (37 percent) complained of pests as the cause of production problems. Also, 25 percent of these farmers complained of inadequate investment funds. In the Hua Hin non-project area, most production problems were similar to those of the farmers in the Cha Am non-project area,

Table 64 - Incidence of Cause of Problems that Affected Farm Production and Marketing in the Study Areas for 1974 - 5

	Cause of problem	Cha Am				Hua Hin			
		Project		Non-project		Project		Non-project	
		f	%	f	%	f	%	f	%
Production	Pests	65	29.8	46	37.1	↑	↑	37	26.8
	Lack of investment funds	6	2.7	31	25.0			40	29.0
	Lack of water	82	37.6	19	15.3			10	7.2
	Lack of farm labour	15	6.9	16	12.9			23	16.7
	Land clearing inadequacy	8	3.7	9	7.3	NA	NA	6	4.3
	Floods	39	17.9	1	0.8			7	5.1
	Lack of farming equipment	3	1.4	2	1.6			15	10.9
	Lack of vehicle	0	0	0	0			0	0
	Inaccessibility	0	0	0	0	↓	↓	0	0
	Total	218	100.0	124	100.0	NA	NA	138	100.0
Marketing	Low price for products	27	63	26	62	↑	↑	25	37
	Lack of vehicle	16	37	4	9	NA	NA	14	21
	Inaccessibility	0	0	12	29			22	33
	Lack of customer	0	0	0	0	↓	↓	6	9
	Total	43	100	42	100	NA	NA	67	100

except for the inadequacy of rainfall and farming equipment, and concern about flooding. Table 65, which shows the amount of rainfall and the number of rainy days in the study areas, supports the responses that the Cha Am study area farmers needed more rain than they got.

Comparing Table 38 with Table 64, it seems that pest problems had no correlation with the mean net farm income. Lack of investment funds shows a negative correlation to the mean net farm income. Lack of water seemed to be positively correlated with mean net farm income. Lack of farm labour seems to show a negative correlation with the mean net farm income, but the inadequacy of land clearing operations and depression flooding were not relevant to the mean net farm income. The lack of farming equipment appears to have a negative correlation with the mean net farm income.

Marketing Problems

Farmers' attitudes on marketing problems in each study area for 1974-5 are shown in Table 64. It appears that about 60 percent of the Cha Am Project and non-project farmers complained of low prices for their production, but only 37 percent of the Hua Hin non-project farmers complained of this. Cha Am Project farmers (37 percent) complained of the lack of a vehicle but none had a problem of inaccessibility. The non-project farmers in both the

Table 65 - Amounts of Rainfall in Each Study Area During the Period: June 1974 to May 1975

Area of study	Type of study area	Whole year rainfall (mm/year)	Numbers of rainy[1] day (days/year)
Cha Am	Project	876.9	70
	Non-project[2]	963.5	47
Hua Hin	Project	1,129.9	147
	Non-project[3]	1,019.4	121

1 Rainy day = rainfall more than 0.1 mm per day.

2 Using Cha Am District Office as representative of Cha Am non-project area.

3 Using Hua Hin Meteorology Office as the representative of the Hua Hin non-project area.

Cha Am and Hua Hin areas (about 30 percent) complained of inaccessibility being the cause of a problem in marketing.

From Tables 38 and 64, the problem of low prices appears to have some correlation with the mean net farm income. The lack of vehicles and lack of customers did not correlate with the mean net farm income at all, and inaccessibility seems to have a negative correlation with the mean net farm income.

Soil Quality

Farmers' opinions about the soil on their farms in the non-project areas are shown in Table 66. It seems that soil quality in the Hua Hin non-project area was slightly better than in the Cha Am non-project area. Comparing Table 38 with Table 66, there is seen to be a negative correlation between apparent soil quality and mean net farm income.

Availability of Water

Water for cultivation in the two non-project areas was studied, and farmers' opinions recorded as shown in Table 66. From the distribution of water adequacy levels, it seems that the Cha Am non-project area had a higher degree of inadequacy of water than the Hua Hin non-project area. This is supported by the rainfall data shown in Table 65. When comparing Tables 38 and 66, there appears to be negative correlation between

Table 66 - Incidence of Farmers' Attitudes on Soil Quality, Water Availability, and Income Before and After Road was Constructed: Non-Project Study Areas for 1974 - 5

	Farmers' attitudes	Cha Am		Hua Hin	
		f	%	f	%
Soil quality	Good	10	16	26	31
	Moderate	51	84	57	67
	Bad	0	0	2	2
	Total	61	100	85	100
Water availability	Too much	0	0	3	3
	Enough	15	25	33	39
	Slight lack	27	44	38	45
	Lack	19	31	11	13
	Total	61	100	85	100
Income before and after road constructed	Increased a lot	7	11	31	36
	Increased somewhat	28	46	19	22
	Equal	4	7	10	12
	Decreased	4	7	3	4
	No answer[1]	18	29	22	26
	Total	61	100	85	100

[1] Arrived after the road had been constructed.

availability of water and mean net farm income for the non-project areas.

Transportation Facilities

Farmers' opinions about their incomes before and after the feeder roads were constructed are shown in Table 66. It appears that the Hua Hin and Cha Am non-project farmers were not significantly different in their incomes after the feeder roads were constructed. Comparison of Tables 38 and 66 shows no correlation between income increment after the road was conotructed and mean net farm income.

For convenience, a summary of the correlation of each sector to income level and mean net farm income for 1974-5 is shown in Table 67.

Comparison of Net Total Income Between Each Study Area

The difference between net total income and net farm income, which equals non-farm income, is shown in Table 39. Farmers in the Hua Hin Project earned much lower non-farm incomes than those of the other three study areas. Therefore, after including the respective amounts of non-farm income, the net total income of the other three areas were close to that of Hua Hin Project farmers as shown in Table 38. The dispersion of net total incomes was less than the dispersion of net farm incomes.

Table 67 - Summary of the Correlation of Each Sector to Income Level, and Mean Net Farm Income for 1974 - 5

X / Y	Income level				Mean net farm income			
	CAP[1]	CAN[2]	HHP[2]	HHN[2]	CAP vs CAN	HHP vs HHN	CAP vs HHP	CAN vs HHN
Road density	NA	NA	NA	NA	+	+	–	–
Road facility	NA	NA	NA	NA	+	+	0	+
Hired vehicle availability	NA	NA	NA	NA	+	+	0	+
Cultivated area per family	+	+	0	+	+	+	+	0
Income per rai	+	+	+	+	+	+	0	+
Land value per rai	NA	+	NA	+	NA	NA	NA	–
Family residents	+	0	0	0	+	0	0	0
Debt per family	+	0	NA	+	+	NA	NA	–
Incidence of debt occurred	NA	NA	NA	NA	+	NA	NA	–
Credit per family	NA	NA	NA	NA	W	NA	NA	W
Incidence of credit occurred	NA	NA	NA	NA	W	NA	NA	W
Shares per family	NA	NA	NA	NA	NA	W	NA	W
Incidence of shares occurred	NA	NA	NA	NA	NA	W	NA	W
Deposits per family	NA	NA	NA	NA	–	+	+	–
Incidence of deposits occurred	NA	NA	NA	NA	+	+	–	–
Yield	NA	NA	NA	NA	+	+	+	–
Marketing availability	NA	NA	NA	NA	+	+	+	+
Agricultural advisory services	NA	NA	NA	NA	+	+	+	0
Fertilizer per rai	NA	+	NA	+	NA	NA	NA	+
Incidence of fertilizer purchased	NA	NA	NA	NA	NA	NA	NA	+

Table 67 (continued)

Y \ X		Income level				Mean net farm income			
		CAP[1]	CAN[2]	HHP[2]	HHN[2]	CAP vs CAN	HHP vs HHN	CAP vs HHP	CAN vs HHN
I.P.H per rai		NA	+	NA	+	NA	NA	NA	-
Incidence of I.P.H purchased		NA	NA	NA	NA	NA	NA	NA	+
Seed per rai		NA	0	NA	0	NA	NA	NA	0
Incidence of seed purchased		NA	NA	NA	NA	NA	NA	NA	-
Farm labour per rai		NA	+	NA	+	NA	NA	NA	-
Incidence of farm labour employed		NA	NA	NA	NA	NA	NA	NA	-
Farming equipment per rai		NA	+	NA	+	NA	NA	NA	-
Incidence of farming equipment employed		NA	NA	NA	NA	NA	NA	NA	+
Production problems[3]	Pest problems	NA	NA	NA	NA	-[3]	NA	NA	+[3]
	Lack of funds	NA	NA	NA	NA	-[3]	NA	NA	-[3]
	Lack of water	NA	NA	NA	NA	+[3]	NA	NA	+[3]
	Lack of farm labour	NA	NA	NA	NA	-[3]	NA	NA	-[3]
	Land clearing inadequacy	NA	NA	NA	NA	-[3]	NA	NA	+[3]
	Depression flooding	NA	NA	NA	NA	+[3]	NA	NA	-[3]
	Lack of farming equipment	NA	NA	NA	NA	-[3]	NA	NA	-[3]
Marketing problems[3]	Low price for products	NA	NA	NA	NA	0	NA	NA	+[3]
	Lack of vehicle	NA	NA	NA	NA	+[3]	NA	NA	-[3]
	Inaccessibility	NA	NA	NA	NA	-[3]	NA	NA	-[3]
	Lack of customer	NA	NA	NA	NA	0	NA	NA	-[3]

Table 67 (continued)

X / Y	Income level				Mean net farm income			
	CAP	CAN	HHP	HHN	CAP vs CAN	HHP vs HHN	CAP vs HHP	HHP vs HHN
Soil quality	NA	NA	NA	NA	NA	NA	NA	-
Water availability	NA	NA	NA	NA	NA	NA	NA	-
Transportation facility	NA	NA	NA	NA	NA	NA	NA	0

1
Total income level.

2
Net farm income level.

3
Correlation in end result is reciprocal to ordinary case.

\+ Positive correlation.

0 No correlation.

\- Negative correlation.

W=Data too weak to indicate the relationship.

NA=Not available.

X = income level, or mean net farm income.

Y = type of sectors.

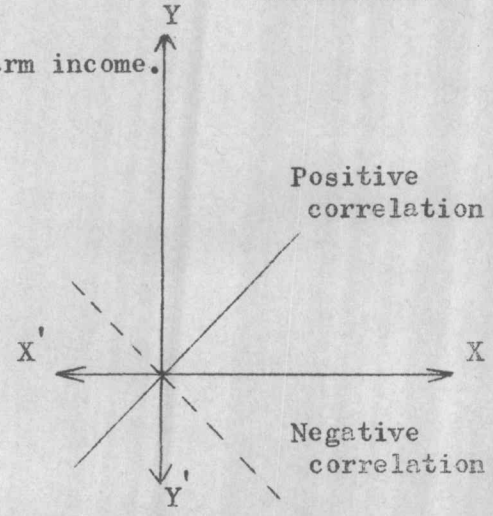
CAP = Cha Am Project area

CAN = Cha Am non-project area

HHP = Hua Hin Project area

HHN = Hua Hin non-project area

Correlation



The incremental amounts of non-farm income might not be affected by many of the principal variables. However, the number of residents in the family dwelling unit and the amounts of non-farm expenditures are thought to have some influence. From Table 46, all pairs -- except project and non-project areas in Cha Am -- showed no correlation between the number of family residents and mean net total income. Project and non-project areas in Cha Am showed some correlation between them.

The average non-farm expenditure in each net total income interval for the study areas for 1974-5 is shown in Table 68. It appears that the higher the net total income, the higher was the non-farm expenditure. Comparison of Table 38 with Table 68 shows some correlation between the mean non-farm expenditure with the mean net total income in project and non-project areas in Cha Am. The non-project pairs of Cha Am and Hua Hin failed to show correlation between non-farm expenditure and mean net total income.

To study the relationship between farm income and farm expenditure, Table 69 shows the average annual farm expenditure for each farm income interval for the study areas for 1974-5 It appears that the higher the farm income, the greater was the farm expenditure.

Table 68 - Average Annual Non-Farm Expenditure in Each Net Total Income Interval for the Study Areas for 1974 - 5

Net total income interval (baht/year)	Cha Am						Hua Hin					
	Project			Non-project			Project			Non-project		
	f	%	Average non-farm expenditure baht/yr	f	%	Average non-farm expenditure baht/yr	f	%	Average non-farm expenditure baht/yr	f	%	Average non-farm expenditure baht/yr
Less than 5,000	26	22	8,286	18	29	4,422	2	3	↑	24	28	10,647
5,000 - 14,999	57	48	8,854	25	41	8,494	25	32		40	47	11,307
15,000 - 24,999	17	14	11,014	13	21	10,526	28	36	NA	12	14	14,957
25,000 - 34,999	10	9	12,414	3	5	19,060	21	27		7	8	16,514
35,000 - 44,999	5	4	11,132	1	2	10,550	1	1		2	3	20,580
More than 44,999	3	3	16,520	1	2	5,260	1	1	↓	-	-	-
Total	118	100	9,633[1]	61	100	8,226[1]	78	100	NA	85	100	12,283[1]

[1] Weighted average.

Table 69 - Average Annual Farm Expendture for Each Farm Income Interral for the Study Areas for 1974 - 5

Farm income interval (baht/year)	Cha Am						Hua Hin					
	Project			Non-project			Project			Non-project		
	f	%	Average farm expendi-ture	f	%	Average farm expendi-ture	f	%	Average farm expendi-ture	f	%	Average farm expendi-ture
Less than 5,000	27	28	2,243	36	42	1,948				29	48	1,144
5,000 - 14,999	40	41	3,929	34	40	4,489				22	36	4,118
15,000 - 24,999	15	16	6,639	5	6	6,675				7	10	5,154
25,000 - 34,999	9	9	9,988	4	5	15,859	NA	NA	NA	1	2	4,464
35,000 - 44,999	3	3	6,323	1	1	32,609				1	2	14,890
More than 44,999	3	3	11,916	5	6	35,851				1	2	10,397
Total	97	100	4,762[1]	85	100	6,252[1]	NA	NA	NA	61	100	3,108[1]

[1] Weighted average.

Degree of Potential Development Achieved in Each Study Area

The percentage and cumulative percentage of each net farm income for each study area for 1974-5 are tabulated in Table 70 and shown in Figs.13 and 14. The net farm income distribution curves for three of the study areas seem to be similar, as shown in Fig. 15. The net farm income of the Hua Hin Project was much higher than those of the other three study areas. From Figs. 13 and 14, the 85th percentile of the cumulative net farm income of each study area was selected to separate the farmers of each study area into two groups. Those farmers whose net farm incomes were above the 85th percentile levels were considered to have achieved the near maximum of all the farmers in that study area. The remainder were considered to constitute the "rest of the farmers". The achievement quotient[1] which is

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[1] Care must be taken in interpreting the significance of achievement quotient values. Besides being a ratio of two levels of income, the value of the achievement quotient depends on the absolute levels of the values of the ratio. For example, a difference of 4,000 baht/year between the 85th percentile value and the mean income of the rest of the farmers could lead to achievement quotients of 33 percent, 60 percent, or 80 percent for 85th percentile levels of 6,000 baht/year, 10,000 baht/year, and 20,000 baht/year, respectively. As higher levels of net

(Footnote continued on p. 172)

Table 70 - Distribution and Cumulative Percentage of Net Farm Income for the Study Areas for 1974 - 5

Net farm income interval (baht/year)	Cha Am						Hua Hin					
	Project			Non-project			Project			Non-project		
	f	%	Σ	f	%	Σ	f	%	Σ	f	%	Σ
-10,000 to - 5,000	2	1.7	1.7	-	0	0	-	0	0	1	1.2	1.2
- 5,000 to - 1	32	27.4	29.1	7	11.5	11.5	1	1.3	1.3	16	18.8	20.0
0 - 4,999	35	29.9	59.1	33	54.1	65.6	4	5.1	6.4	43	50.6	70.6
5,000 - 9,999	20	17.1	76.1	12	19.7	85.3	9	11.5	17.9	13	15.3	85.9
10,000 - 14,999	13	11.1	87.2	4	6.5	91.8	18	23.1	41.0	4	4.7	90.6
15,000 - 19,999	4	3.4	90.6	2	3.3	95.1	21	27.0	68.0	6	7.0	97.6
20,000 - 24,999	2	1.7	92.3	2	3.3	98.4	9	11.5	79.5	1	1.2	98.8
25,000 - 29,999	4	3.4	95.7	-	-	98.4	11	14.1	93.6	1	1.2	100.0
30,000 - 34,999	2	1.7	97.4	-	-	98.4	4	5.1	98.7	-	-	100.0
35,000 - 39,999	2	1.7	99.1	-	-	98.4	-	-	98.7	-	-	100.0
More than 39,999	1	0.9	100.0	1	1.6	100.0	1	1.3	100.0	-	-	100.0
Total	117[1]	100.0	100.0	61	100.0	100.0	78	100.0	100.0	85	100.0	100.0

[1] Total number of farmers = 119; 2 observations missing from above data.

Fig.13-Histogram and Cumulative Distribution Curves of the Net Farm Income of Project and Non-Project Areas in Cha Am: 1974-5

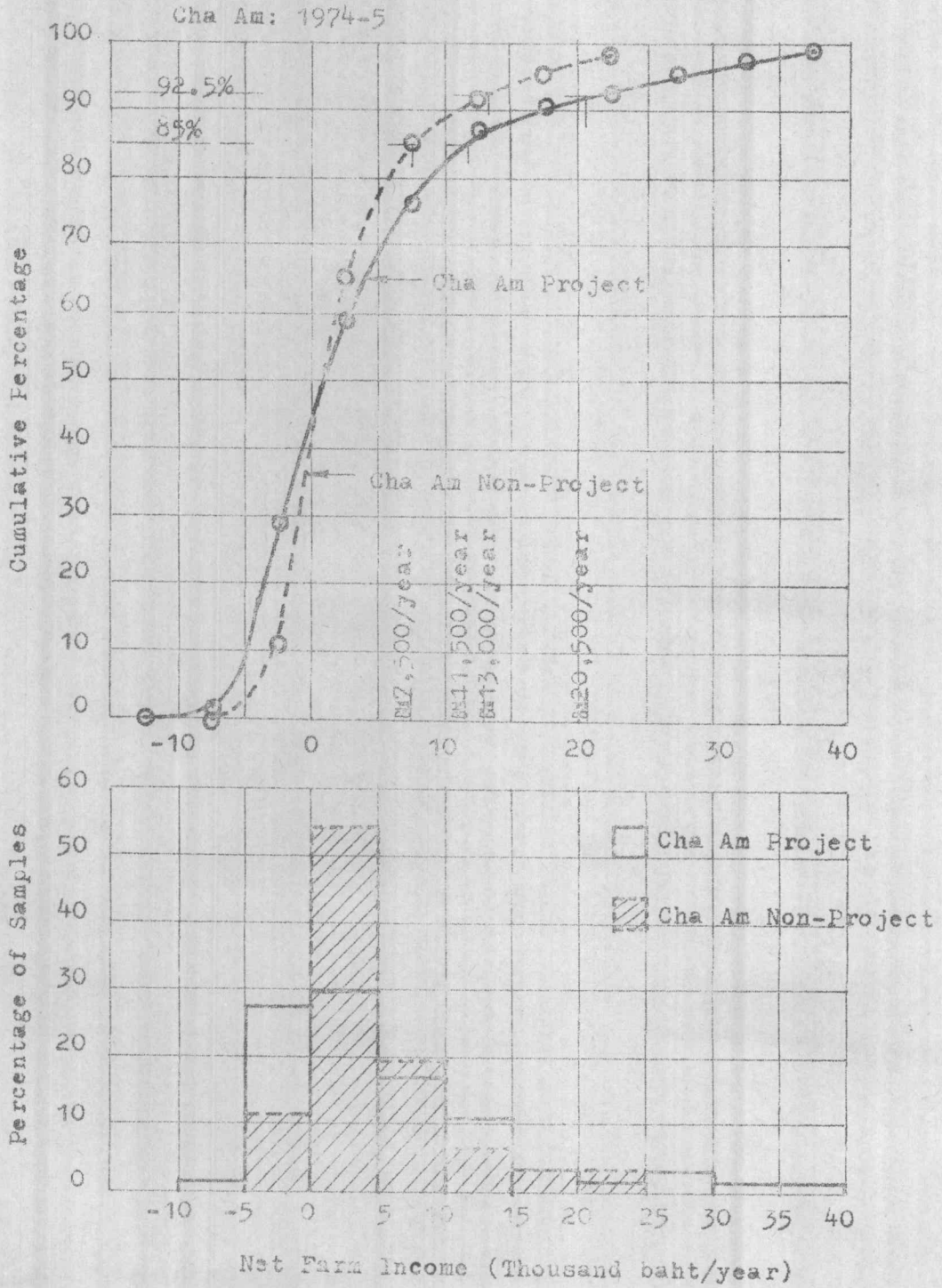


Fig.14-Histogram and Cumulative Distribution Curves of the Net Farm Income of Project and Non-Project Areas in Hua Hin: 1974-5

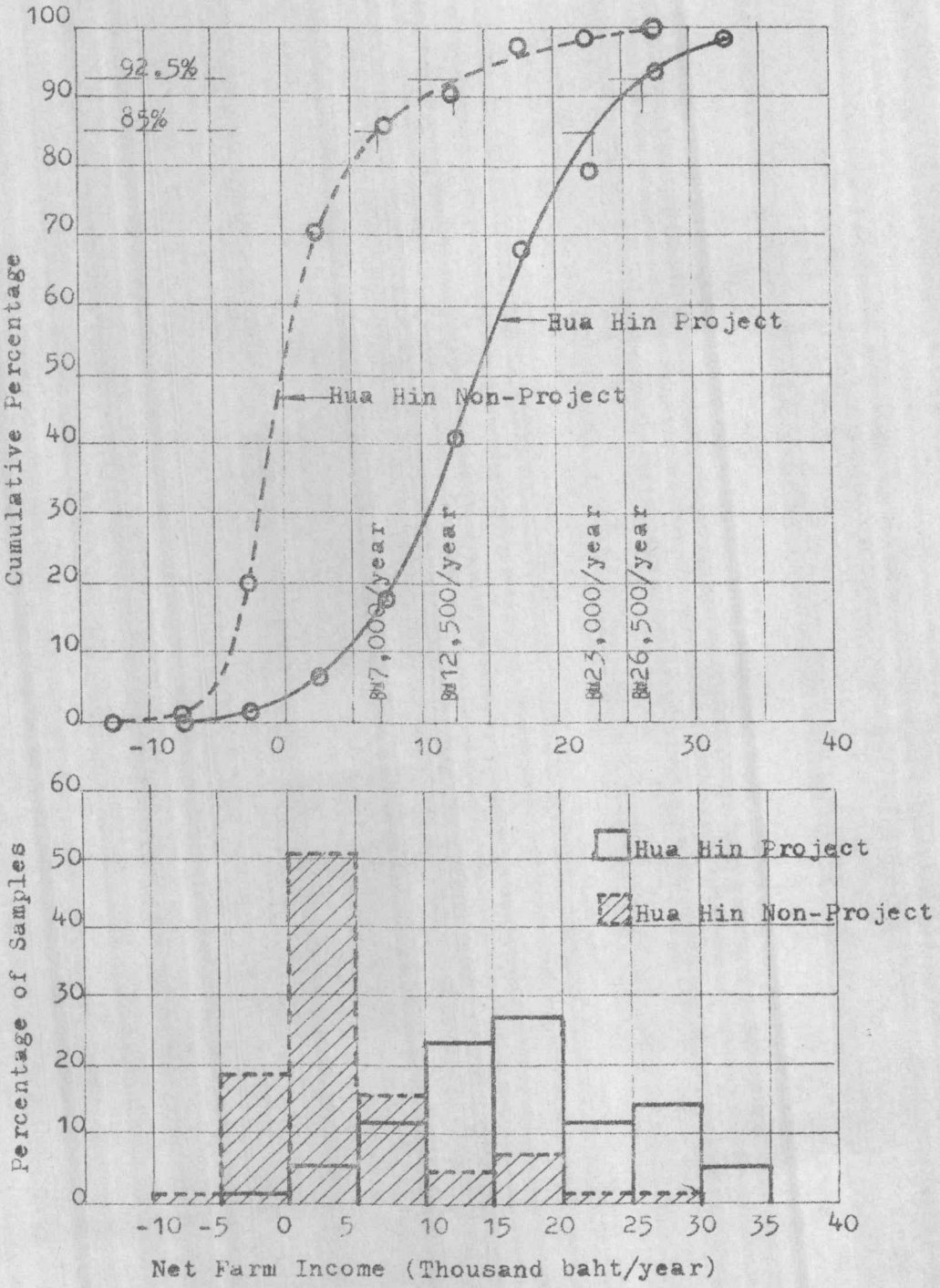
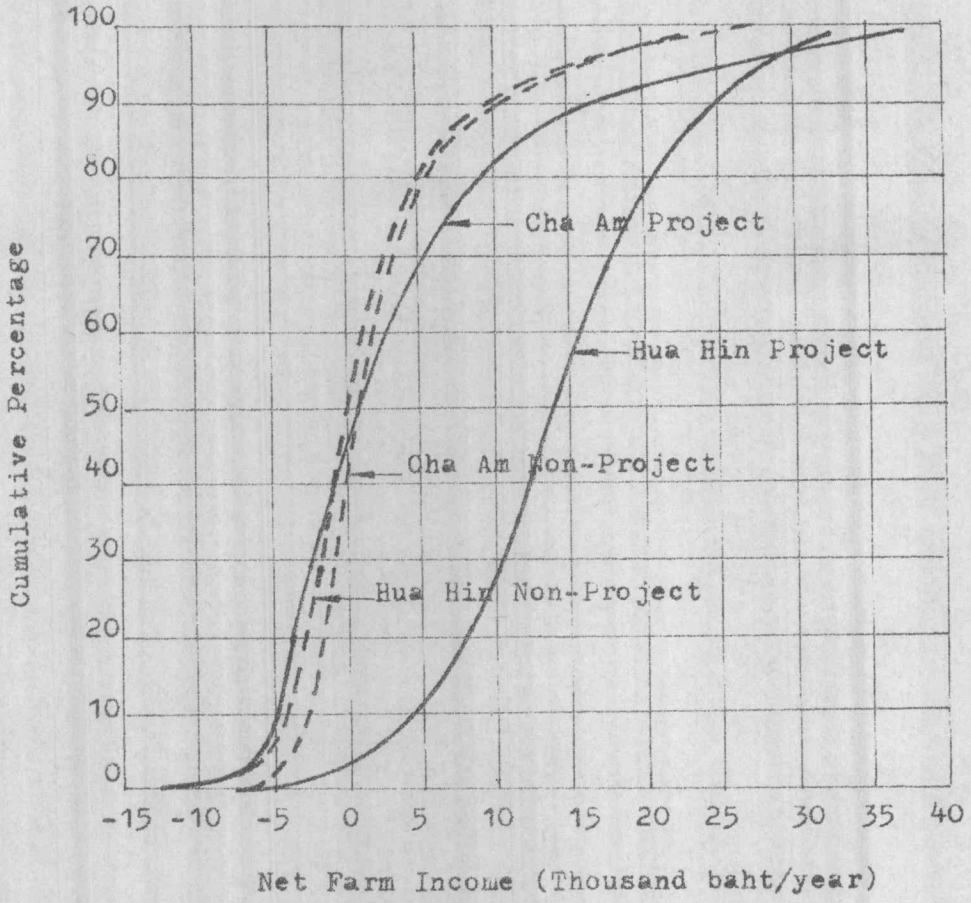


Fig.15-Cumulative Distribution Curves of the Net Farm Income of the Study Areas for 1974-5



the ratio of the mean net farm income of the rest of the farmers to that of the high achievement group (taken as the 85th percentile level of all farmers) of each study area is tabulated in Table 71.

From Table 71, it can be seen that the Hua Hin Project had the highest achievement quotient (59 percent). The Cha Am Project was the lowest achievement study area (20 percent). For the Hua Hin Project, the income distribution of the rest of the farmers more nearly approached the high achievement group than did the three other study areas. Even though the Cha Am Project farmers had an average net farm income higher than the farmers of the two non-project study areas, the incomes of the rest of the farmers were far behind that of the high achievement group. Hence, the achievement quotient of the Cha Am Project was the lowest of all the study areas.

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farm income are a desirable objective of farming, the position effect which is inherent in this ratio serves to mark a high level of income of the rest of the farmers with a high achievement quotient. At high absolute levels of net farm income, perhaps the differences are less important than at lower levels; the achievement quotient reflects this lesser importance with higher absolute levels of net farm income.

Table 71 - Potential Development Levels and Achievement Quotients Based on Net Farm Income (baht/year) in the Study Areas for 1974 - 5

Area of study	Type of study area	High achievers[1]				Rest of the farmers		Achievement quotient, %
		f	Net farm income, baht			f	Mean net farm income, baht	
			Mean	Median	85th percentile of all farmers			
Cha Am	Project	25	24,254	20,500	11,500	94	2,305	20
	Non-project	16	14,389	13,000	7,500	45	1,958	26
Hua Hin	Project	19	28,584	26,500	23,000	59	13,494	59
	Non-project	17	14,188	12,500	7,000	68	1,732	25

[1] Defined as having net farm incomes greater than the 85th percentile value for the study area.

The values of factors pertaining to economic achievement in the non-project study areas for 1974-5 are shown in Table 72. It appears that the high achievement group had their houses and farms nearer to the road than those of the rest of farmers. The high achievement group also appears to make more trips, to cultivate more area, and to earn more net farm income per rai than the rest did. Their land values, the family residents who worked on the farm, and their maize yields were all greater than corresponding values for the rest of the farmers. The agricultural advisors met them more often, and the high achievement farmers used more fertilizer, pesticide, seed, farm labour and farming equipment, and had more shares and deposits in cooperatives or banks. The distance from their houses to the farms, their debt and their credit seem to bear no relationship to their net farm incomes.

Table 72 - Values of Factors Pertaining to Economic Achievement in the Non-Project Study Areas for 1974-5

Type of factors	Cha Am		Hua Hin	
	[1]HA	[2]RF	[1]HA	[2]RF
Distance from house to road (km)	0.04	0.56	0.21	0.39
Distance from house to farm (km)	0.41	0.31	0.30	1.08
Distance from farm to road (km)	0.03	0.92	0.33	0.77
Trips[3] per month	3.98	2.57	6.16	5.33
Cultivated area (rai)	30.7	17.6	32.5	17.5
Net farm income per rai (baht)	469	107	436	98
Land value (baht/rai)	2,107	1,393	2,187	1,847
Residents[4] (persons/family)	3.50	2.62	3.24	2.88
Debt (baht)	850	1,594	3,647	2,265
Credit (baht)	375	0	0	59
Shares (baht)	100	8	41	25
Deposits (baht)	928	28	1,706	559
Agricultural advisory service (times/year)	1.13	0.38	0.94	0.82
Maize yield (kg/rai)	173	88	334	192
Fertilizer used per rai (baht/year)	731	241	709	109
Pesticide used per rai (baht/year)	510	131	2,073	242
Seed purchased per rai (baht/year)	1,299	303	1,068	486
Farm labour employed per rai (baht/year)	469	209	5,353	1,102
Farming equipment employed (baht/year per rai)	2,267	1,178	4,154	1,865
Net farm income (baht/year)	7,500[5] 13,000[6]	1,958	7,000[5] 12,500[6]	1,732

[1] HA = high achievers.

[2] RF = rest of the farmers.

[3] One round trip of the residents working on farm.

[4] Number of residents working on farm.

[5] 85th percentile levels of net farm income of all farmers in the study area.

[6] Median net farm income of the high achievement group in the study area.