INCIDENCE AND DETERMINANTS OF NONFISHING EMPLOYMENT AMONG FISHERMEN: CASE STUDY OF THE STATE OF MALACCA, MALAYSIA*

by

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CONTENTS

ABSTRACT

Restriction or reduction of fishing effort is a universal prescription for an overexploited fishery. Conceivably the approach taken ranges from taking fishermen out of fishing completely to developing alternative sources of income for fishermen. The former approach imposes drastic changes on fishermen. The latter approach promises better prospects for success as fishermen are not divorced abruptly from their connections to the sea. Furthermore there is a strong subsistence component in most traditional small-scale fisheries which implies fishing communities will be deprived of an important source of protein food if they are prohibited from fishing.

This paper attempts to look at the incidence and nature of nonfishing employment and explore the main determinants of fishermen participation in these nonfishing activities. The study is focused on fishermen in the state of Malacca and is based on data collected from a survey of 285 respondents in early 1992.

The incidence of nonfishing employment is high (40%) in terms of numbers of fishermen having nonfishing employment and in terms of contribution of nonfishing to total income (38%). The importance of nonfishing income in improving income distribution, as evidenced by the Gini coefficient is not supported by this set of data. The main factors affecting participation examined are age, income from fishing, educational level, family size, and distance from town center. The influence of these factors on participation in nonfishing employment are examined via the logit and probit regression procedures.

1. Introduction

The role of off-farm employment (part time farming) among farmers and its role in the development process has been well documented in the agricultural development literature. Among others this includes special publications like the comprehensive survey by Frauendorfer (1966), a special issue of GeoJournal (6(4) 1982), a special issue of Sociologia Ruralis (Vol. XXIII No. 1 - 1983), and more recently a book by Hallberg et al. (1991). In Asia Shand (1985) is a two-volume monograph devoted to part-time farming in Asia. There are numerous other articles and publications on the subject. Some of these will be referred to later. However, the literature on nonfishing employment (part-time fishing) among fishermen in Asia is very scanty (see Panayotou 1985). This is rather surprising as the fisheries sector is quite important, especially for most coastal state in the region. This is even more surprising considering the fact that most fisheries today are in a state of overexploitation and restriction or reduction in fishing effort, which includes reducing the number of fishermen, has been advocated for most of them. There is general agreement that the solution to most fisheries problems lies outside the fisheries sector (Smith 1981). Reduction of fishing effort entails getting fishermen out of the fishing enterprise entirely or developing sources of nonfishing employment to compensate for restricted fishing opportunities. There is little evidence that fishermen relocation schemes have been successful. Fishermen generally do not like such drastic changes to their lifestyles when they are removed completely from the sea. There is, without a doubt, an emotional attachment to the sea. Furthermore, there is a strong subsistence component in most traditional small scale fisheries which implies many fishermen and their families will be deprived of an important source of protein food if they are

relocated away from the sea. Hence, the development of alternate sources of nonfishing employment is an important viable option in the effort to uplift the socioeconomic status of fishing communities. Furthermore, there is reason to believe that returns from nonfishing employment would be higher than that from fishing and thus should be promoted irrespective of whether fishing effort should be reduced or not. Documenting the incidence and understanding the determinants of fishermen participation in nonfishing activities are therefore of critical importance in the formulation of policies affecting the fisheries sector.

This paper is an attempt at applying the off-farm research framework to a case involving the fishery sector. In the section following this introduction we review briefly the evolution of off-farm employment and highlight some issues that have arisen out of the off-farm employment research. Similarities and differences between off-farm and nonfishing activities are noted. This section is important as it provides the necessary perspective on the nature and issues involved is nonfishing employment. The next major section presents the results of the case study on nonfishing employment and income among fishermen in the state of Malacca. A final section provides a summary and conclusions of the study.

2. Review of Nonfishing Employment

2.1 The Evolution of Nonfishing Employment Among Fishermen

Shand (1985) and Ho (1986) discuss the linkage mechanisms between agricultural development and multiple job holding by farmers at different stages of growth of the overall economy.

In the very early stage of development the economy is predominantly rural and agricultural. Agriculture is traditional, productivity is low and is mainly for subsistence. The sector is basically a closed sector with minimal contacts with those in other sectors. Since farming activities are quite seasonal, farmers are involved with nonagricultural production but mainly for own consumption or supplying local needs. These nonagricultural activities are undertaken only after the labour requirements of farming are met. In other words these activities are supply determined with farming as the main activity. Returns, or wages, from these nonfarming activities are generally lower than that from farming.

With improvements in agricultural productivity there is a tendency for labour to shift to agriculture from these nonagricultural activities because of increased cropping intensity and higher labour use. Nonagricultural activities may persist but they may become specialised activities rather than a mixed enterprise. These activities also tend to be diversified from agricultural related activities. As the sector is opened up and with decreasing transport and marketing costs there is a tendency for the output of the rural nonagricultural enterprises to be replaced by that from the more commercialized manufacturing and urban based industries. Hence the rural nonagricultural activities are transformed from supplying local rural needs to that of meeting urban-based demands. Proximity to urban areas becomes an important determinant of these activities. They thus become demand determined (instead of supply determined). Returns from nonagricultural enterprises increase and could even be higher compared to that from agricultural activities. As intersectoral linkages are strengthened, increasing commercialization and specialisation and rising income raise the opportunity cost of agricultural labour. Labour intensity in agriculture declines

and so does the importance of agriculture as a source of employment and income.

The situation is basically the same with respect to the fishing sector. Like agriculture fishing is quite seasonal and fishermen have been involved with supplementary non-fishing activities. These activities are generally related to supplying inputs to the fishing enterprises (boat-building, net making, petty trade etc.) and/or processing harvest (fermented fish, dried fish etc.). In the early stage of development these non-fishing activities are meant for local supply or consumption only. With overall development and increasing commercialisation these activities become more specialised and linkage to the urban industrial sector are stronger.

There is, however, a fundamental difference between farming and fishing. Although farming is subject to the land constraint, the constraint imposed by the fish stock on fishing is what distinguishes it from farming. (However, aquaculture is more like farming). Land is stationary while the fish stock is mobile. Fishing is basically a hunting operation as opposed to a culturing (husbandry) practise of farming. A lot of the input into fishing basically goes to searching. While there is a lot of flexibility in mixing farming and nonfarming activities, one can distribute husbandry practices within the growing cycle to suit nonfarm activities, but fishing and nonfishing activities are almost mutually exclusive. The opportunity cost of a fishing day postponed is direct and instantly felt. Farming activities can be shared much more easily among family members but fishing is usually done only by the regulars (usually males) in the family.

2.2 Definition and Measurement of Nonfishing Employment

In studying the phenomenon of nonfishing employment among fishermen the question of classifying fishermen by participation and the degree of involvement in non fishery employment becomes crucial. For this we have to turn to the off-farm employment or part-time farming literature.

As mentioned earlier, the literature on nonfishing employment among fishermen is very scanty. In fact it is safe to assume that there is no study that directly addresses this issue in Malaysia. This section is based heavily on the literature developed around the part-time farming (PTF) issue.

In the PTF literature the unit of analysis has been focused on the farm, farmer, and farm-family.

A focus on the farm usually relates to the labour requirement of the farm or the annual work unit (AWU) which is equivalent to one man year of labour. Hence a full-time farm ought to be able to keep one person fully occupied throughout the year - based on the generally accepted standard of 275 standard man days per year, 40 hour work week or 1800 hrs per year.

A focus on the farmer usually relates to the existence of nonfarm work or gainful activity outside the farm. Related to this is the proportion of his time spent farming or the contribution of farm to total income. Although the percentage figure may vary it is generally accepted that a farmer who works less than 50% of his time on the farm is not considered a full-time farmer. The same percentage figure applies to proportion of total income derived from the farm. A full-time farmer is one who

derives more than 50% of his income from farming. Note that income is not necessarily proportional to the time spent working.

From the above discussion it is quite possible for a full-time farmer (who devotes all his labour to farming) to work a part-time farm (with actual labour requirement of less than the AWU). This is likely if the farmer has unearned sources of income (eg. pensions, remittance from children) and/or prepared to accept the part-time status due to age or simply because of the unavailability of off-farm employment. On the other hand a farmer operating a full time farm (more than one AWU) may employ hired-labour and/or labour-saving devices to enable him to work part-time (in terms of hours on the farm).

Still, another focus of the part-time studies is the family/household (Tai et al. 1987). It is argued that it is the household and not the farmer alone that is the decision-maker. The measurement used is still the existence of outside gainful employment by household members.

In the Malaysian case the Fishermen Association Act specifies that a "true" fishermen is one who fishes not less than 120 days a year or derives not less than 60% of total income from fishing. Thus based on the standard number of days of employment (i.e. 275 days per year) a full-time fishermen is one who spends 43.64% of his time (in terms of days) on fishing. (This figure used to be 90 days or 32.73% of standard man year).

The Fishermen Act definition, however, does not distinguish aquaculturists from fishermen who go out to sea. The present study, however, separates aquaculture from

capture fishing as the two activities are not similar even though the output could be the same product. In the main this distinction is necessary as the two activities are not dependent on the same resource stock.

3. Analytical Framework

For the theoretical underpinnings explaining nonfishing employment by fishermen we can resort to the basic labor-leisure decision model (Sumner, 1982; Huffman, 1980; Silberberg, 1990; Deaton and Muellbauer, 1980 among others).

Basically a fisherman is faced with the decision of allocating a given endowment of total time (TT = 168 hrs/wk) to a combination of (1) time spent fishing (TF), (2) time spent on other employment (TNF) and (3) time spent on nonemployment activities i.e. leisure (TL). While time spent on nonemployment activities is assumed to contribute directly to his utility (the objective function), time spent working does not. Rather income generated from work is used to consume a bundle of goods that contribute to utility. These goods can be represented in the utility function by the single composite good G. Note that G must be equal to total expenditure which are derived from total income Y. Thus this consumption is influenced by the factors influencing all earnings.

The objective function of the fisherman thus can be stated by the following:

$$U = U (TL , G , X)$$

where G is the bundle of goods consumed and X represents the exogenous factors, fixed prices and other characteristics affecting utility such as age, education etc.

The constraints facing the fisherman in maximizing the above objective are thus the time and income constraints.

Earned income is derived from working (TT-TL) hours. In this analysis there are two possible sources of earned income - income from fishing,(YF) and income from nonfishing employment (YNF).

Other than time spent fishing (TF), fishing income is influenced by price of fish (P_f) and prices of non labour variable inputs (P_v) and quantities of fixed factors - made up of the fisherman's own human capital stock (H_f) and other fixed stock (K_f). YF can thus be interpreted as net fishing returns to fisherman time and fixed factors. This can also be interpreted as the transformation function-transforming time into consumption goods.

The fish earnings function can be written as

$$YF = YF\ (TF,\ P_f,\ P_v,\ K_f,\ H_f).$$

The marginal earnings from fishing can be written as

$$MY_f = \partial\ YF/\partial\ TF = MY_f\ (TF,\ P_f,\ P_v,\ K_f,\ H_f)$$

This can be interpreted as the marginal productivity of time in the production of goods for consumption.

Income from nonfishing employment is clearly a function of the ongoing wage rate W_{nf}, which is influenced by labor market conditions, and skills and experience i.e. human capital in nonfishing employment (H_{nf}), and other factors (Z_{nf}). This can be written as

$$YNF = YNF\ (TNF,\ W_{nf},\ H_{nf},\ Z_{nf})$$

The marginal earnings from nonfishing work is

$$MY_{nf} = \partial YNF/\partial TNF = MY_{nf}(W_{nf}, H_{nf}, Z_{nf})$$

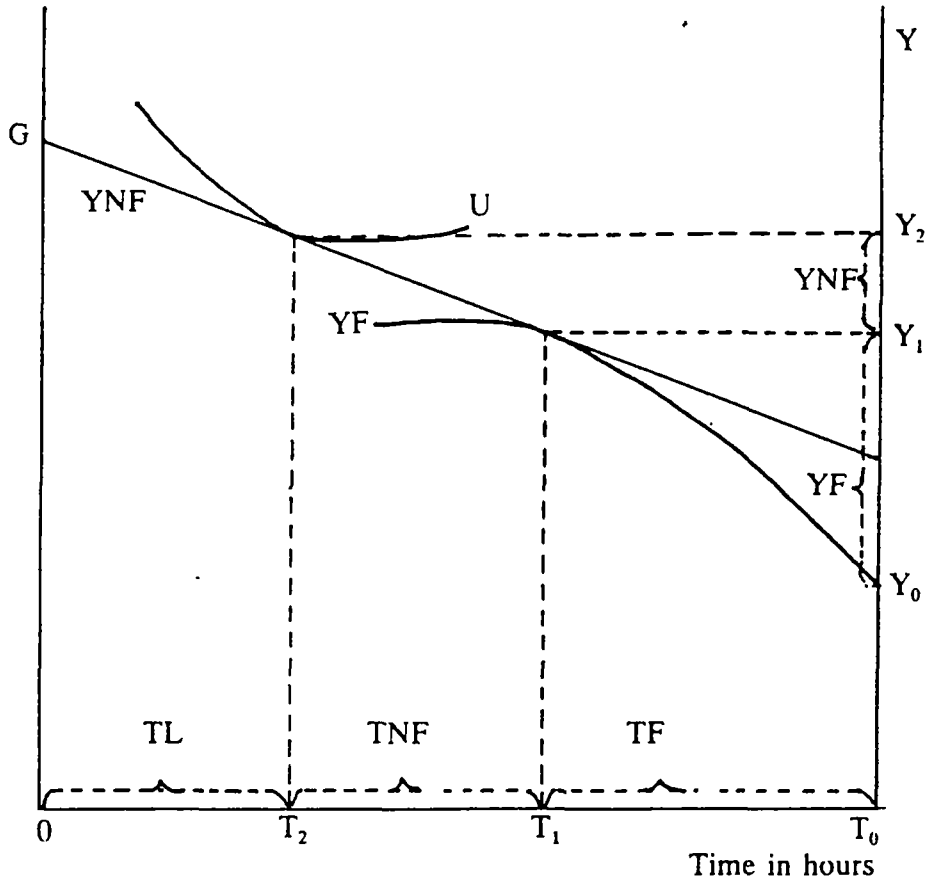
It is clear that the fisherman will not participate in nonfishing employment as long as the marginal earnings from fishing is greater than that from nonfishing employment. The other source of income is from unearned sources i.e. those not influenced by the time allocation. This can include pensions, remittance from family members, and other transfer payments. These sources of income can, however, influence time spent earning income. This utility maximizing framework can be illustrated by Figure 3.1.

The horizontal axis measures the time scale (hours per week) from left to right with a maximum, the time endowment, at T_o (i.e. T_o = 168 hours/week). The vertical axis measures the value of earnings and expenditures on consumption goods. Y_o represents the level of unearned income.

The curve Y_o YF shows the net earnings from fishing associated with time spent fishing, measured from right to left. As mentioned earlier this can be viewed as the transformation curve between time and goods consumed (income). The slope of this curve is the marginal earnings from fishing.

The line YNF represents the budget line from nonfishing employment. Its slope is the marginal earnings from non fishing work. Since the fisherman will only participate in nonfishing employment if $MY_{nf} > MY_f$ the total budget constraint facing the fisherman is T_oYNF. Thus to the left of T_1, the fisherman will be engaged in nonfishing employment as shown for the individual represented by the utility level curve drawn. For that individual the time spent fishing is $T_o - T_1$, time spent on nonfishing work is $T_1 - T_2$, while the remainder is spent on nonwork activities.

Figure 3.1: Time Allocation of A Utility Maximizing Fisherman With Nonfishing Employment



4. Case Study of the State of Malacca, Malaysia

4.1 Data

The data for this study is derived from a cross-sectional survey of fishing households implemented in February 1992. The population for this study is the list of members of the two (West Malacca and South Malacca) Fishermen Associations (FA) in Malacca. It is estimated that 80% of fishermen in the state of Malacca are members of the respective association. A sample of 285 respondents or about 20% of the population was selected from 32 fishing villages throughout the Malacca state coastline. This is roughly 18% of the total number of fishermen (estimated at 1557) reported by the Dept. of Fisheries for the state of Malacca in 1990. The sample from South Malacca FA was further divided into Central Malacca (117 respondents) and South Malacca (79). The remainder (89) are members of the West Malacca FA. Central Malacca occupies the central part of the state and is within the vicinity of the City of Malacca while the other sub-areas lie to the north and south of the city. The population of Malacca is about 531,000 in 1990 and about 89,000 (17%) reside in the city area, the state capital and the largest city in the state.

4.2 Sample Characteristics

This section presents the characteristics of the sample surveyed. Of the total(285), 31% are members of the West Malacca Fishermen Association, categorised for this study as North Malacca (Table 4.1). The rest are from the South Malacca Fishermen Association which has been divided into central and south Malacca sub regions each with 41% and 28% of the sample, respectively. The city of Malacca, the largest city

in the state, is situated in the central region and most of the industrial areas are located here.

Table 4.1: Distribution of Respondents by Location and Ethnicity

	North	Central	South	Total
Malays	82	69	66	217
	(37.8)	(31.8)	(30.4)	
	(92.1)*	(59.0)	(83.5)	(76.1)
Chinese	7	31	13	51
	(13.7)	(60.8)	(25.5)	
	(7.9)	(26.5)	(16.5)	(17.9)
Portuguese	-	17	-	17
		(100)		(6.0)
		(14.5)		(6.0)
Total	89	117	79	285
	(31.2)	(41.1)	(27.7)	(100)

* Figures in parentheses refer to % of row total and % of column total, respectively.

In terms of ethnic background most of the respondents are Malays (217 or 76.1%) followed by Chinese (51 or 17.9%) and those of Portuguese descent (17 or 6%). (Table 4.1). All of the Portuguese fishermen are located in central Malacca. They constitute 14.5% of the respondents in this region. The Malays and Chinese form about 59% and 26.5% of the sample, respectively, The Malays are predominant in north and south Malacca -92.1% and 83.5%, respectively.

Table 4.2 shows some of the personal characteristics of respondents. The average age of respondents is 47 years. Majority of them (71%) have only primary level education

while 9.5% did not even complete the primary level. About 19% have had secondary level education with about 8% at the upper secondary level.

Table 4.2: Personal Characteristics of Respondents

	Average	No.Reporting	% of Total (n=285)
Age (years)	47.23	285	100.0
Educational Status		285	100.0
Upper secondary		23(8.1)*	
Lower secondary		32(11.2)	
Primary		203(71.2)	
No schooling		27(9.5)	
Previous Employment		126	44.2
Agriculture		13(10.3)	
Factory Hand/Labourer		51(40.5)	
Military		29(23.0)	
Misc		33(26.2)	
Present Activities			
Fishing		257	90.2
Aquaculture		20	7.0
Tourist Related Activities		23	8.1
Others		114	40.0

* Figures in parentheses are % of those reporting.

A lot of the respondents did not start out as fishermen. About 44% have had previous employment before becoming fishermen. Fourty per cent of these were labourers or working in factories, 23% were in the armed forces including the police service, 10% were engaged in agriculture while the rest (about 26%) had miscellaneous jobs in the private and public sectors as clerks, storekeepers, lorry attendants etc.

Ninety per cent of the respondents are currently involved in fishing. Some are involved in aquaculture (7%) and tourism related activities (8.1%) (like guiding sports fishermen and picnickers). A substantial portion (40%) of them are involved with

other activities which include running small business ventures, agricultural activities, salaried employment in the private and public sectors, labourers, and miscellaneous other jobs.

The average household is made up of 5.8 individuals, inclusive of the respondent (Table 4.3). Other members of the household include the wife, 2.9 children (average of 3.3 for the 86% reporting) and another member of the family, usually parents and parents in law, children in law, grandchildren, sibling etc. Table 4.4 shows the age distribution of the household members. More than two-thirds of household have the largest number of members within the 18-30 year category. This is followed by 0.8 individual in the 7-12 year category (with 52% of households reporting having members of this age). The average age of children is 14.9 years while the average number of children aged less than 15 years is 2.6 (reported by 78.6% of households).

Almost 42% (117) of respondents reported being involved with more than one activity. Of the 162 single job holders 86.4% are fishermen, 1.8% are those involved with tourism related activities, 1.2% are aquaculturists and 10.5% with miscellaneous other jobs. Of the 257 fishermen, 45.5% reported multiple job holdings.

Table 4.3: Composition of Household Members

	Average of those Reporting		Overall Avg. (n=285)
	Number	% Reporting	
Wife	1.0	91.6	0.92
Children	3.3	86.3	2.87
Parents	1.4	17.9	0.25
Sibling	2.6	16.1	0.42
Parents in law	1.3	3.2	0.04
Children in law	1.4	5.6	0.08
Grandchildren	2.1	9.1	0.19
NL	2.4	2.8	0.07
Total	4.9	99.3	4.83

Table 4.4: Age Distribution of Household Members (Excluding Respondent)

Age Category	Average of those Reporting		Overall Avg. (n=285)
	Number	% Reporting	
0-6	1.6	39.6	0.6
7-12	1.6	51.6	0.8
13-15	1.2	42.8	0.5
16-17	1.2	28.8	0.3
18-30	1.8	66.7	1.2
31-40	1.1	38.2	0.4
41-55	1.1	53.0	0.6
>56	1.2	23.2	0.3

In terms of educational achievement, only 13 (4.6%) households reported having members with tertiary education (Table 4.5). The corresponding figures for upper secondary and lower secondary are, respectively, 155 (54.6%) and 179 (62.8%). The majority (73%) of households have members with primary education. However, a

Table 4.5: Educational Status of Household Members

	Average of those Reporting		Overall Avg. (n=285)
	Number	% Reporting	
Tertiary	1.3	4.6	0.06
Upper Secondary	1.8	54.4	0.96
Lower Secondary	1.8	62.8	1.12
Primary	2.1	73.0	1.51
No Schooling	1.4	50.5	0.71

substantial portion (50.5%) of household still have members with no schooling at all. This should be interpreted as those who did not complete the primary education and is usually associated with the older members of the household.

As mentioned earlier not all of the respondents are currently active in fishing. Table 4.6 shows that fishermen on average spend 126 hours per month fishing. This translates to 31.5 hours per week which is somewhat less than the standard full time 40 hour week. The average for the overall sample is much less at 113 hours per month or 28.3 hours per week. Twenty respondents (7%) are engaged in aquaculture and the average time spent by them is 56 hours per month (or 14 hours/week). Of the 111 respondents (38.9%) that reported employment in other activities, they put in about 125 hours per month (31 hours/week) for these activities. On the whole the respondents spend 171 hours per month (43 hours/week) on all these activities.

Table 4.6: Monthly Hours of Work - Respondents

	Average of those Reporting		Overall Avg. (n=285)
	Number	% Reporting	
Fishing	126.18	89.8	113.34
Aquaculture	55.95	7.0	3.93
Others	124.99	38.9	46.68
All	171.36	96.8	165.95

Table 4.7 shows that respondents spend an average of 19 days on all other activities per month. With an average of 6.7 hours per day this makes the total of 125 hours per month (or 31.2 hours per week) spent on all other activities.

4.3 Role of Nonfishing Income

Fishing is by far the most important source of income for respondents (Table 4.8). Sixty two per cent of monthly average income are derived from fishing. This is followed by income from all other activities of RM138.60 (28%). Aquaculture and tourism related income are next with RM29.86 (6%) and RM18.84 (3.8%) respectively.

Table 4.8: Employment and Earned Income of Respondents

Employment Category	Average Income of those Reporting		Overall Avg. (n=285)
	Average	% Reporting	
Fishing	346.17	88.8	307.30
Aquaculture	447.90	6.7	29.86
Tourism related	255.71	7.4	18.84
Other	355.87	8.9	138.60
Total Earned Income	508.89	97.2	494.60

Table 4.7: Average number of days, hours per day and total monthly hours of other work performed by Respondents

	Days/month			Hours/day			Hours/month		
	Average of those reporting		Overall Avg.	Average of those reporting		Overall Avg.	Average of those reporting		Overall
	Average	% reporting		Average	% reporting		Average	% Reporting	Avg.
Business	19.9	14	2.79	6.5	14	0.91	135.48	14	19.01
Processing	5	0.4	0.02	4	0.4	0.01	20	0.4	0.07
Salaries -private	23.33	5.3	1.23	7.4	5.3	0.39	176.47	5.3	9.29
Salaried -public	21	4.6	0.96	9	4.2	0.38	180.33	4.1	7.59
Agriculture	17.04	8.1	1.38	3.96	8.1	0.32	59.30	8.1	4.79
Contract Labour	14.4	5.3	0.76	7.47	5.3	0.39	108.80	5.3	5.73
Odd job	15	2.5	0.37	5.5	2.1	0.12	70	2.1	1.47
Carpentry	8.67	1.1	0.09	8	1.1	0.08	69.33	1.1	0.73
Total	19.14	39.6	7.6	6.69	39.9	2.61	124.99	38.9	48.68

Table 4.9 shows the relative contribution of the various activities to income from all other sources. Income from business leads all others with RM62.75 per month. The other major contributors are salaried employment (RM41.33), contract labour (RM14.21) and agriculture (RM12.67).

The employment status of household members can be seen from Table 4.10. By far the most important type of employment for household members are as factory workers and private-sector salaried employees. These are reported by 26% and 24.6% of the households respectively. Only 9.5% of households have a household member engaged in fishing. Thus fishing is clearly restricted to the household head for most of the families interviewed.

Table 4.9: Earned Income of Respondents from Other Sources by Job Category

Employment Category	Average of those Reporting		Overall Avg. (n=285)
	RM	% Reporting	RM
Business	447.12	14.0	62.75
Handicraft	70	0.4	0.25
Processing	100	0.4	0.35
Salaried Private	419.67	5.3	22.09
Salaried Public	421.85	4.6	19.24
Agriculture			
Contract	171.90	7.4	12.67
Labourer	270.00	5.3	14.21
Odd job	283.00	2.1	5.96
Carpentry	103.33	1.1	1.09
Total	355.87	38.9	138.60

Table 4.10: Number of Household Members Employed in Various Activities

Employment Categories	Average of those Reporting		Overall Avg. (n=285)
	Number	% Reporting	
Fishing	1.26	9.5	0.12
Salaried-Public	1.19	9.1	0.11
Salaried-Private	1.40	24.6	0.34
Handicraft	1.16	6.7	0.08
Processing	1.0	1.1	0.01
Business	1.23	10.5	0.13
Factory	1.39	26.0	0.36
Agriculture	1.0	0.7	0.01

Table 4.11 shows the income derived from employment by household members. The main contributors, to overall monthly average income of household members are salaried employment in the private sector (RM83.90) and public sector (RM42-60), factory (RM74.67), business (RM35.97), fishing (RM23.97) and handicraft (RM13.65). The total income earned by all household members is RM 365.16 per month. As can be seen from Table 4.12 this is equivalent to 40.4% of total household income of RM903.97 from all sources. Unearned income, mainly remittances from family members who have moved out, constitutes about 4.9% of total household income.

Table 4.11: Earned Income of Household Members by Job Category

Employment Category	Average of Those Reporting		Overall Avg. (n=285)
	RM	% Reporting	RM
Fishing	252.96	9.5	23.7
Salaried-Public	505.83	8.4	42.60
Salaried-Private	356.89	3.5	83.90
Handicraft	228.82	6.0	13.65
Processing	150.00	1.1	1.58
Business	353.45	10.2	35.97
Pension	245.71	2.5	6.04
Factory	295.56	25.3	74.67
Agriculture	175.00	0.7	1.23
Total	562.54	64.9	365.16

Table 4.12: Sources of Household Income

	Average of Those Reporting		Overall Avg. (n=285)
	RM	% Reporting	RM
Respondent	508.89	97.2	494.60
Wife	228.78	14.4	32.91
Other	599.30	55.4	332.25
Remittance	177.47	24.9	44.21
Total Household	910.36	99.3	903.97

Besides narrowing the gap between rural and urban household incomes the PTF literature consider nonfarm employment as a potential factor in improving the distributional equity of rural household income (Shand 1986). Table 4.13 presents the distribution of total household income as well as that of fishing income only (i.e. if there had been no nonfishing employment). The overall measure of distributional equity used is the Gini Coefficient, a measure based on the Lorenz Curve as shown in Fig. 4.1 (Anand, 1983).

From Table 4.13 the distribution of income is rather unequal, the bottom 10% of fishermen earns 3.5% of total fishing income while the top 10% gets 31.16%. The percentage share of income is increasing as one goes up the decile scale. The average income of the 10th decile is 8.8 times that of the first. Referring to Fig. 4.1 the Gini coefficient measures the ratio of the area between the line of perfect equality (the diagonal) and the line representing the existing distribution (the Lorenz curve) to the area of the triangle bordered by the diagonal. The computed Gini Coefficient is 0.34. This is consistent with those estimated for West Coast (0.28) and East Coast (0.41) of Peninsular Malaysia by Fredericks et al. (1985).

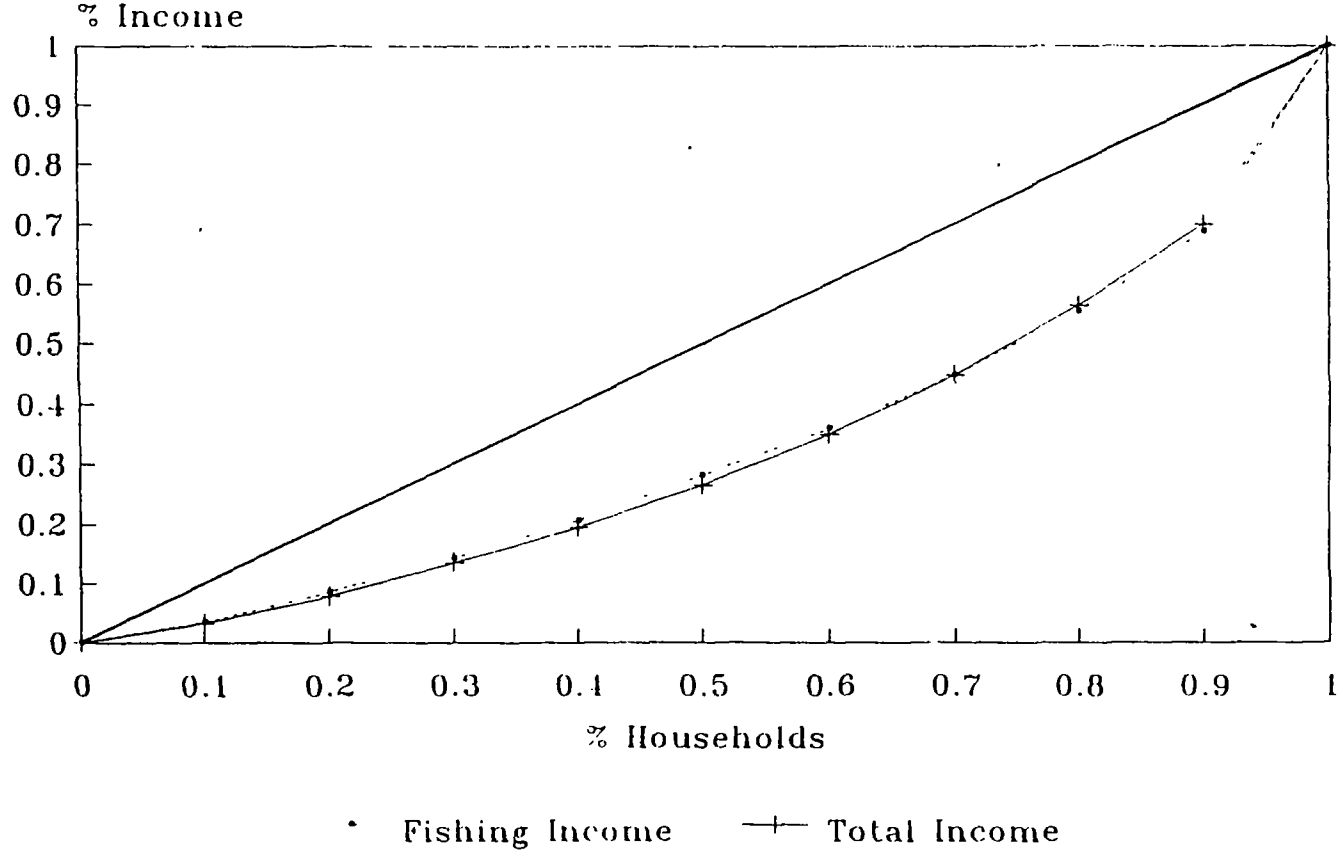
The distribution of total household income, taking into account the income from nonfishing employment, is similar to that for fishing income. The Gini coefficient is slightly greater, indicating a worsening situation. From Table 4.13 the first decile accounts for only 3.34% of total household income while for the tenth the corresponding figure is 29.9%. The average income of this latter group is roughly 8.9 times that of the former. It is important to note that an equivalent proportionate increase in income across all groups will not change the measured Gini coefficient while an equal absolute increase will decrease the value of the coefficient (Anand, 1983). From the results obtained it is clear that nonfishing employment has not improved the distribution of income as argued in the part-time farming literature (Shand, 1980). In this case higher income fishermen benefit more from nonfishing employment than their lower income counterpart.

Table 4.13: Gini Coefficients and Distribution of Fishing and Total Income by Decile Groups of Fishermen

Decile	Fishing		Total	
	Average	%*	Average	%
1	137.20	3.52	176.40	3.34
2	200.00	5.14	237.00	4.49
3	218.80	5.62	298.20	5.66
4	250.00	6.42	316.00	6.00
5	296.80	7.62	377.72	7.16
6	300.00	7.70	438.60	8.32
7	346.40	8.89	523.96	9.94
8	408.00	10.48	605.20	11.48
9	524.00	13.45	723.60	13.72
10	1213.50	31.16	1576.40	29.90
Gini Coefficient	0.3387		0.3456	

* % figures are those of column totals

Fig. 4.1 Lorenz Curves for Distribution of Income of Fishing Households



Gini Coeff: Fishing=0.3387 Total=0.3456

4.4 Logit and Probit Estimation of Participation in NonFishing Employment

The number of observations used to estimate participation in nonfishing employment consists of 253 of the 285 respondents described in section 4.2. The smaller number of observations is the result of excluding respondents, who did not report income from fishing.

Consistent with the theory presented in section three, the exogenous variables expected to influence the marginal value of time of the fisherman are explained below. DMYLOC is a location dummy (1=central Malacca, 0=otherwise) included in the model to test the impact of accessibility of the fishermen to nonfishing work. If the fishing village is closer to business and tourist centers, the fisherman has greater accessibility to nonfishing employment. Age of fisherman (AGE) and age squared (AGE2) are used to depict a hump shaped life cycle profile for participation decision. The use of AGE2 reflects an inverted U-shaped relationship between age and nonfishing employment. Both AGE and AGE2 may represent general experience that increases the marginal value of time in each activity. Education (EDUC) may affect the marginal value of time in both fishing and nonfishing activities. The effect of education on the participation decision may be positive if the relative effect of education is larger for nonfishing work. The variable AGELT15 (number of children of age 15 and below) is used to capture the impact of the number of junior household members on the household heads decision to seek employment outside the fishery. The impact is however difficult to predict as the larger the number of family members in this category, the greater the need for income, and thus the need to participate in nonfishing employment. It could also be argued that the larger the number of family

members in this category, the greater the demand on the household heads' time at home to attend to the younger members of the household, thus leaving less time for nonfishing employment.

The variable FMYNFE refers to the number of family members other than the household head who are engaged in nonfishing employment. A priori, the effect of this variable on the decision to participate on nonfishing work is not predictable. If more family members are involved in nonfishing work, the exposure of the household head to nonfishing work opportunities is greater. One could thus expect a positive relationship between FMYNFE and the decision to participate in nonfishing work. It is also possible that the larger the number of family members with nonfishing employment, the less is the need for the household head to participate in nonfishing work to augment household income. The fishing income ratio variable (FSHINCRA) is the ratio of fishing income to total monthly income of the household. If fishing income forms only a small portion of total household income, one will expect fishermen to participate more in nonfishing work. A negative relationship between FSHINCRA and the probability of nonfishing work is therefore expected. In many rural households, income remittances from children working and residing outside the household form an important source of household income and thus influence work decision of household heads. If remittance income is large, there is less need for the household head to participate in nonfishing work. The number of years in all other employment (YOEMPLOY) is used to capture the effect of experience on the probability of participation in nonfishing work. More experience will enable the individual to obtain nonfishing employment more easily thus increasing the probability of participating in nonfishing work.

The results of estimating the logit and probit equations for the participation decision (YES or NO) as a function of the variables described above is presented in Table 4.14.

The variables that are significant in explaining the nonfishing work decision at the 10% level of significance or higher are location (DMYLOC), AGE, AGE2, number of family members with nonfishing employment (FMYNFE), fishing income to total household income ratio (FSHINCRA), remittance income (INCREMT) and years of employment in nonfishing activities (YOEMPLOY). The signs for each of the significant variables are consistent with a priori expectations.

The significance of the location dummy (DMYLOC) confirms the general literature on rural development that creation of job opportunities in rural areas will increase the accessibility of such jobs to fishermen and farmers and thus encourage their participation in nonfishing and off-farm employment. Distance from fishing villages to nonfishing employment areas increase commuting costs and decrease net income from nonfishing employment hence may reduce the probabilities of fishermen's participation in such activities. The significance of the AGE and AGE2 variables confirm the hump shaped pattern found in other labour supply studies (Sumner 1982, Robinson, et al. 1982). The number of family members with nonfishing employment (FMYNFE) has a negative impact on the probability of household head participating in nonfishing employment. This implies that the need for nonfishing employment for the household head is reduced if more household members are involved in nonfishing work. The same indication is given by the negative sign of the remittance income variable (INCREMT). The number of years in other employment (YOEMPLOY)

confirm the view that experience plays a much stronger role than education (EDUC, which is not significant) in influencing the probability of nonfishing employment.

From a policy perspective nonfishing employment can play an important role in reducing pressure on overexploited fisheries resources as well as help in reducing the income dependence of fishermen on fishing alone. Fisheries management policy therefore should benefit from this and management strategies should attempt to use the variables identified above for enhancing greater participation of fishermen in nonfishing work. Specifically the siting of industries and development projects closer to fishing communities could complement fishery management objectives of stock development and income enhancement for fishermen.

Table 4.14: Estimation of Participation in Nonfishing Work

Explanatory Variables	Expected Signs	Coefficients from Logit Model	Coefficients from Probit Model
DMYLOC	-	-0.7603 (-1.905)	-0.4107 (-1.835)
AGE	+	0.0891 (3.707)	0.1006 (3.855)
AGE2	-	-0.0024 (-3.312)	-0.0013 (-3.545)
EDUC	?	0.2639 (0.483)	0.1779 (0.594)
AGELT15	?	0.0548 (0.448)	0.0540 (0.799)
FMYNFE	?	-2.0717 (-3.701)	-1.0417 (-3.480)
FSHINCRA	-	6.1234 (-5.215)	-3.4717 (-5.671)
INCREMT	-	-0.0046 (-1.905)	-0.0026 (-2.413)
YOEMPLOY	+	0.5598 (4.836)	0.2799 (5.824)
Dependent variable		DMYNFE	DMYNFE
Number of observations		253	253
Log of likelihood function		- 88.6337	- 90.1708
Restricted (Slopes=0) Log-L		-173.4622	-173.4622
Chi-squared (8df)		169.6571	166.5829
McFadden R^2		0.4890	0.4802

Figures in parentheses are t-statistics.

5.0 Summary and Conclusions

Nonfishing employment has been argued as a viable alternative in fisheries management and can be used to uplift the socioeconomic status of fishing communities. An understanding of the incidence and determinants of fishermen participation in nonfishing employment is important in formulating policies affecting the small-scale fisheries sector. This paper attempts to elicit the response of fishermen in the state of Malacca concerning the incidence of their involvement in nonfishing employment. Their participation rate is also examined based on the labour-leisure decision model.

The data for this study is obtained from a cross-sectional survey of 285 fishing households implemented in February 1992. The sampled respondents were selected randomly from the north, central and south Malacca. The Malays are the dominant ethnic group, followed by the Chinese and the Portuguese. The average age of respondents is 47 years. Majority of them have only primary level education. The average household size is 5.8 individuals.

A large majority of the sampled respondents are active fishermen who spent an average of 31.5 hours per week fishing. Furthermore, 40% of them are engaged in nonfishing activities and they spent an average of 31.2 hours per week on nonfishing activities. In terms of income earned, approximately 38% of their monthly income are derived from nonfishing employment. The results also show that a lot of respondents were engaged in nonfishing jobs before they became fishermen.

The high incidence and widespread involvement in nonfishing employment has relevance to fisheries management and development policies. It has often been maintained that poverty is widespread in the small-scale fishing sector. In order to increase income level of fishermen, measures such as vessel and gear subsidies, improved fishing technologies and increased capital intensities are advocated as means of increasing fishermen's productivities. These measures may increase output and revenue in the short-run but fishermen will be made worse off in the long-run as predicted by the theory. This is because fish stocks will be driven down. Recognizing this long-term adverse effect of increasing productivities of fishermen, limited entry licensing policy which restrict fishing effort is implemented. However, there is often tremendous resistance from the fishing communities whose immediate livelihoods are affected. Furthermore, limited entry policy is unlikely to gain total support from politicians dependent on fishermen's votes. As a consequence, fisheries managers are forced to soften their stand and result in implementation failures of the policy.

The above scenario is often encountered in fishing communities dependent solely on fisheries as their only source of income. In such communities, the opportunity cost of fishermen's effort is low. However, with the availability of nonfishing employment, fishermen can take up these jobs on a part-time basis or in times when stocks are overfished. Nonfishing jobs will also increase the demand for fishermen's labour and thereby increase their opportunity cost. Pressure to increase fishing effort will be eased, especially when fishermen are able to secure more remunerative nonfishing jobs. Consequently, effort control policies can be more successfully implemented and enforced.

Part-time fishing appears more likely to achieve the bio-socioeconomic objectives of fisheries management. Encouraging fishermen to allocate a portion of their capital and labour resources to nonfishing employment will help to alleviate the problem of economic inefficiency in overexploited fisheries. Reducing effort by transferring inputs out of the overexploited fisheries will increase resource rent through increasing catch per unit of effort and decreasing unit costs of fishing. Reducing fishing effort will also improve the biological productivity of the overfished stocks. Catches of fish will increase thereby fulfilling the objective of increased protein supply. Income to fishermen can be augmented by nonfishing sources which may help to fulfil the objective of poverty alleviation. In terms of income distribution, however, the results do not indicate any significant improvement arising from nonfishing employment.

The issue of how to increase participation of fishermen in nonfishing employment is addressed using the estimated logit and probit equations. The availability and close proximity of nonfishing jobs to fishermen households are important factors in encouraging participation. This implies that policies should be formulated to increase the availability of nonfishing jobs in the vicinity of fishing communities. The experience and skill of fishermen in nonfishing work is a positive factor for increase participation. Policies should be designed to retrain fishermen to improve their skills in nonfishing jobs.

A key conclusion of this study is that improving the welfare of fishing communities should not be confined merely to policies pertaining to fisheries management. A more encompassing approach should be adopted so as to integrate fisheries management with development policies such as industrialization, education and training policies

etc. For the success of this approach, closer cooperation of the respective authorities and agencies is required. In addition, fishermen themselves should be given a role in the policies formulation, implementation and enforcement process since ultimately their livelihood will be affected by these policies. Furthermore, the success of the approach will be enhanced if it is adopted on a regional rather than a country basis since there may be great diversities in the social, cultural, economic and institutional characteristics among fishing communities.

As discussed previously, increased opportunity cost of fishermen's effort can be a viable option for reducing fishing effort. However, the question of the responsiveness of fishermen labour to wage offer in the nonfishing sector is not being addressed in this paper. Similarly, nonfishing employment participation of fishermen household members is an important aspect that requires explicit treatment in the analysis. This is because the basic decision unit is the fishermen household and there are numerous interactions between the household heads and other members of the household with respect to household labour allocations to fishing and nonfishing employment. Furthermore, involvement of fishermen in nonfishing employment is often seasonal in nature. Hence seasonal availability of nonfishing employment is a crucial issue. These issues highlighted above need to be researched further in the future.

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