The Use and Productivity of Labour in Shifting Cultivation:
An East Malaysian Case study

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THE USE AND PRODUCTIVITY OF LABOUR IN SHIFTING CULTIVATION: AN EAST MALAYSIAN CASE STUDY

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Shifting cultivation of hill rice in the East Malaysian states of Sarawak and Sabah has long been condemned as uneconomic. Low yields, averaging between 0.5 and 1.0 ton per ha, are taken to imply unprofitably low returns to labour and hence a need to accelerate the transfer of labour out of shifting cultivation into more remunerative cash-crop enterprises. Yet shifting cultivation persists, even in areas such as the Saribas District of Sarawak which have been involved in the cash economy since late in the 19th century. This may mean, as some assert, that "cultural barriers" prevent the Iban, Kadazan and other practitioners of shifting cultivation from completely abandoning their time-honoured but unproductive methods. Alternatively, shifting cultivation may bring economic benefits which have not been fully appreciated by the critics.

They key to understanding the persistence of shifting cultivation, given its extensive nature, is the labour economy. This paper draws on the results of a year-long farm management survey, conducted in 1979-80, of 44 Iban shifting cultivators in the Saribas District, to examine the pattern of labour use and to measure the returns to labour for this activity. The paper is organized as follows. The first section outlines the sources of data, the characteristics of the study area and the practice of shifting cultivation in the study area. The next section documents the labour requirements of shifting cultivation, giving particular attention to the seasonality of labour use. The third section quantifies the returns to labour and examines the factors, controllable and uncontrollable, affecting the returns to labour. A final section considers the conclusions which can be made in the light of this analysis.

BACKGROUND

The survey households resided in two longhouse communities - Batu Lintang, a prosperous longhouse of 29 households located along the Batang Layar, and Nanga Tapih, a struggling longhouse of 17 households on the Sungai Spak, both in the Betong Sub-district of the Saribas. The study was carried out in the 1979-80 farming season. Sources of data included work diaries kept by all households, periodic household interviews, periodic field observations, and direct measurements of farm size, land capability, quantity of seed planted and quantity of rice harvested. In

1979-80 a total of 45 households in the two longhouses cultivated hill rice, of which 44 kept a work diary. The basic data set and further details about data collection can be found in Cramb (1980, 1984).

The physical environment of the study area has been described by Sibat (1980). The soils are underlain by Cretaceous sediments, primarily red or light grey shales. The terrain consists of moderately steep to very steep low hills, dissected hills and mountains, and a ridge-and-valley complex. The elevation ranges from 30 m to 350 m a.s.l., with hill summits typically more than 50 m above the associated valley floors. The soils themselves are mainly Red-Yellow Podzolic Soils locally classified into the Merit Family. Almost 85 per cent of the land is placed in Class 5 (on a scale of 1 to 5) and is not recommended for any form of agriculture. That agriculture has nevertheless been practised on such land for centuries indicates the difficulty of applying such a classification in hill farming areas.

The average annual rainfall is 3,134 mm, ranging from 1,431 mm to 4,360 mm. On average the wettest month is December (443 mm) and the driest month is July (124 mm). The natural vegetation of the area is Lowland Mixed Dipterocarp Forest. However, all but very small pockets of the original forest have been felled, giving rise to a patchwork of rice farms, rubber and pepper gardens, and various stages of secondary forest, which contains few of the tree species found in primary forest.

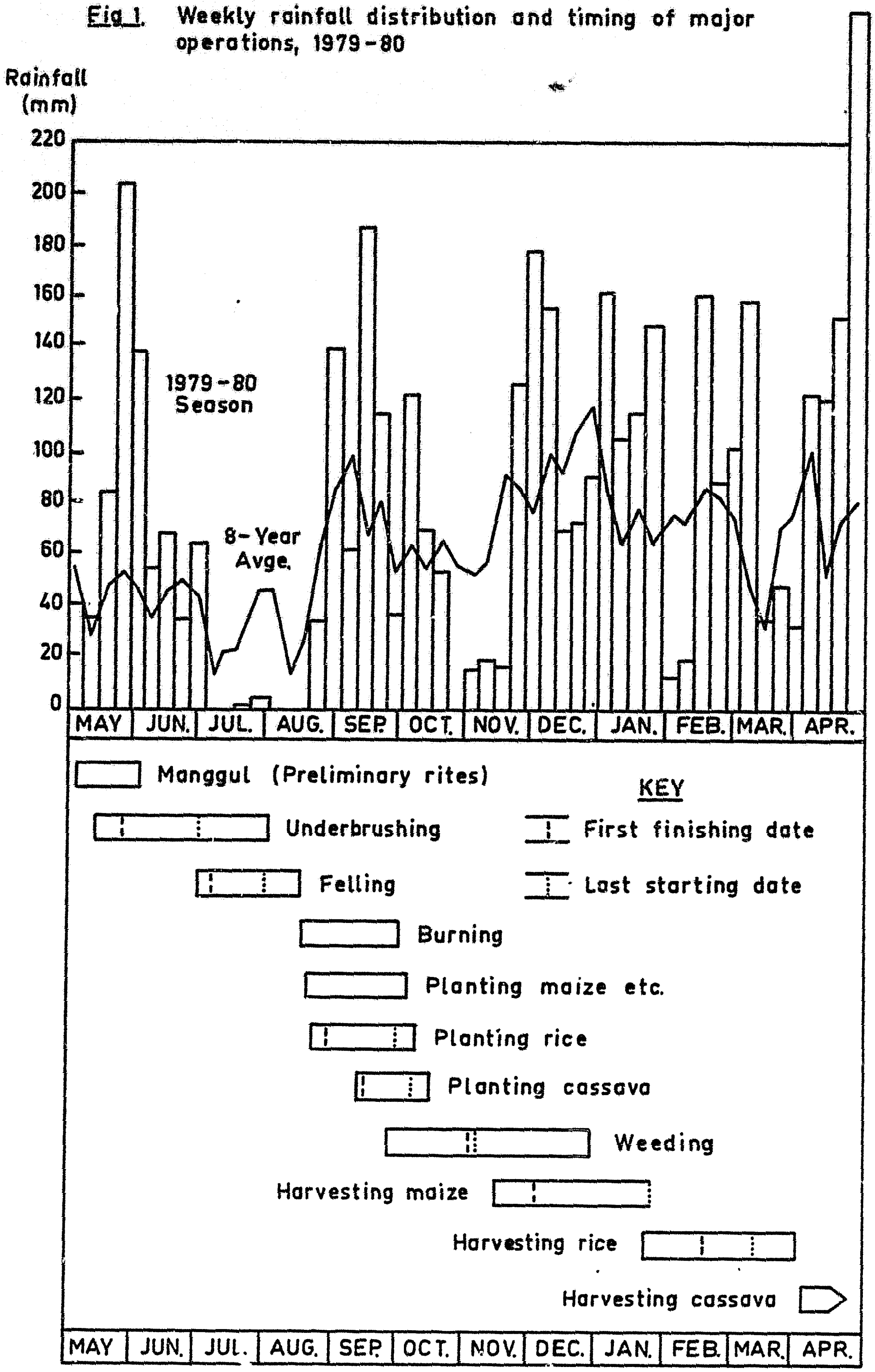
Shifting cultivation as practised in the Saribas involves the alternation of brief (usually 1 year) periods of cropping with longer (5 to 20 year) periods of fallow during which largely unmanaged forest succession is harnessed to restore the soil's fertility and physical condition and to reduce the occurrence of crop weeds, pests and diseases. Small fields of 1 to 3 ha are cleared by each household, using bush-knife and axe, and the vegetation burned, thereby clearing a surface for planting and providing a layer of ash as fertilizer. If the burn is poor the remaining debris is often stacked in heaps and reburned. With no further field preparation the rice is direct-seeded using a dibble-stick. Maize, cassava and numerous vegetables are intercropped with the rice. A small dose of fertilizer (diammonium phosphate), sold at subsidized price by the government, is usually applied. One round of manual weeding is performed, frequently supplemented by the spraying of the herbicide, paraquat. Pest and disease control is sporadic and largely ineffective. Harvesting is done with a small hand-held blade and post-harvest operations are all performed manually.

Fig. 1 shows the timing of field operations in relation to the pattern of rainfall. The critical periods are the relatively dry spell around July-August, which enables the cut vegetation to dry out, and the wetter period from about September, which facilitates crop establishment. The aim of the farmer is to fire the farm and begin planting just before the onset of the rains. If he fires and plants too early germination and seedling establishment will be poor. If he fires too late there will be a poor burn and hence a reduction in the availability of nutrients for crop growth.

LABOUR USE

Traditionally, shifting cultivation of hill rice was the only farm activity of the Iban. This does not mean that all available labour was used for this purpose. Considerable time was spent on hunting and gathering activities both near and far from the longhouse, and until early in the present century sporadic raiding and warfare were important

Fig 1. Weekly rainfall distribution and timing of major operations, 1979-80



male pursuits. Nevertheless, hill rice cultivation was the dominant concern.

With the advent of commercial agriculture (principally rubber and pepper production) there has been a reduction in the amount of labour allocated to hill rice, associated with a reduction in the size of the annual farm clearing. Table 1 shows the average allocation of labour for the survey households. Hill rice accounted for only about 45 per cent of farm work and about 34 per cent of total work. Even so, it remained the single most important activity in terms of labour use.

Table 1 - Average Labour Allocation of Survey Households, 1979-80

Activity	Average work-days per household	Per cent
Hill rice	248.5	34.1
Pepper	211.5	29.1
Rubber	71.0	9.8
Other farm work	25.0	3.4
Off-farm work	55.5	7.7
Other work*	116.5	16.0
Total	728.0	100.0

* Not including domestic work

The household division of labour for hill rice cultivation is shown in Table 2. The division by age group is only approximate, depending in practice on the total number of workers in the household and on the vigour of the more elderly members. Nevertheless the table indicates the general pattern of task-allocation for a typical family. It should also be noted that younger males frequently take up wage-work outside the community and so are absent from farm work for sometimes months at a time. Nevertheless their contribution in such tasks as field preparation and dibbling makes it possible for females and the elderly (classes of labour with lower opportunity cost) to carry on with maintenance, harvesting, and post-harvest operations for rice and secondary crops. Note that because tasks tend to be distributed according to the worker's capability, no attempt has been made in what follows to weight individual labour inputs in relation to a standard work-day.

Table 2 - Division of Labour for Hill Rice Cultivation by Age Group and Sex

Operation	Age group (years)			
	15 - 55		> 55	
	M	F	M	F
Underbrushing	++	++		
Felling	++	+		
Burning	++			
Secondary clearing	++	+		
Dibbling	++		+	
Sowing		++		+
Hand weeding	+	++	+	++
Spraying weeds	++	+		
Harvesting rice	++	++	++	++
Transporting rice	++	+		
Threshing rice	++	+		
Winnowing rice	+	++		
Drying rice		+	+	++
Secondary crops		++	+	++

Key: ++ Major contribution + Minor contribution

Table 3 gives the average labour requirement for each operation in the hill rice cycle, on both a per household and a per hectare basis. The total requirement was 166.5 work-days per household, or 209.0 work-days per hectare, the most labour-demanding operations being weeding and harvesting. With spraying of weedicide the total per hectare requirement was reduced to 202.5 work days, compared with 234.5 work-days without spraying. Freeman (1970: 245) estimated a per hectare requirement for the Baleh area in Sarawak of 154 to 191 work-days when clearing primary forest and 140 to 179 work-days when clearing secondary forest (including in both cases building fences and traps, constructing a farm hut, and guarding the farm). The main reason for the generally higher estimates in the present study is the inclusion of secondary crops, requiring on average 36.0 work-days per hectare. Nevertheless, total labour requirements remained low compared with other crops (e.g. about 900 work-days per ha for pepper).

Table 3 - Average Labour Input by Operation

Operation	Average no. work-days	
	Per household	Per ha
Underbrushing	24.5	19.5
Felling	10.5	7.5
Burning and secondary clearing	4.5	4.5
Planting rice	34.5	28.0
Weed control	70.0	57.0[a]
Harvesting rice	51.5	40.5[b]
Post-harvest (excl. drying)	14.0	8.5[c]
Secondary crops	46.5	36.0
Miscellaneous[d]	10.5	7.5
Total	266.5	209.0

a. With spraying = 50.5 wd/ha; without spraying = 82.5 wd/ha.
b. 8.5 wd/100 kg
c. 2.0 wd/100 kg
d. Farm hut (3.0 wd/hh); fertilizing (1.0 wd/hh); farm path (1.0 wd/hh); visiting farm etc. (5.5 wd/hh).

Table 4 shows the average duration of each stage of the cultivation cycle from clearing (i.e. underbrushing and felling) to harvesting (not including smaller, subsidiary farms, sometimes used for cultivation of glutinous rice). The longest operation was weeding (60 days) and the shortest was planting (10 days). The longest interval between operations was the two-month period from weeding to harvesting. The total duration from the start of clearing to the end of harvesting was 279 days, and from the start of planting to the end of harvesting, 192 days.

Fig. 2 combines the information from Tables 3 and 4 in the form of a labour chart. The horizontal axis measures the duration of the cultivation cycle in days. To locate this axis within the calendar year it can be noted that the mean date for the commencement of clearing was June 7 (ranging from May 11 to June 30) and the mean date for the completion of harvesting was March 9 (ranging from February 18 to March 30).

Fig. 2. Average labour chart for Main Hill Rice farm, 1979-80

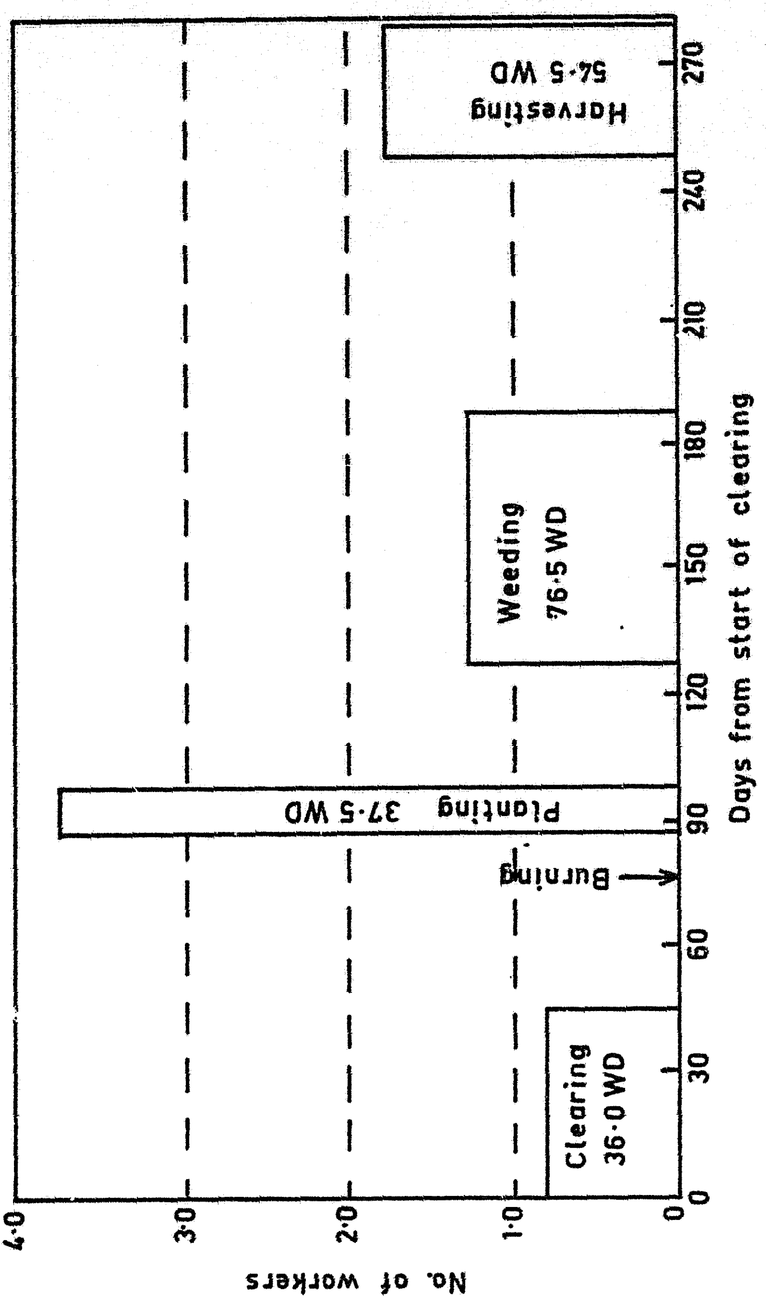


Table 4 -Average Duration of Each Stage of the Cultivation Cycle in the Main Farm.

Stage	Average duration (days)
Clearing [a]	45
Clearing to burning	32
Burning to planting	10
Planting	10
Planting to weeding	30
Weeding	60
Weeding to harvesting	61
Harvesting	31
Total planting to harvesting	192
Total clearing to harvesting	279

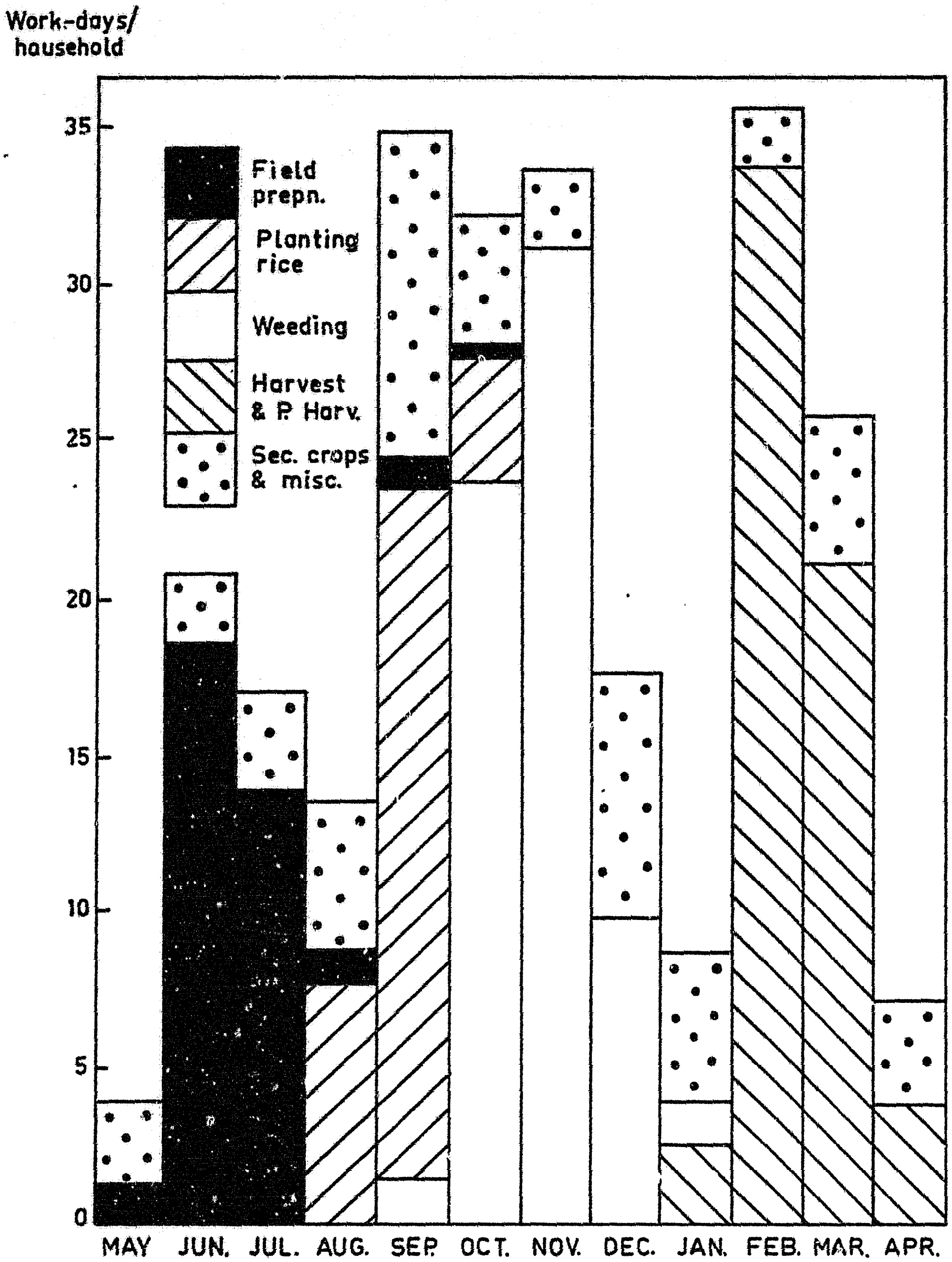
a. Underbrushing and felling

The vertical axis measures the average number of workers required throughout an operation, calculated as the total labour requirement for the operation in work-days divided by the duration of the operation in days. Hence it can be interpreted as measuring the average concentration of labour in work-days per day. The actual number of workers in the farm will of course vary from day to day, perhaps from as high as 10 or 12 when a labour exchange group has been organised, to zero when the family members are working elsewhere or not working at all. Nevertheless, the average number of workers is a rough indication of the extent to which an operation has to be compressed or concentrated into a limited time-period. Given these definitions of the axes, the area of the box representing each operation is then proportional to the total labour requirement for the operation, in work-days. This has been calculated as the average per hectare requirement multiplied by 1.3 ha, the average size of the main farm. Thus the labour chart shows, not only the labour requirement, but the timing, duration, and concentration of each operation.

It can be seen from Fig. 2 that clearing had the lowest labour requirement (36.0 work-days) and also the lowest concentration (0.8 work-days per day). Planting also had a relatively low total requirement (37.5 work-days) but was highly concentrated in a 10-day period, averaging 3.8 work-days per day. Harvesting, with the second-largest requirement (54.5 work-days), was moderately concentrated at 1.8 work-days per day.

Fig. 3, showing the average monthly labour input for the survey households, indicates how the requirements depicted in the labour chart translated into the actual labour profile. Averaging the labour profiles of individual households in this way has the effect of spreading out the labour peaks for each operation, as some households start and finish their operations somewhat earlier than other households. Nevertheless, given the overall co-ordination of operations, and especially the

Fig. 3. Average monthly labour profile for Hill rice, 1979-80



exchange of labour within the longhouse community, the average labour profile gives an accurate picture of the distribution of work throughout the year, both for the typical household and for the community as a whole. The profile shows that the peak months for field preparation were June and July, for planting, September, for weeding, October and November, and for harvesting, February. For all operations together the peak months were September, October, November and February. In general, even with the averaging effect, the profile was highly uneven.

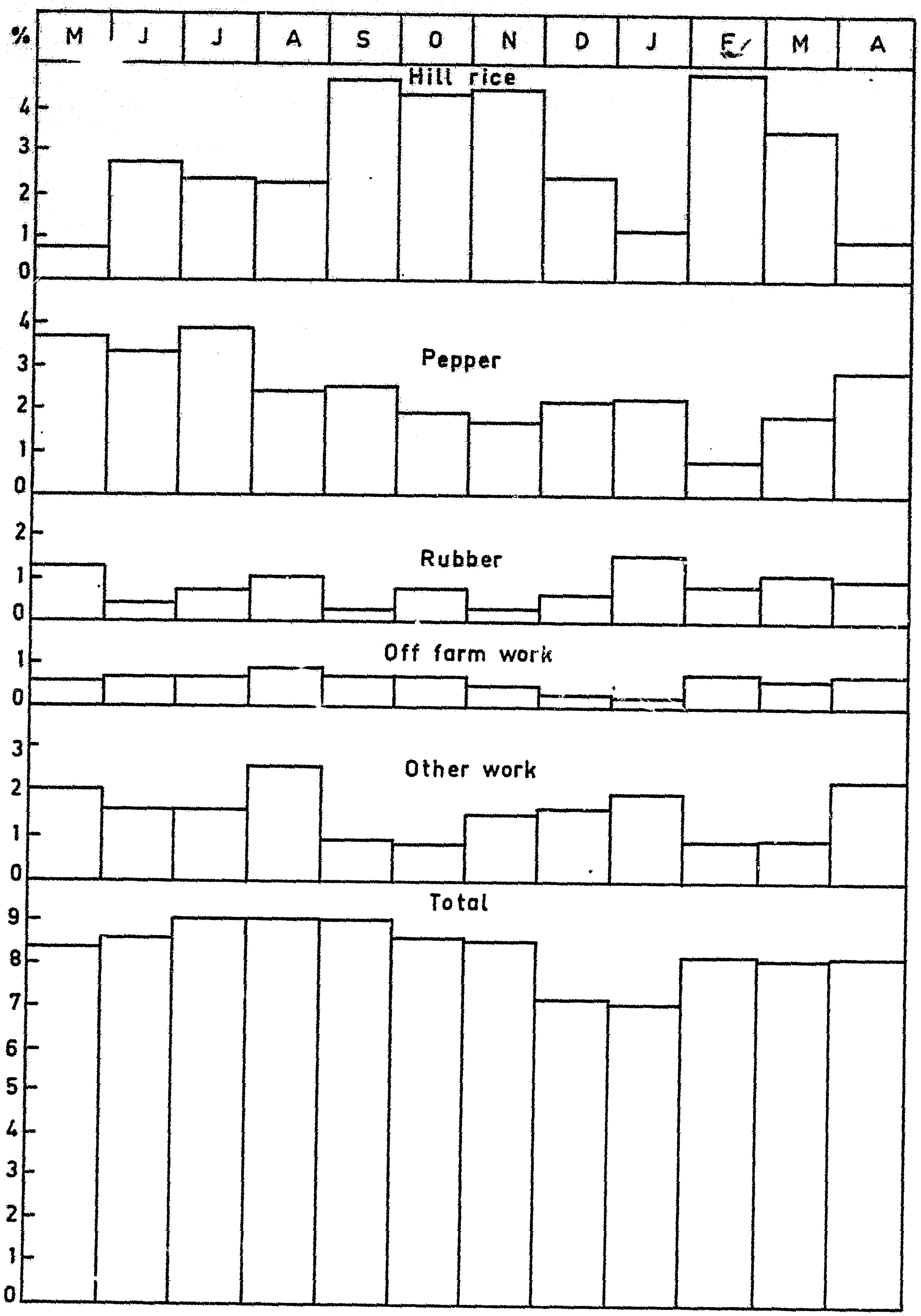
Table 5 shows the incidence of exchange labour and hired labour by operation. The use of exchange labour is related to the nature of the operation (that is, the degree to which the operation is facilitated by working in groups) and to the need for synchronization of operations within a farming area. The use of hired labour largely reflects a shortage of household labour during peak periods. Clearing and planting made greatest use of both exchange and hired labour, with roughly 30 to 40 per cent of the labour input for the average farm being contributed from these sources. In both cases the need for synchronization of operations is obvious. In particular, once planting has been synchronized across farms all subsequent operations will be in phase, with or without any further labour exchange. The use of hired labour for clearing may reflect a shortage of labour due to the pepper harvest, and the use of hired labour for planting reinforces the impression that this operation is the most concentrated of the whole cycle.

Table 5 - Use of Exchange and Hired Labour, by Operation

Operation	% of households using:		% of labour input from exchange and hired labour
	Exchange labour	Hired labour	
Underbrushing	55	9	31
Felling	52	-	29
Secondary clearing	7	-	7
Planting	80	9	39
Weeding	48	-	12
Harvesting	50	-	10

Given the highly seasonal nature of the labour requirements for hill rice and the increasingly diversified character of the hill farming system as a whole, it is important to look at the hill rice cycle in relation to the other major farming activities of the survey households, in particular, pepper cultivation. Fig. 4 shows that the peak months for pepper are from April to July, during which harvesting takes place, with a secondary peak in December-January when digging, fertilizing, weeding and pruning are carried out. These peaks correspond quite closely with the slack periods for hill rice. Conversely, the peak periods for hill

Fig. 4. Average monthly labour profile for all activities, 1979-80



rice (September to November and February) come at times when the labour requirement for pepper is relatively low.

In short, there is a high degree of supplementarity between rice and pepper with respect to labour use. This is clearly recognised by the farmers. For example, when the elderly headman of Nanga Tapih was asked why his community continued to plant hill rice when pepper was more profitable, his answer was that hill rice fits neatly into the off-season for pepper. Consequently the total labour profile shown in Fig. 4 exhibits a much more even distribution than the profile for hill rice alone. The overall peak months were July, August and September, when pepper harvesting overlapped to some extent with the early phases of the hill rice cycle. The quietest months were December and January, which is also the time of heaviest rainfall.

LABOUR PRODUCTIVITY

As suggested at the outset, the view that shifting cultivation is uneconomic is strongly influenced by the observation that per hectare yields are characteristically low. The mean yield of unhusked rice for the survey households was only 525 kg per ha. This may have been somewhat lower than the long-term average for the study area, but even so the indications are that, where young secondary forest is being utilized, hill rice yields typically range from 500 to 700 kg per ha, and where primary forest or old secondary forest is cleared, from 700 to 1,000 kg per ha (Freeman 1970; Cramb and Dian 1979). It is true that the yield of intercrops must also be taken into account (Cramb 1985). As will be shown below, intercrops make almost as great an economic contribution as rice. Nevertheless, in comparison with more intensive systems of food production, shifting cultivation as practised in the study area is clearly a low-yielding activity.

Low yields, however, do not necessarily mean the activity is uneconomic. In the past, notwithstanding the low yields, Iban shifting cultivators were able to supply their subsistence requirements and produce a small surplus for the local trading network (Cramb 1988). Even now, with reduced farm sizes and a partial transfer of family labour to cash crops, the hill rice activity contributes a substantial proportion of household food requirements. On average, the survey households produced 690 kg of unhusked rice, which was 72 per cent of estimated requirements. The degree of self-sufficiency varied greatly between households and communities, but 22 per cent of households could be considered to have met their requirements in the year in question.

There are several reasons why a degree of self-sufficiency is still sought. These include a taste preference for the traditional hill rice varieties, the benefits of producing intercropped vegetables at low opportunity cost, the security provided against the possible disruption of rice supplies or an upturn in rice prices and, not least, a desire to maintain some continuity with a past in which rice growing was not only the economic mainstay of the community but a major social and cultural focal point. These considerations imply that a premium should be added to the measured productivity of labour to correctly reflect the returns as perceived by farm households.

Nevertheless, the measured returns to labour indicate the "bottom line" with regard to labour productivity. If the measured returns to labour fell sufficiently far below the returns available in competing activities, the compensating benefits of self-sufficiency would be eventually more than offset. Hence the ensuing discussion uses the measured returns to labour as the prime indicator of the profitability of shifting cultivation. The measure used is the gross margin per work-day. The use of this ratio to measure returns to labour is based on the reasonable assumption that the opportunity costs of land and capital involved in hill rice cultivation are negligible.

Table 6 shows the average gross margin per work-day for the survey households. The value of output was estimated using local prices, even though all of the rice and most of the secondary crops were not in fact marketed but retained for domestic consumption. For rice the relevant figure was the price of husked rice sold at the longhouse shop, converted to an unhusked basis using the local milling percentage (measured at 75 per cent by weight). This price indicated the saving in cash expenditure on rice for every kilogram of rice produced and so reflected the cash value of subsistence production to the farm household. For secondary crops, too, the prevailing local prices were used. On this basis, the average gross income from rice was M$407 and from secondary crops, M$298. Hence secondary crops contributed 42 per cent of total gross income from the activity. Variable costs included paid-out costs for fertilizer, weedicide and (in some cases) hired labour, and the imputed cost of seed. The gross margin per ha refers to the area cultivated and not the total area within the shifting cultivation cycle. The gross margin per work-day was calculated by dividing the gross margin per ha by the total input of family and exchange labour (but not hired labour) per cultivated ha.

Table 6 - Average Costs and Returns for Hill Rice

Item	Average value ($)[a]
Gross income:	
Rice	407
Secondary crops	298
Total	705
Variable costs:	
Paid-out costs	33
Imputed costs	16
Total	49
Gross margin	656
Gross margin per ha	508
Gross margin per work-day	2.41

[a] All values in 1980 Malaysian dollars

The gross margin per work-day of M$2.41 compared with the local farm wage rate of M$2.50 to M$4.00 per day, a gross margin for rubber and pepper cultivation of M$5 to M$6 per work-day, and a local off-farm wage rate of M$8 to M$10 per day. Hence the returns to labour in shifting cultivation were at the lower bound of the available employment options. This does not mean, however, that all the labour used for shifting cultivation could have earned a higher return in these other activities. The demand for casual farm wage-work was limited as almost all households continued to rely principally on family and exchange labour. Though pepper cultivation may have brought in a higher average gross margin, there were seasonal slack periods, as noted above, in which the opportunity cost of expending labour on shifting cultivation was much less than indicated by the gross margin per work-day for pepper. Off-farm work was mainly available to younger men, and even within this category there was insufficient local demand to provide year-round employment for every individual. The factors affecting the decision to migrate in search of non-farm work are more complex, making this option not strictly comparable with the returns to shifting cultivation as calculated.

The above measure of labour productivity gives only an average indication of performance. What was the range of performance and what were the factors enabling some households to realize higher returns to labour than others? Table 7 divides the 44 households into three performance groups, labelled A, B, and C, according as their gross margin per work-day from hill rice was, respectively, less than M$2, between M$2 and M$3, or between M$3 and M$4.

Table 7 - Definition of Performance Groups According to Gross Margin per Work-day

Performance group	Range of GM per work-day	Mean GM per work-day	No. of households
A	<2.00	1.55	13
B	2.00 - 2.99	2.51	22
C	3.00 - 3.99	3.44	9

To assess the reasons for the differences between the performance groups the gross margin per work-day can be broken down into its components, namely, gross income per ha (GI/HA), variable costs per ha (VC/HA), gross margin per ha (GM/HA), and work-days per ha (WD/HA). By definition:

$$GM/WD = (GI/HA)-(VC/HA)/(WD/HA) = (GM/HA)/(WD/HA)$$

Table 8 examines these components for each of the performance groups. It is clear that Groups B and C obtained significantly higher gross income per ha than Group A. Variable costs per ha increased steadily from A to C, but the means were not significantly different. Consequently B and C also achieved significantly higher gross margin per ha than A. Work-days per ha decreased steadily from A to C by a total of 47.5 work-days, though the means were not significantly different. The average gross margin per work-day is given again in the table for completeness. The evidence thus indicates that higher returns to labour were achieved mainly through higher gross income per ha, but partly too through a lower labour input per ha.

Table 8 - Components of Economic Performance, by Performance Group

Item	Performance group		
	A	B	C
Gross income per ha ($)	398*	576*	663
Variable costs per ha ($)	28	35	41
Gross margin per ha ($)	373*	534*	622
Work-days per ha	227.0	208.0	180.5
Gross margin per work-day ($)	1.55	2.51	3.44

* Means significantly different at the 5% level

Table 9 examines some of the factors affecting gross income per ha. Short fallow periods, poor quality land, and high pest damage did not help to account for group differences. Nor did the rate of fertilizer use. However Group A included a significantly higher percentage of farmers who burned their farms late and this may have had an effect on gross income (though as noted below, it is likely the major effect was on labour requirements). Weeding intensity is an important determinant of output, but Group C farmers actually put in significantly fewer work days per ha for weeding. This may have been associated with a somewhat higher incidence of using weedicide. The net effect of all these factors was that rice yields increased progressively from A to C, though the means were not significantly different.

Table 9 – Factors Affecting Gross Income per Hectare, by Performance Group

Item	Performance Group		
	A	B	C
% fallowing for less than 8 years	15	27	11
% with class 4/5 land	92	91	78
% burning late	39*	5*	11
Fertilizer rate (kg/ha)	26.3	18.5	19.2
Weeding labour (work-days/ha)	64.5	58.5*	42.0*
% using weedicide	69	81	89
% with high pest damage	23	27	44
Yield of rice (kg/ha)	432.5	528.0	652.5

* Means significantly different at the 5% level

Table 10 examines some of the factors affecting variable costs per ha. As recorded in the previous table, neither fertilizer rate nor the incidence of using weedicide differed significantly between performance groups. The incidence of hiring labour increased progressively from 0 per cent of Group A households to 33 per cent of Group B households, though once again the differences were not statistically significant.

Table 10 – Factors Affecting Variable Costs per Hectare, by Performance Group

Item	Performance Group		
	A	B	C
Fertilizer rate (kg/ha)	26.3	18.5	19.2
% using weedicide	69	81	89
% hiring labour	0	14	33

Table 11 examines factors affecting the labour input per ha. As noted previously, significantly more Group A farmers burned their farms late and this led to a significantly greater labour requirement for secondary clearing and planting. Thus a poor burn may have affected the gross margin per work-day in two ways - by reducing the gross income per ha, and hence the gross margin per ha, and by increasing the required work-days per ha. Group C farmers, as well as avoiding extra labour for secondary clearing and planting, put in significantly less labour for weeding. This too may have been related to the timeliness of the burn, one effect of a good burn being to inhibit weed growth. Group C may have also simply traded off a reduction in yield against improved returns to labour. The incidence of hired labour is mentioned again as it may have been associated with a reduction in the input of family labour as well as increased work efficiency, hired labourers frequently being employed on a task basis.

Table 11 - Factors Affecting Work-Days per Hectare, by Performance Group

Item	Performance Group		
	A	B	C
% burning late	39*	5*	11
Labour input for secondary clearing and planting (wd/ha)	43.5*	27.0*	25.5
Labour input for weeding (wd/ha)	64.5	58.5*	42.0*
% hiring labour	0	14	33

* Means significantly different at the 5% level

In short, a number of factors were responsible for differences in labour productivity as measured by the gross margin per work-day, including those leading to higher gross income per ha and those reducing the required number of work-days per ha. Possibly the most important factor, influencing both these components, was the timing and hence the effectiveness of the burn, a good burn resulting in increased yield and reduced labour requirements for clearing, planting and weeding. The use of weedicide and hired labour may also have helped to reduce the work-days per ha.

CONCLUSION

Shifting cultivation as practised by the Saribas Iban of Sarawak and, by extension, other groups in East Malaysia, is characterized by a marked division of labour within the household, a low per-hectare labour input and a highly uneven labour profile. This means that for much of the cultivation cycle it is possible to use labour which has a low opportunity cost, either (1) because the <u>timing</u> of operations means that there are few alternative uses of labour or (2) because the <u>category</u> of labour involved (e.g., elderly women engaged in weeding) has few alternative uses. Moreover, the real returns to this labour include an unmeasured premium because shifting cultivation makes a substantial contribution towards food security, as well as providing preferred forms of food (hill rice varieties and local vegetables) through a preferred, traditional form of activity.

Hence, although the measured returns to labour are low (between M$2 and M$3 per work-day) relative to the principal alternative activity, pepper cultivation (between M$5 and M$6 per work-day), the latter figure in fact represents the <u>upper limit</u> to the opportunity cost of labour used in shifting cultivation, whereas the former figure represents the <u>lower limit</u> of the returns to labour used in shifting cultivation. The margin between the two is not so great as to require rejection of the hypothesis that the real returns to labour in shifting cultivation exceed its real opportunity cost. Hence this remains the most plausible explanation for the persistence of shifting cultivation, albeit on a reduced scale, among farm households in East Malaysia.

Nevertheless, the analysis of factors affecting the returns to labour suggests that the range of performance is quite narrow and the scope for improved productivity is limited. The major factor leading to higher returns to labour is the timing of the burn relative to the onset of the rains, a timely burn resulting in both higher yields and lower labour requirements for secondary clearing, planting and weeding. Though a degree of good management is required in order to have the field ready for burning at the desired time, the duration of the mid-year dry spell and the timing and intensity of the rains are uncertain variables, hence the choice of a date for burning is an exercise in risky decision-making which is not likely to be improved by outside advice.

Given the limitations on improving labour productivity in shifting cultivation, it is likely that as the East Malaysian economy develops further and the opportunity cost of labour continues to rise, it will become increasingly unprofitable for family labour to be used for shifting cultivation. Hence the trend towards smaller annual farm clearings will probably continue. Nevertheless, it seems safe to predict that some labour will continue to be used economically to cultivate small plots for hill rice and vegetable crops and hence that shifting cultivation in this form will persist for some decades to come.

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