SHIFTING CULTIVATION FOR TRANSMIGRATION PROJECTS ?

How "primitive" techniques could help to solve development problems in Central Kalimantan Transmigration Areas.

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Abstracts

After outlining the broad objectives and general guidelines of the Directorate General of Transmigration, this report analyses the general evolution of exiting upland Transmigration projects with respect to the generally recommended development strategies.

It appears that due to labour and cash scarcities this development strategy does not permit the assumed objectives to be reached. After observing the manner in which local farmers in Central Kalimantan solved similar problems, the author proposes new development strategy more suited to the local conditions.

Ringkasan

Setelah mempelajari tujuan dan garis besar kebijaksanaan umum dari Direktorat Jenderal Transmigrasi; maka penulisan ini menganalisa perkembangan dasar Proyek Transmigrasi yang ada di lahan kering sehubungan dengan strategi pengembangan yang disarankan.

Mengingat kurangnya tenaga kerja dan dana, jelaslah strategi pengembangan ini tidak memungkinkan untuk mencapai tujuannya. Setelah mengadakan pengamatan terhadap para petani lokal di Kalimantan Tengah maka masalah tersebut dapat dipecahkan, dalam hal ini penulis mengusulkan suatu strategi pengembangan baru yang lebih sesuai dengan kondisi setempat.

Introduction

Since 1980 a multidisciplinary team of ORSTOM (pedologists, geographers and agronomists) is working in the Central Kalimantan uplands in a joint venture with the Indonesian Ministry of Man Power and Transmigration. The aim of the undertaken studies was to determine suitable locations for Transmigration projects, collect the data necessary for further development planification, and determine the most suitable farming systems.

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1. General Objectives and Guidelines For Transmigration

The Transmigration programme is one of the first priorities of the Indonesian government. The targets of the last five year plan (Repelita III) are rather ambitious as they imply the migration of 500.000 families (more than 2 million inhabitants) from the overcrowded islands of Java, Bali and Madura to the less populated outer islands of the archipelago : Sumatra, Sulawesi and Kalimantan.

According to the very ambitious targets of the plan, the general objectives of Transmigration projects do not aim at establishing the most efficient farming systems, but at optimising returns for capital investment.

This means that the most efficient Transmigration project will be the one with the lowest capital investment per transmigrant family. Particular attention is given to the carrying capacity of the projects, that is, the number of families per project unit. Thus, the smaller the area allotted per family, the higher the carrying capacity of the project, and the lower the capital investment per family. Such criteria precludes any extensive or semi-extensive farming systems, the largest allotments being two hectares in irrigated farming and five hectares in dryland farming.

Policy objectives retained by the Directorate General of Transmigration are :

- Food self-sufficiency by the end of the second year;
- Promotion of commercial crops;
- Development of small-scale industries, mainly initial processing of local productions;
- The target income of the transmigrant should quickly attain the level of his former one on Java and, within five years, equal the income of the local farmers;
- The level of investment should be as low as possible and not exceed 5,000 - 6,000 US dollars per family;
- Further development of the project should be planned, with particular attention given to the employment of the second generation of transmigrants and of spontaneous transmigrants.

2. General Evolution of Existing Transmigration Projects in Upland Conditions

A comparative study of existing transmigration projects enables us to list the major problems and to evaluate the adequacy of the retained development strategy. The general evolution of existing upland projects can be summarized as follows :

During the first year, on the average, barely half of the already cleared land is cultivated. There are several explanation for this, not the least of which is, naturally, the stress caused by transmigration. Many settlers originate from densely populated, irrigated, rice cultivation areas and are not sufficiently prepared for life in a totally new environment. The proximity of the forest, the presence of unfamiliar wild animals, and the many stories told on Java about the primitive outer islands of the archipelago very often lead to irrational fears. There is a lack of sociological studies in these colonization areas that should quickly be remedied. In addtion to this, as very few of the newly-arrived settlers were very rarely small-holders on Java, most having been only agricultural labourers with no ruling decisions to make, the lack of enterprise spirit is quite general. From a more technical point of view they are very often unaware of the techniques of dryland cultivation of arable crops and are almost always absolutely ignorant of the management of tree-crop plantations (except at the scale of the home garden).

The first year nearly 75% of the available labour goes to off-farm work. Since rice, fish, cooking oil, salt, etc. are supplied for one year, there is no real incentive for agricultural work. The settler prefers paid off-farm work, such as additional clearing on other units, building houses, administration buildings, schools, dispensaries, and so on.

By the end of the second year, the settler should be food-sufficient. But the yield of the small plot cultivated during the first year is usually not sufficient to cover his needs.

The settler then tries to extend the cultivated area to 0.75 hectares. He is generally surprised by the luxurious growth of weeds and in the best cases manages to cultivate only 0.5 hectares properly. As soon as the rice stored during the first harvest comes to an end, he needs money to feed his family and looks for off-farm work again. This is naturally to the disadvantage of proper farm management, the search for immediate satisfaction of his needs necessarily relegating the planting of tree-crops to the coming years.

In the third and fourth years the situation becomes more critical. Under permanent cultivation with poor weeding due to labour scarcity, the growth of weeds regularly increases. Furthermore, the reduction of the soil's fertility, the swarming of pests, and diseases necessitate higher inputs in order to obtain correct yields. Having no available cash and not wanting to go deeper into debt, the settler generally refuses to buy the necessary materials.

On the average, during the third and fourth years, the cultivated plots only cover 1.0 ha. per family and the yields range from 300 to 500 kg/paddy per hectare. The farmer is still reluctant to clear new land for plantations.

At this stage the cropping system is very labour-intensive but there is little hope of making profits from arable cultivation which could in turn pay for fertilizers, pesticides, or drought animals. At best there is a possibility of off-farm work and the settler will become an agricultural labourer again. His only chance of remaining a smallholder is to get cash income from tree-crops if they have been planted by PTP's*) as on the Rimbo-Bujang and Baturaja Transmigration projects in Sumatra. On projects where this implementation has not been provided but left to the settler himself, the long-term prospects are rather dim.

The Directorate General of Transmigration is now aware of the fact that tree-crop development cannot be left to the initiative of the settlers alone. In many projects block-planting, mainly of rubber and coconut, has been promoted by the DGT with the help of the PTP's *)

3. Diagnostic-Main Problems

In most upland Transmigration projects, the greatest difficulties are encountered by those settlers who are trying to establish intensive food-cropping systems.

Since the nutritional level of the soils is generally very low, a high fertilization rate is always necessary. The intense leaching due to the heavy rainfall strongly reduces the efficiency of manuring. The luxurious growth of weeds requires a high labour availabili-

*) Industrial Plantation Societies.

ty and restricts the cultivated area to less than 1.0 ha. per family. Under continuous cultivation the swarming of pests and diseases do not enable the farmers to obtain high yields and in any case the input is very high - labour, fertilizers, pesticides - while the output is always rather low.

Although some settlers do possess the required knowledge and technology, they generally fail in establishing their food-crop area, mainly due to labour and cash scarcities.

3.1. Labour scarcity

The average transmigrant family ranges from 4 to 5 members : the settler himself, his wife, and two or three children, usually under the age of 15 years. Younger children confine the settler's wife to housework, in the absence of grandparents or a younger sister (of the wife), who generally look after the children on Java.

During the following years, the labour availability rises rather quickly. The diagram below, from Hunting Technical Services (Southeast Sulawesi TAD project, Agricultural Development 2, Jakarta, 1977) gives a good estimation of the labour availability of the average transmigrant family :

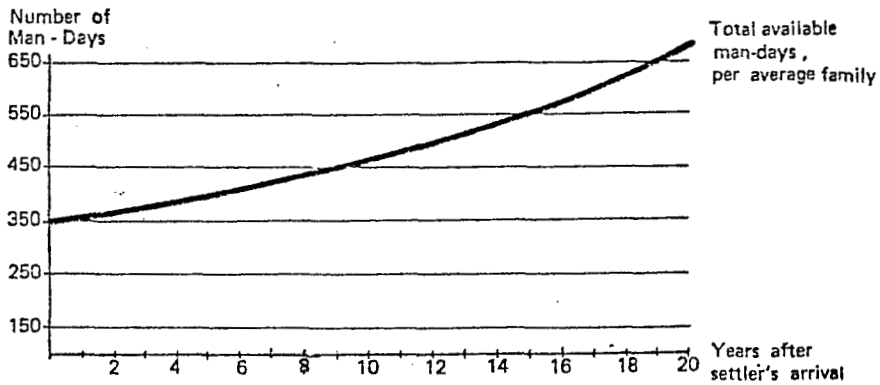
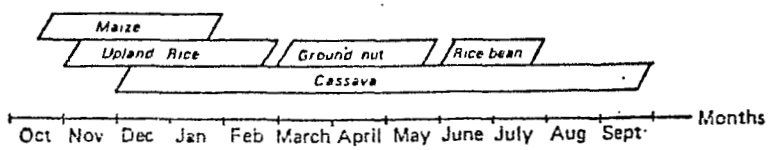


Fig. 2. *Labour availability of an average transmigrant family.*

Intensive cropping systems like those tested by the Central Research Institute in Agriculture at Bogor (CRIA-LP3), are, in many Transmigration areas, always very labour intensive. For instance, the following cropping pattern was tested in Way-Abung (Sumatra) in 1977 - 1978 :



This pattern implies three consecutive crops during one cropping year, interplanting and relay-planting of maize and cassava. The total labour requirement for the three crops was 672 M-D/ha. This means that, according to the labour availability of the average transmigrant family, only 0.5 ha. could be cultivated during the first years of settlement. Not until twenty years after his arrival could the settler manage to cultivate one hectare under this cropping pattern, and of course there would be no available labour left for plantation management.

Nevertheless, this cropping pattern could be further ameliorated through the implementation of techniques which demand less labour, such as the use of draught cattle, herbicides, or mechanization. In such cases, however, the problem of cash scarcity arises, for an increase in the technical level always implies an increase in the input level; this further necessitates available possibilities of obtaining cash or credit.

3.2. *Cash scarcity*

The cropping pattern mentioned above presents a material cost of Rp 162.000,-/ha*) and a labour cost of Rp 138.000,-/ha. If the settler manages to cultivate only 0.5 ha. during the first years, this means an overall cost of Rp 150.000,-.

The socio-economic surveys of previously established Transmigration areas indicate that the average *gross return* of the settlers barely reaches Rp 130.000,- per year during the first four years, the gross return per man-day being inferior to Rp 400,-. Under such conditions there will be no available cash for investments in inputs, though there would still be the possibility of credit through BIMAS or INMAS **). Programmes. Yet intensive agriculture implies high risks : unforseeable drought periods, great numbers of pests, or diseases may lead to misharvests. However, the inputs needed for such cropping patterns are considered too costly for farmers to afford.

Therefore, due to labour and cash scarcities, farmers are encouraged to reduce inputs to the utmost and take up "mining agriculture". The fact is that the general evolution of intensive upland cropping systems under such conditions is towards *cassava monoculture*. This leads to the exhaustion, within four to five years, of the very low nutrient reserves in the soil, and the plots rapidly turn into *alang-alang (Imperata cylindrica)* wasteland.

Thus, the recommended development strategy is obviously not adapted to reach the targets set by the Directorate General of Transmigration.

In Central Kalimantan, local farmers face exactly the same problems of labour and cash scarcities. Yet their standard of living is much higher than that of the average Javanese or Balinese farmer. The study of how they solved their problems is of the utmost interest before trying to define a new development strategy more suitable to conditions in Central Kalimantan.

4. Local Food Crop-Farming Systems

With an average population density of 4 inhabitants per square kilometer, the Dayaks of Central Kalimantan had to face a very drastic labour scarcity. Where available

*) 1 $ US ≈ 1000 Rupiah (Rp)
**) National credit programmes for farmers

land is not a limiting factor, they developed one of the most efficient farming systems in terms of return for invested labour : shifting cultivation.

4.1. *Shifting cultivation of upland rice :*

The following figures are the mean values of the labour requirements for the slash-and-burn upland rice cultivation practiced by the Central Kalimantan Dayaks. They were obtained through a survey of a randomized sample of 60 cultivators in 7 villages of the study area in 1980 - 1981.

Table 1.

Labour requirements in Man-Days/ha. for shifting cultivation of upland rice (One year of cultivation only)

Operations Indonesian name (English name)	slash-and-burn of virgin forest	slash-and-burn of 15-year-old secondary forest
1. Menebas (Clearing the undergrowth)	21 ± 7	28 ± 4
2. Menebang (Felling the trees)	27 ± 7	24 ± 4
3. Membakar (Burning)	1.3 ± 0.4	2.4 ± 1.3
4. Menugal (Dibbling and casting)	20 ± 5	31 ± 5
5. Merumput (Weeding)	3 ± 3	15 ± 7
6. Memagar (Fencing - facultative)	11 ± 3	11 ± 3
7. Bikin pondok (Farm huts construction - one year out of two)	7	7
8. Mengetam (Harvest)	31 ± 6	44 ± 5
TOTAL	121.3 ± 20	162.4 ± 17

All work is done manually with axes and knives. No chemical manuring or pesticides are applied. The average yields range from 1000 to 1500 kg paddy per hectare. Some years they can reach 2500 kg but a drop to 500 kg/ha. is more frequent (unexpected drought period, heavy rain during the burning period, or severe pest attacks). Nevertheless, should misharvest occur, the situation is not as critical as on colonization projects, since the only inputs are labour and seeds. Moreover, the Dayaks are still able to buy rice with the money they can get from commercial crops such as rubber and rattan or from ironwood *(Eusideroxylon zwageri)*.

With an average yield of 1250 kg paddy/ha. and an average local price of Rp 125/kg paddy, the gross return per man-day is around Rp 1.290 for a ladang on primary forest and Rp 960 for a ladang on secondary forest.

As land is not a limiting factor, the Dayak shifts his ladang every year. Sometimes, however, (5 times out of 60 in our sample) he cultivates his ladang for a second year. in such cases there is no felling work to be done, but a more careful weeding is necessary. Total labour requirements remain at the level of that for secondary forest, about 160 man-days/ha. Yields are generally lower (mainly due to in-sufficient weeding) and

range from 750 kg paddy/ha. to 1250 kg paddy/ha., making the gross return per man-day around Rp 780,-.

These figures can be bettered still. For instance, with a chain-saw the felling can be reduced to 3 to 5 man-days/ha. and more effective weeding can increase yields to 1750 kg paddy/ha, as proved by experiments at the GKE Agricultural School of Tumbang Lahang in Central Kalimantan.

At any rate, even if ameliorated these techniques lead to surplus only if there is a great deal of available land. As fifteen years of bush fallow are necessary to restore the possibility of fertilization through burning, the average holding should cover at least fifteen hectares, in order to assure food self-sufficiency.

In most parts of Central Kalimantan enough land is available to allow for long bush fallows. But in some cases, like the middle Katingan area where fertile soils are limited to the narrow alluvial valley, a more intensive farming system had to be developed to adapt to the increasing demographic pressure of the last forty years.

4.2. *A first step towards intensification : the development of low-lands*

Because the luxurious growth of weeds on the uplands rendered continuous cultivation impossible (with the available technology), the inhabitants of the valley tried to develop the flooded low-lands behind the banks of the river. There, after cutting and treading in the low-land weeds (mainly Cyperaceae), transplanted rice could easily choke the regrowing weeds. Some fields have been cultivated continuously for 20 years (one crop per year) with neither soil work, nor chemical manuring, nor pest control, nor any indication of a decrease in the soil's fertility. The main problems reported to us were damage caused by regional flooding, as there is no water control, and the regular swarming of rats.

The next table summarizes the agricultural operations, labour requirements, and timing of operations obtained from the survey of a randomized sample of ten cultivators from Buntut Bali and Tumbang Lahang on the Katingan River :

Table 2.

Labour requirements for "padi luau"; local low-land rice cultivation

Operations Indonesian name (English name)	Labour requirement M-D/ha.	Timing
1. Pesemaian (Nursery preparation)	12 ± 3	End August, beginning September
2. Menebas (Cutting of weeds)	49 ± 10	September - October
3. Menanam (Pulling out)	51 ± 15	October - November
4. Merumput (Weeding)	13 ± 14	December
5. Memagar (Fencing - facultative)	14	January
6. Mengetam (Harvesting)	58 ± 17	Maret - April
7. Processing	18 ± 7	April
TOTAL	215 ± 44	7 to 8 months

Some years when the field is not yet flooded the pulling out can be replaced by dibbling and casting or by direct seeding. Thus total labour requirements can be reduced to :

- 175 M-D/ha. if dibbling and casting
- 156 M-D/ha. if direct seeding (weeding requires two times more labour in this case)

Low-land rice yield can be much higher than upland rice yields, and sometimes reach 3000 kg/hectare. But quite often regional flooding and rats can totally destroy paddy fields. As a result, average yields over a long period are similar to upland rice yields, around 1500 kg paddy/hectare. The average gross return for invested labour is 7 kg paddy/man-day or Rp 875 per man-day at a local commodity price of Rp 125 per kg paddy. These figures could still be easily ameliorated by water control and rodenticides, for instance.

If we compare the results of the so-called "primitive" Dayak agriculture with the results obtained on most Transmigration projects; we have to admit that the most intensive is not necessarily the most efficient. The analysis of problems occurring on existing Transmigration projects and the observation of local agriculture are of the highest interest to the developer because they enable him to define more suitable development strategies.

5. New Development Strategy

Due to labour and cash scarcities, short-term promotion of intensive arable farming on Transmigration projects is nearly impossible. The only solution under such conditions is the promotion of farming systems which have the highest possible returns for invested labour. Therefore, the development of commercial perennial crops should receive priority. However, as tree-crops only begin to produce four to six years after planting, in the meantime food self-sufficiency should be assured. Thus ameliorated shifting cultivation could provide an acceptable transitory answer to the settlers' problems.

With a regular shift of 0.5 to 1.0 ha. every year, a transmigrant could manage to clear his 5-hectare allotment in 5 to 8 years after his arrival and be food self-sufficient during this period. As shifting cultivation techniques are not very labour-intensive, the saved labour could be utilized for the planting of tree-crops, interplanted with upland rice from the first year if the crops are wide-spaced, like coconut, oil palm, or rubber; in pure stand after the first rice harvest if the crops are narrow-spaced, such as coffee or pepper. According to the growth of the tree-crops, rice or cassava could be interplanted during the second year or even during the third year on the same plot.

Of course this shifting can only be a transition to a more intensive arable cropping system. Between the fifth and the eighth year, nearly all of the holding will be cleared. But from the fourth year, coffee, pepper, and coconuts have already been producing and the settler will soon come into cash. Also, during this same period, labour availability has increased from 350 to 400 man-days/year on the average (cf. figure 2) and labour requirements for perennial crops will only be for maintenance and harvest.

With and increasing income from commercial tree-crops and available labour at his disposal, the transmigrant will be in the best conditions to develop his food-crop area. He will be able to purchase fertilizers, pesticides, or even draught cattle and animal

drawn equipment, the necessary agricultural intensification will be possible. If Irrigable low-lands are available which is the case in most of the land-units of the Tumbang Sangai priority area*), food crops should be limited to those areas.

This kind of development strategy has the advantages of being adapted to the capabilities of the new settlers as well as to the local conditions. It avoids stagnancy and permits further development and intensification by means of reinvestment of benefits and not by means of credit. Therefore, the use of this "primitive" agriculture will be a determining factor.

*) Upper Mentaya - Central Kalimantan.