

FARMING SYSTEMS AND DEMOGRAPHIC BREAK POINTS

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Intisari

Propinsi Lampung sampai pertengahan tahun 1970-an masih daerah penerima. Sejak lima belas tahun beberapa bagian propinsi ini menjadi daerah pengirim. Untuk menguraikan kejadian itu, suatu angka "tekanan penduduk" dipakai. Angka tekanan penduduk dihitung dari kepadatan penduduk dan penggunaan tanah. Kalau "tekanan penduduk" mencapai suatu tingkat yang tinggi (*demographic break point*) untuk kepala keluarga ada dua kemungkinan = mengganti cara pengolahan/penggunaan tanah, atau pindah. Untuk pemilihan penggunaan tanah tersebut faktor budaya (suku kangsas) lebih berpengaruh daripada kesuburan tanah.

Untuk sistem perkebunan tingkat tekanan penduduk adalah 300j./km², untuk persawahan: 600 s.d. 1.000 j/km², dan untuk tegalan: 300 s.d. 350 j/km².

Introduction

During more than eighty years until the seventieth decade the Province of Lampung was a receiving area for immigrants from Java and other parts of the archipelago. Fifteen years ago, around mid-seventies, several parts of this province became sending areas. This paper tries to explain the push factors of these out-migrations.

Lampung: a Heterogeneous Demography

With a total of 5,250,000 inhabitants in 1986, i.e., an average of 180 inhabitants/km², Lampung was the most heavily populated province in the Indonesian archipelago, after Java and Bali. Outside the protected areas, where certain forms of settlement was prohibited, and which covered 30 percent of the surface area of the province, densities ranged over 250

inhabitants/km², an average figure that greatly concealed variable facts. Settlement, resulting from migrations some of which took place quite a long time ago, has spread unevenly throughout the province.

Situated at the southernmost part of Sumatra, Lampung is but twenty kilometers away from the west coast of Java. Such a location and the low density of its population in the early century, about 15 inhabitants/km² (Volkstelling, 1930, 1935), has made it the privileged destination of peasants in search of land.

The first migrants, arrived in the late nineteenth century, were the Sumendo, followed in the 1920s by the Ogan, both ethnic groups originating from the mountainous areas of the present province of South Sumatra. The coffee boom as well as family traditions among these groups can explain such

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movements. The Sumendo obey the matrilinear system according to which the eldest daughter inherits most of the family property, and thus consequently compels the other children to emigrate. Up to the present, their route has followed the range of the *Bukit Barisan*, a major axis of the island of Sumatra.

The Javanese and the Sundanese constitute the second wave of migration. As early as in the last century, the impoverishment of the Javanese farmers led the Dutch colonial authorities to seek virgin areas liable to receive many of the landless peasants. Within the vast farming colonization program called *kolonisatie*, Lampung was selected as the privileged destination, particularly for the regions of Pringsewu-Gading Rejo where settlement began in 1905, and later of Metro in 1935 (Peltzer, 1945). After the Independence, population movements from Java and Bali took place under the name of Transmigration with important fluctuations until the end of the 1970's (Hardjono, 1975; Levang & Sevin, 1989). After that followed organized migrations within the province which were called the local transmigration.

However, migrations planned from Java or Bali to Lampung have not brought more than 20 percent of the immigrated Javanese population, actual residents of the Province. Since the turn of the century, spontaneous migrants have kept streaming into Lampung.

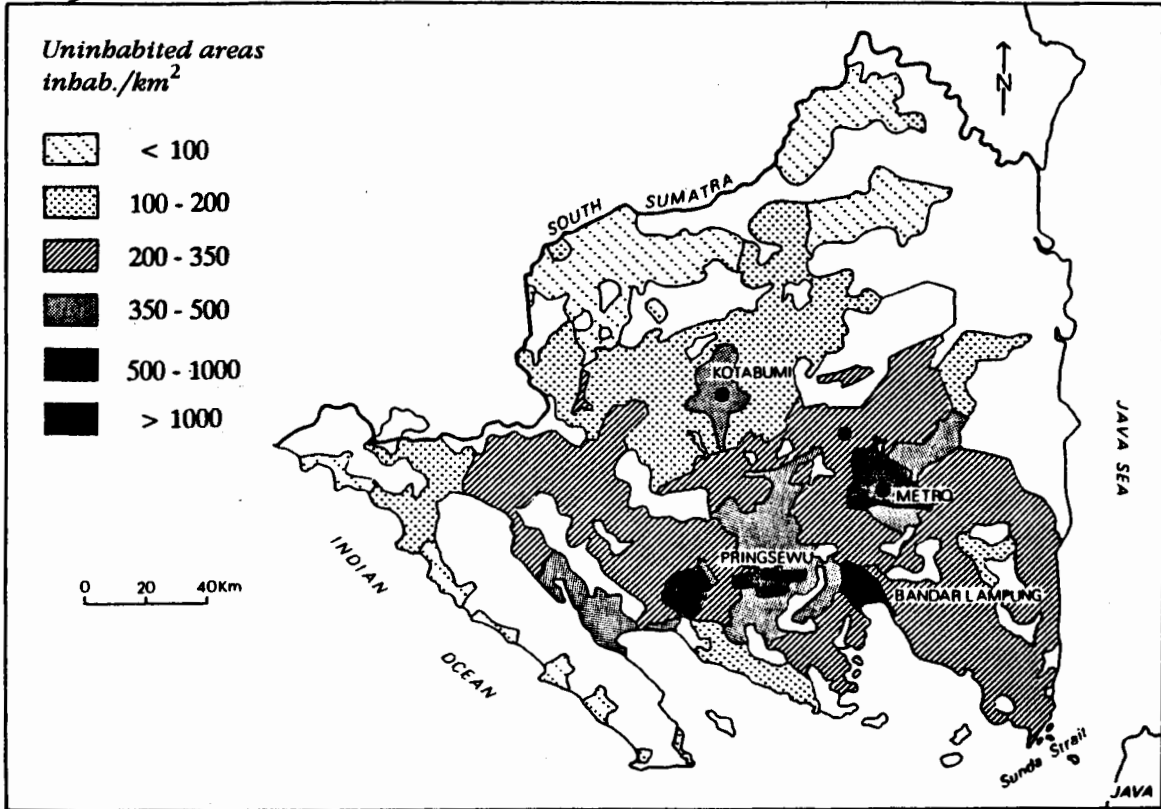
The result of such movements was an average population growth rate of 5 percent per year between 1930 and 1985 (Volkstelling, 1930; BPS & SUPAS 1985). The diversity of the migrants' ethnic and geographic origins, and the various types of migrations

(spontaneous or induced by the government) have brought about uneven population movements over the Province where settlement has now become quite heterogeneous (Fig. 1).

Densities range between 10 and 1,200 inhabitants/km² (not counting the provincial capital Bandar Lampung). Four zones can be considered:

- the peneplain, where densities reach "Javanese levels", organized around the historical centers of *kolonisatie*, Pringsewu and Metro. Figures run over 500 inhabitants/km², and in some regions the figures are even higher than 1,000 inhabitants/km². The Javanese and Sundanese groups are the majority, reaching from 80 to 95 percent of the population;
- the mountain (Barisan range), the northern border of the peneplain and the east coast. The population density in these parts is 350 inhabitants/km² and never decline under 100. If the Javanese are the most important group in the area, the Sumatrans, mainly the Sumendo, the Ogan, and the Abung, are found in significant numbers. All the allochtons are spontaneous migrants, or their descendants;
- the west coast (Pesisir, Balik Bukit) is the only region where an autochthonous ethnic group (Lampung Pesisir) still forms the majority of the population. Densities there were the lowest to be found in Lampung (18 and 38 inhabitants/km²) in 1985, and never reached to 100;
- the northern part of the Province, the settlement zone of the local transmigrants. Until 1960, this area only provided emigrants. It was not

FIGURE 1.
A HETEROGENEOUS DEMOGRAPHY



before the transmigration programs were introduced, particularly those of local transmigration, that people immigrated there. Thanks to them, densities now vary between 35 and 60 inhabitants/km². The settlements are mostly Javanese, with some native villagers, Mesuji and Way-Kanan, who mainly live along the rivers.

A comparison between figures 2 and 3 will clearly show how closely population densities and farming systems are related.

Major Farming Systems

Sparsely populated areas (50 to 350 inhabitants per km²) offer farming systems based either on perennial crops, such as coffee, pepper, clove, *damar* (*Shorea sp. resins*), and rubber, or on upland food crops such as upland rice, intercropped with maize and cassava. Heavily populated areas (500 to 1,100 inhabitants/km²) rely exclusively on irrigated rice with two farming seasons a year. Medium densities (between 300 and 800 inhabitants/km²) will produce various systems often associating irrigated rice farming for the first season of the year with upland food crops (maize, peanuts, soya, etc.) for the second (Fig. 2 & 3).

The distribution of the different farming systems over the land space results from three major factors: soil fertility, ethnic origin, and irrigation.

The native Lampung population, and later other Sumatranese groups, mostly Ogan and Sumendo, very naturally settled down on fertile lands: the alluvial plains along the large rivers and their main affluents, and the mountainous areas of the Barisan range where andesitic and basaltic mother rock gave

birth to rich soils. Highly suitable for slash and buru upland rice farming with secondary forest fallow, such lands have also proved particularly propitious to pepper, coffee, and clove growing.

In the large eastern peneplain which occupies 2/3 of Lampung are found leached ferralitic soils derived from acid tufa. Despised by the native populations because they tend to be easily invaded with *alang-alang* (*imperata cylindrica*), these lands are but seldom developed. Surely enough those huge, almost empty, territories became the target of the great Javanese farming colonization projects, Dutch *kolonisatie* at first, then Transmigration after the Independence.

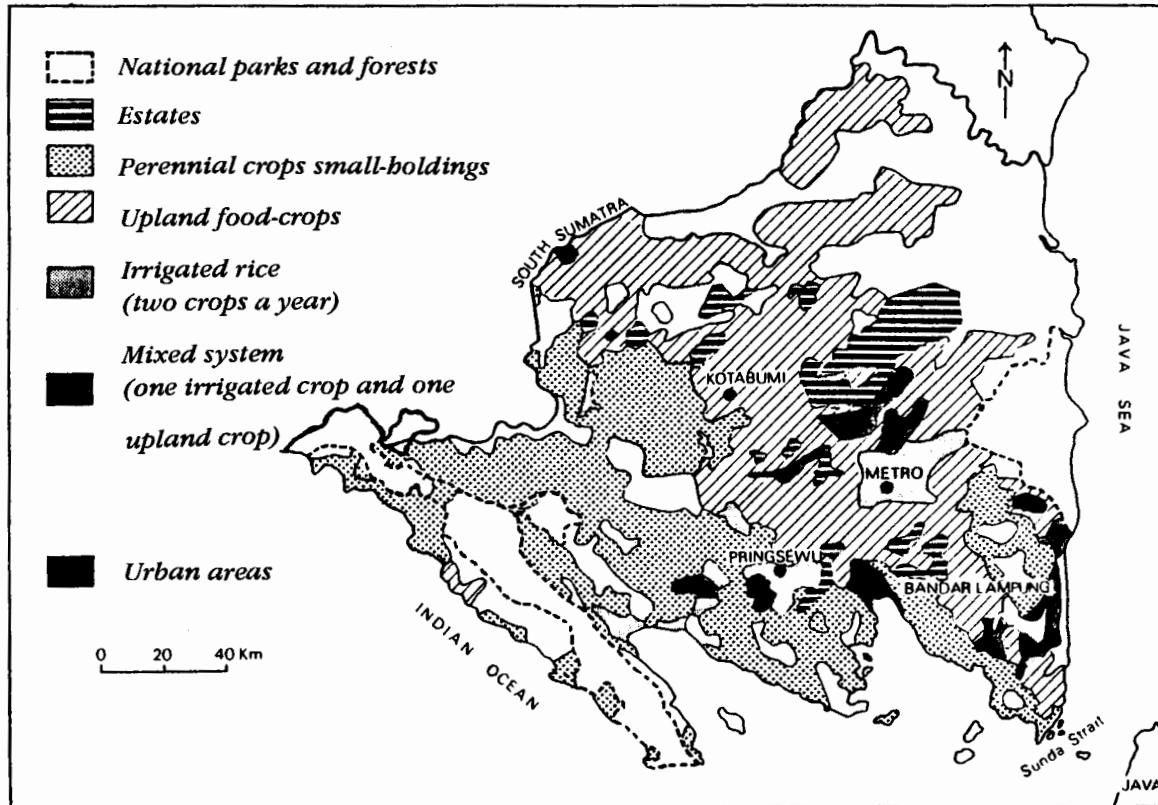
Where there is no irrigation network, Javanese farmers resort to the traditional *tumpang sari* system, in which upland rice, maize, and cassava are cultivated on the same plot with only one yield a year. Where a network does exist, its quality will determine the number of yields of irrigated rice. Too often, an excessive extension of the network will not allow an extra yield of rice which is then replaced with an upland crop: maize, peanuts, soya, or golden grain.

The technical requirements and economic results of each major farming system are easily differentiated. They vary greatly within each system too, depending on local and cultural features, on access and trade facilities, job opportunities, etc. We will here endeavour to describe the main characteristics of the major systems.

Farming Systems Based on Upland Crops: Coffee and Pepper

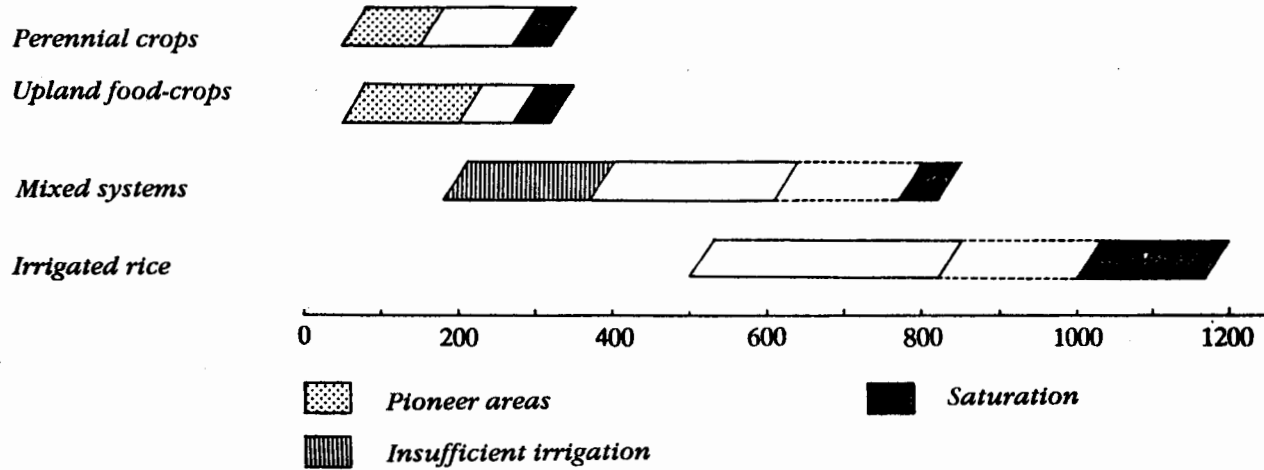
In Lampung, pepper, coffee or clove plantations were developed at the

FIGURE 2.
MAJOR FARMING SYSTEMS



Source: ORSTOM field surveys, 1987.

FIGURE 3.
FARMING SYSTEMS AND DEMOGRAPHIC DENSITIES



Source: ORSTOM Field surveys, 1987.

expense of a much older system: upland rice shifting cultivation.

Until the late 19th century, the needs in food crops of the local populations were met with one yield of upland rice a year on clearings of 1.4 ha. on the average per family (Levang, *et al.* 1982; Levang, 1983). Left to natural forest regrowth after one cropping season, these areas are only put to use again at the end of a long forested fallow period of 15 to 20 years. Bush products such as *damar*, dragon's blood and rattan, provide each household with a modest income. Pepper, which is grown almost exclusively along the main rivers, is the only cash crop available to the Lampung people, and probably has been since the 16th century (Marsden, 1783).

Since the beginning of the 20th century, the construction of the Tanjung Karang - Palembang railway and the upgrading of road and harbour facilities have helped towards the distribution of manufactured goods from Java and the marketing of farming produces from Lampung. The quick development of coffee and hevea plantations provides the necessary cash to the local populations (Broersma, 1916; Scholz, 1983).

Implementation techniques used on plantations are much the same today as they were then. The *ladang* is not left to forest regrowth after harvesting the upland rice, but is rather planted with coffee trees and/or pepper props. Saplings thus greatly benefit from the nutrients found in the ashes after clearing. Chemical fertilizers or pesticides are seldom resorted to.

The main difficulty when setting up a plantation is to ensure its maintenance during the 3 to 6 years that will elapse

before it gives its first harvests. If the upland rice yields are enough to retribute labour used for clearing and planting, the maintenance of a yet non-productive plantation demands considerable investment: 6 to 12 weedings a year. Calling on family labour implies that the basic needs of those families are satisfied, which is not often the case.

Calling on wage earning labour likewise implies that the planter receives a sufficient income, from other plantations for example, and also that he can plan ahead long term household expenses. Which seldom is the case as well, and the planter may have to dig into his landed estate capital to meet the deal.

For 5 to 10 years, the rate of production will stay high. Then, owing to the lack of pruning and cutting back of coffee trees, and to problems linked with the replacement of dead pepper plants, production will shortly fall back. Planters tend to postpone as late as possible the time when inevitably they must replant their land. Plantations that are too old will yield less and less. When production cannot cover the maintenance costs anymore, such plantations are simply left to die.

Another obstacle, and not the least, arises from the huge variations, from one year to the next, on the price of commodities, mainly exported ones such as coffee and pepper. The planter has no control whatsoever on the quotation changes. Booms after recessions are not uncommon, which explains why planters are not too eager to run into debt to start or improve a plantation.

The economic results of the system depend greatly on plantation ages and on commodity prices. In 1987, for an average area of 1 to 2 hectares, a family could expect a 1 to 1.5 million rupiah income*. Following in 1988 a dramatic raise due to the boom on pepper, the average income fell back to one million rupiahs in 1989 after the collapse of coffee prices.

However, the income a planter's family drawn from coffee or pepper, even if the plantation is poorly maintained or already in a recession stage, remains much higher than that drawn from continuous upland rice farming.

Upland Food Crop Farming Systems

Neglected by the native populations because of their low fertility, the leached ferralitic soils of the large eastern peneplain are left to the great Transmigration projects. Given two hectares per family, thousands of Javanese peasants have been installed there with government money in the hope that they will bring out the productivity of those vast areas invaded by *alang-alang*.

That was granting too much credit to the Javanese farmer's reputation of excellency and not enough to the essential influence of an exceptional environment: the incomparable fertility of Javanese soils. Transplanted into Lampung's less favorable conditions, the traditional Javanese system *tumpang sari* will encounter serious difficulties.

Even if the first year's output is rather satisfactory, the situation is rapidly degrading in the following years. Surprisingly enough, the Javanese peasant has managed to contain the *Imperata* by hoeing the soil twice, sometimes three times, and uprooting the rhizomes. But on the other hand, the fast development of short-cycled herbaceous weeds requires a lot of weeding time which the transmigrants's families can seldom spare. The rate of organic matter of the soil quickly decreases, which in turn increases leaching and reduces the effect of fertilization. In these pioneer zones, the sudden appearance of wide planted areas attracts a great many predators such as wild boars, stags and elephants, and brings about the proliferation of all kinds of pests: stem borers, bugs, rats, etc...

Most often from the second year on, the family's food supply is not provided by the harvest anymore. The farmer is then compelled to seek work outside and stays away for increasingly longer periods at a time. The land plot is not properly kept in his absence, the rice and maize output drops, only cassava remains productive. Because of his low income, the migrants tends to opt for the monoculture of cassava with no restitution of manure to the soil. After five to ten years, even cassava can barely grow out of these exhausted soils. *Alang-alang* then reappears on land plots that have been gradually abandoned. As to the migrant, he has turned into an unskilled labourer or a farm hand working for agro-industrial

* All data on household incomes from Benoit, *et al.* (1989). In 1987 U.S.\$ 1 = Rp 1600.

estates judiciously established in the vicinity of major Transmigration centers.

In 1987, the *tumpang sari* system gives a net income of about Rp 230.000,00/ha. per year. That same year, in the Metro area, on similar, but irrigated soils, a rice grower will get an income four times higher in only one cropping season.

Two-Season Irrigated Rice Farming Systems

The association of Dutch engineers with Javanese rice growers gave birth to the first irrigated perimeters in Lampung within the *kolonisatie* programs from 1905 on.

Until the late sixties, farmers used rice varieties that allowed only one yield a year. The second season was devoted either to secondary crops (*palawija* in Indonesian), or to a grazed fallow.

From the start of the year 1970, the Green Revolution radically transformed farming systems in irrigated areas. Through the *BIMAS* programs*, selected varieties, chemical fertilizers and pesticides granted by the government were quickly adopted by the peasants. The more recent introduction of pre-emergence weedkillers also knew a rapid success.

Over a comparatively short period of some ten years, the rice growers tremendously expanded their technical capacity. But the same techniques, brought to upland crop farming areas, had no success with the peasants.

The use of irrigation alone enables farmers to obtain steady yields of over 2,000 kilograms of paddy per hectare.

Fertilization on short-cycled varieties allows two crops of rice a year and provides average yields of 6,000 kilograms of paddy per hectare. The reasonable use of pesticides as a preventive means helps to avoid unwanted inter-annual fluctuations in output.

On an average area of 63 ares of paddy-field, the annual income of a family in the region of Metro reaches over 1.5 million rupiahs in 1987.

Unlike with upland crop farming, here the rice grower can count on his output, hence on a minimum income. A gradual mastering of the main factors of production enables him not only to increase outputs but also to ensure their stability. The concept of risk must be taken into account to understand the attitude of the farmer faced with new techniques. The behaviour of peasants in zones where irrigation allows but one yield of rice a year is a perfect example of such confrontation.

Mixed Systems: Irrigated Rice and Upland

Mixed systems are to be found mainly in two cases:

- the extension beyond its real capacity of a regional irrigation network; and
- small village-size networks without large reservoirs.

In both cases, irrigation is not provided during the dry season.

In all respects, the situation in such areas can be seen as an in-between, compared to the two previously described systems, whether it be regarding the population pressure, the

* *BIMAS*: abbreviation of Bimbingan MASSal, a system of farming credits in kind.

standard of income, or the technical ability of farmers. The first farming season only offers relative security to the farmer. The second one fosters even a higher risk than that taken in the *tumpang sari* system, because it concerns upland crops and takes place at the end of the rainy season.

In 1987, the average annual income of a family involved in a mixed farming system reaches about Rp 800,000.00.

We have seen that in Lampung the existence of a given farming system in a region is due to the conjunction of three factors: soil fertility, ethnic origin of the inhabitants and presence of an irrigated network. Within the same system, significant differences can be noticed according to how long the area has been populated, to its accessibility, the quality of its infrastructures, etc.

In zones of old native settlement mostly devoted to small plantation systems, the rather low prices on land and the need for labor have caused important spontaneous migration movements from Java. In other regions, the large colonization centers have led to the development of huge, mostly Javanese populated areas, and have become the magnets of spontaneous immigration.

On the whole, the older the immigration from Java, the higher the demographic densities. The Javanese population does not progress steadily but in rushes. These occur as if the land were divided into closebound districts, the size of a dozen villages. Each district gradually grows until it reaches its population maximum. Only when the situation becomes unbearable will people migrate to the neighbouring areas, as yet untouched.

Saturated Systems: the Breaking Points

Once limited to the proximity of major colonization project, spontaneous Javanese immigrations have spread, since the 1960's, to plantation zones traditionally occupied by native Sumatranese populations: Lampung, Sumendo, and Ogan.

Plantations: Towards the End of Extensive Farming Systems

Given the conditions in Lampung, changing from slash and burn to plantation farming requires an important labour input, especially for the harvesting of coffee, pepper, and clove. Up to the years 1960, seasonal farm hands from Java did the work. The extensions of plantations called for extra hands to ensure their maintenance and whole hamlets of Javanese labourers were erected on the plantations. Mother-villages along the roads and rivers remained inhabited almost exclusively by the native populations.

This first nucleus of settlement will allow masses of migrants to come looking for work, but mainly of land. Very few can afford to purchase a plantation. But forested parcels, away from the villages, can be obtained at a very reasonable price.

It is common practice, in order to buy land, to borrow a parcel of about 1 hectare for a three year period, and turu it into a coffee plantation. The tenant subsists more or less on cover crops: maize and cassava mostly. At the end of those three years, when the coffee shrubs start to yield, the parcel is divided in two lots: one goes back to the owner, the other becomes the tenant's

property. Such an arrangement is satisfactory for both parties. The Javanese has been made a landowner with his work power as sole investment, the Lampung has got a plantation without any effort on his part.

More and more migrants are attracted by the possibility of becoming landowners, while the native Lampung, new to the idea of land value, gradually loses his landed estate capital. For a Javanese coming from an overpopulated area, land has a value in itself. For the Lampung, a land plot is worth only its contents or its short distance to the village. Except in the rewarding times of harvest, in case of an urgent need of money, to pay hospital or school tuition fees for example, the planter will be compelled to whittle his only capital: land.

Such circumstances lead to distinguish three kinds of family:

- **wealthy families:** these are almost always natives who own a large landed estate capital, plantations, and paddy fields. Quite often they will engage in secondary activities: people or goods transportation, rice processing, or marketing of farming produces. Real clans of gentlemen farmers, some may employ several dozens of farm hands and share-croppers on a permanent basis;
- **smallholders:** these are either long established Javanese migrants who settled there when land prices still ran low, or ruined natives left with only a few plantation parcels;
- **farm labourers:** those were the last to come among Javanese migrants. Higher prices now forbid them to buy land. Competition between farm hands no more allows high daily

wages nor does it make possible to exchange one's labour for land.

The system becomes saturated when recent immigrants cannot find work as farm hands. This occurs when the population density reaches 300 to 350 inhabitants/km². All available land parcels have then been turned into plantations with full employment. Labour is at its minimum cost. If a farm hand were to accept lower wages, he would not be able to support his family anymore.

There is however a certain fluctuation in the minimum demographic pressure a system can bear, according to the quotations on commodities. That is, when coffee or pepper prices are high, planters are ready to hire farm hands with a one-year contract in order to ensure the good maintenance of their plantations. For 10 to 12 weedings, the usual salary, per hectare and per year, will consist of 100 kilogram of white rice, given out in monthly installments, and 100 kg of coffee when harvested. Although rather costly for the planter, this method enables him to pay after harvesting, a favourable time when cash is available, while providing against the eventuality of a collapse in prices.

On the other hand, during recession periods owners are reluctant to invest into old or meagerly productive plantations, which has an immediate effect on job opportunities and consequently on the maximum demographic load.

Upland Crop Farming Systems: The Attractions of Land Ownership

Transmigration zones devoted to upland food crops reveal their inner

contradiction from the start. Food crop farming very seldom grant families their self-sufficiency. An outside job alone will somehow help to make up for the deficiencies of farming production. And yet population densities keep rising fast, up to reaching 300 to 350 inhabitants/km². The development of Transmigration centers acts as a magnet for spontaneous migration. In many of them, 10 years after their creation, official migrants represent only 15 to 20 percent of the population. The majority of families consist of spontaneous migrants who bought their parcels from transmigrants or settled on neighbouring reserved areas.

The average surface owned by migrants is thus rapidly falling from 2 to 1.5 ha. being seldom encountered. Taking out 25 ares for the *pekarangan* (house-plot comprising an orchard garden around the house), only 125 ares are devoted to food cropping growing. The average income drawn from farming activities rarely runs higher than Rp 300,000.00 a year per family.

But if upland rice, maize, and cassava outputs are not sufficient to support his family, they are enough to grant the migrant the status of farmer. From farm hand in Java, his accession to ownership has enabled him to climb one step on the social ladder. Whether official or spontaneous, the migrant's main goal is to free himself from his previous condition of labourer.

His calculation is not made from the financial point of view: as an independent farmer he seldom makes more than Rp 500.00 a day, whereas a daily labourer's income is about Rp 1,500.00. Similarly, many a spontaneous migrant will rather purchase poorly

fertile soils which will entitle him to a certificate of ownership, than fertile land without that precious paper. Now in the outer islands of the archipelago, such certificates are not usually delivered outside Transmigration areas.

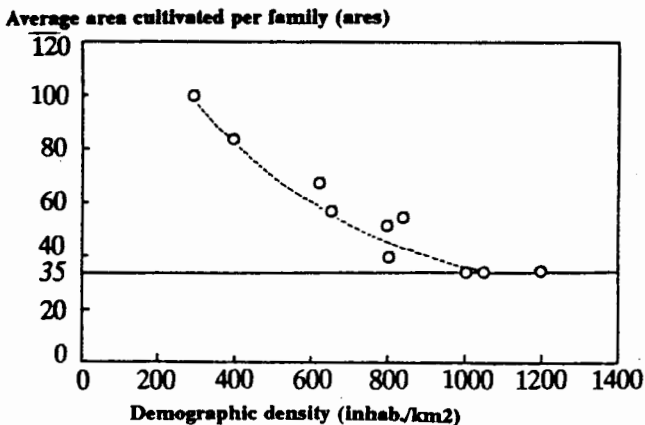
The head of the household always introduces himself as farmer, not as farm labourer. He tends to conceal the importance of the "minor" and "occasional" income drawn from outside jobs. A close examination of his statements reveals that those "minor" revenues often represent over 75 percent of the household income. True, farming activities, even if not profitable, are given a priority. His 125 cultivated ares provide full-time employment to the head of the household, with the help of one or two other members for the peak periods. Outside these periods, at least one member of the family has to work as daily labourer on sugar-cane plantations or other large estates. Such jobs generally fall on the younger people, sometimes on the father if the children are too young, but seldom on the wife. Too many youths thus jeopardize their future by early dropping out of school to become farm hands.

It looks as if those outside jobs, held by a few members in the family, were meant to support an unprofitable farming system, with the sole purpose of granting the head of the household the status of landowner.

Irrigated Rice Farming: Javanese Densities

On the irrigated perimeters of Gading Rejo-Pringsewu developed between 1905 and 1927, the Dutch authorities allotted parcels comprising a *pekarangan* and one *bau* of paddy-field

FIGURE 4.
BRAEKPOINT IN IRRIGATED RICE CROPPING



Source: ORSTOM field surveys, 1987.

per family. A *bau*, measuring 70 ares, is then considered as the standard surface on which to ensure the full employment and subsistence of a family.

Until the end of the years 1970, with one crop of irrigated rice a year followed by a grazing fallow season, no farm can survive if the land is parcelled out. The introduction of high-yield, short-cycled varieties, together with chemical fertilization, make it possible to double the average yield per crop, and to realize two yields a year.

From then on, the land being able to support a greater number of families is rapidly parcelled out. Lots of a *bau* at first are themselves always divided in two. Nowadays, parcels of 70 solid ares have virtually disappeared. Most of them cover 1/2 or 1/4 of a *bau* (35 and 17.5 ares respectively). A further dividing would be of no interest, such surfaces being already inferior to the minimum viable one.

In theory, it should be possible for a family to farm only 17.5 are and complement its income with outside revenues. This is forfeiting the farming

peak periods, which forbid any external wage-earning employment, and the lack of job opportunities outside those periods. Such circumstances have driven heads of family to seek a wage-earning job while leaving their parcel in the hands of a sharecropper. Figure 4 shows the evolution of the average cultivated surface per family related to demographic pressure. From a density of 1,000 inhabitants/km² upwards, the average surface of cultivated property per family asymptotically tends towards 35 ares.

This can be considered as a breaking point: on an average surface of 35 ares, a rice-grower cannot keep a couple of oxen or buffaloes anymore. Competition is high to graze on the grass and weeds of the roadside. Full employment is not guaranteed in farming and competition is high as well for daily labour jobs. If there are no small factories in the neighbourhood (tile and brick wrks...), the peasants have no choice but to invest more pains into their own parcel.

Dividing the meager family property for children to inherit their share is impossible and many young couples resort to sharecropping. In irrigated rice farming systems, half the yields traditionally fall back to the owner. When pressure on the land is high, inputs are almost always paid by the sharecropper. Therefore, if owning a 35 are paddy-field provides enough food for a family, the share-cropper will have to find at least 50 to 70 ares for the same result.

Such figures bear out the reakty of a breaking point of land surface around 35 ares for irrigated rice growing. The maximum number of farmers the system can stand has been reached. Newcomers, whether migrants or young couples, will encounter the greatest difficulties in finding farming jobs. They will have to seek employment in a local factory, if any, or to emigrate to a town or the pioneer fronts in the north of Lampung.

Mixed Farming Systems: An In-Between Situation

Mixed farming systems, exploited to the utmost, remain the perfect balance between upland and irrigated farming. Even with the highest population densities (800 inhabitants/km²), the average cultivated surface is practically never inferior to 75 to 80 ares per household. The factors described for irrigated systems remain valid here, but the breaking points are higher, only one crop of rice being produced per year.

Whatever the system involved, saturation is obvious when emigration is strong or even relative (when demography is lower than natural population growth). Such a situation is

clearly observed in easily accessible plantation zones as well as in very old colonization areas.

In 1905, when the first census was taken, the population of Lampung amounted to only 160,000 inhabitants. In 1986, there were over 5,250,000 inhabitants in the Province where the rate of population growth was the highest of the archipelago. Densities of more than 1,000 inhabitants/km² are found next to densities inferior to 50.

Among the reasons offered to explain such differences, soil fertility usually comes first. Mohr (1938) gives very interesting conclusions on the relationship between densities and soil fertility on the Island of Java. However, the comparison he makes between Java and the outer islands now seems doubtful, the farming systems described being entirely different. Rather than soil fertility, the choice of a farming system will determine the maximum population pressure of a region.

The ethnic factor, through the choice of a farming system and the family traditions, is as important as soil fertility. For example, areas of low fertility where Javanese migrants have implemented the *tumpang sari* system can show the same densities as more fertile zones where native Lampung people grow coffee.

Irrigation plays a decisive part, for it makes it possible to neglect the soil's fertility factor. In all upland food crop farming areas where irrigation has been introduced, population densities have doubled in ten years.

For each farming system, it is feasible to determine the breaking points of demographic pressure. Once these are reached, a region cannot absorb any

more newcomers, immigrants or young couples, except if the farming system is to be modified.

On plantations, the breaking point is around 350 inhabitants/km². At that level, the land market is saturated and all wage-earning farm labourers are fully employed. The system could feed more people owing to the relatively high income drawn from the plantations. But it could not ensure their full employment. It is the financial capacity of landowners to hire wage-earning labourers which alone determines the demographic breaking point of plantation systems.

The breaking point in irrigated rice growing, because the system calls for more labour, will be higher, around 600 or 1,000 inhabitants/km², respectively, depending on how many farming seasons, one or two, can be realized. At such densities, the land market stagnates, not from the landowners' doing, but because it has become impossible to further parcel out paddy-fields.

This is the farm size breaking point beyond which the family's survival would be endangered.

This point is closely linked to the yield rates of the paddy fields. The Green Revolution has helped to considerably bring it down. Theoretically, any future improvement in yield rates would even bring it lower. However, a lot of families are barely surviving and can hardly afford the raise in input process anymore. The present trend is actually towards a drop in yield rates.

In upland food crop farming systems on the poor soils of the large eastern penneplains, farming incomes alone are not sufficient to support a household.

Production on the maximum surface that can be farmed by a family, according to the techniques used, does not even meet its elementary needs in food. Temporary outside jobs held by one or several members of the family will provide the complementary revenues necessary to ensure survival. In such circumstances, parcelling out land plots is out of the question. The maximum densities range around 300 and 350 inhabitants/km².

When demographic breaking points are reached, new household heads have no choice but select another farming system, or to emigrate. Hence in the heavy populated region of Fringsewn, paddy fields are gradually giving place to activities which bring higher incomes per land unit: market gardening, fish breeding, tile and brick works. In the area of Way Apung, the development of the Way Rarem irrigation network has made dozens of Transmigration villages, that had been at a stand still for 15 to 20 years, prosperous at last. And the development of hevea plantations not far from there also contributes to improve household incomes.

Changing farming systems is seldom within the reach of individual enterprise. Emigration often remains the only option. This can be observed in all zones where demographic pressures have risen to its breaking point.

Since the years 1975-1980, almost all irrigated rice growing regions have shown the symptoms of a relative emigration, whether or not they have reached the demographic breaking point. Most likely, a certain number of areas, such as that of Metro, will never reach the critical point. For in fact, the exceptional development of Indonesia

since 1969, the higher standards of living and education, as well as the attractions of the cities, have driven many young people away from country life.

Conclusion

The outmigration is to take place when the demographic break point is reached and thus family survival becomes difficult. This point is determined by the choice of a farming system rather than by the soil fertility. And the choices of a farming system have to be viewed through the family traditions and the cultural factors.

Family survival is not the only reason that leads people to emigrate nowadays. If the level of income to be provided by a new activity seems to be more and more the essential motive, status should also be taken into account. As is often the case among rural populations, the status of a civil servant or a wage-earning employee is considered as more gratifying than that of a peasant.

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