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# FARM SYSTEMS IN SOUTH-EAST ASIA [1]

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## INTRODUCTION

Agricultural systems may be distinguished according to the manner in which various forms of agriculture are carried on within the farm ; they are determined by their *dependence* on and *place* in *nature* (permanent, semi-permanent or intermittent, and impermanent), according to their *basis*, viz. the crop or stock grown, according to their *type*, which is characterised by the chief implement used for cultivation, and according to the *method* of growing and cultivation. Several different systems of agriculture may be encountered in the same farm, even though the permanent cultivation of various cereals with the same types and methods is combined into a single agricultural system, since root crops or trees will often be grown in addition, or cattle raised.

Moreover, different conditions have not only led to different agricultural systems, but to different combinations of agricultural systems. Since these combinations constitute the farm, they are termed the farm type as regards the farm, and a region characterised by one or more farm types is termed an agricultural region. The farm type or the associated farm types of an agricultural region are then termed the farm system (29b).

The agricultural regions in the tropics can usually be very clearly distinguished according to their farm systems, since these have been maintained for a very long period as a result of isolation and lack of development and are often traditionally associated with the entire cultural pattern. In this first survey we shall give a description of the Indonesian systems.

## THE JAVANESE FARM SYSTEM

The central region, or true Kedjawen, in which this system was of traditional occurrence, has rain throughout the year or only a rather brief dry period, and predominantly rich volcanic soils. The farms are mostly dwarf or small-sized. The farm system consists of five permanent agricultural systems :

a The growing of irrigated rice with the hoe or plough (sawah system).
b The growing with the hoe of trees, mixed with other plants, usually vegetables and fruit, but also a great many root crops, on the fenced-in space surrounding the house (pekarangan, or mixed garden or compound system).
c The growing of dry crops, occasionally mixed, with the hoe or plough, usually in crop rotation 1) on fields which cannot be irrigated (tegalan system) and 2) on the dry sawahs (polowidjo system), the chief crops being cassava, sweet potatoes, maize, ground nut, soya, etc.
d Cattle raising : carabao, cows, or the breeding of small livestock : goats and sheep, or poultry (chickens and ducks) (stock-breeding system).
e The breeding of fish in fresh-water and salt-water ponds (tambaks) (fish-breeding system).

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Of these agricultural systems, a), b) and d) are always in evidence, while $c_1$) occurs on land which cannot be irrigated, and $c_2$) alternately with sawah, generally during the dry period. Fish-breeding is very often absent, particularly in the dry plains. Owing to the pressure of population a great number of dwarf farm units have sprung up, and these may also occasionally lack cattle, mixed garden or sawah. Consequently the farm type shows variations.

It seems that the original farm system was sawah and mixed garden with carabaos and poultry, since the agricultural regions of which we have the earliest accounts consisted of small coastal plains along the estuaries which were surrounded by wooded hills and entirely occupied by sawahs and mixed gardens (31). This combination is still found today in the culturally related maternal regions (or at any rate formerly maternal regions, [2]) as assumed in the case of Java [3]) of southern Burma, Tenasserim and Siam (Mons of Pegu and Lawas of Siam), Cambodia (Khmers), Annam (Chams of Champa) and Patani (46), and also in the core of the matriarchal Khasi region of Assam (27).

Landed property, principally sawah, was also not much more extensive a thousand years ago than it is today, viz. a maximum of about 1 hectare to a family. At he present day, however, in Java a great deal of this consists of the less productive dry soils which were originally lacking and are consequently still largely absent today in the mentioned areas. Cultivation with the hoe seems to have been the general rule, but in course of time cattle, i.e. the carabao buffalo, were introduced for working the soil, for treading of the sawah as in Patani, or for ploughing.

A part of the landed property (about 25 %; see 29a) always consisted of mixed garden, as it still does in the above-mentioned regions, so that the house and the garden and plantation belonging to it constituted a whole which was the property of the cottager (with the exception of trees which have passed into other hands as a result of mortgaging and the like). The mixed gardens are generally planted with a varied assortment of trees, bamboo, shrubs, such plants as banana and papaw, small plants, root crops and spices, but chiefly with coconut in suitable districts. These produce vegetables, fruit, tubers, spices and medicinal herbs, flowers, kapok, etc., bamboo, firewood and timber, so that broadly speaking the sawah produces the staple food (rice), the tegalan the supplementary staple food, and the mixed garden the additional food (supplementary proteins, vitamins) and as a result of regulair sales, the supplementary daily income. Hence in the Javanese farm system no part of the land is unused, everything, with the exception of the dwelling-house itself, being intensively planted (17, 26, 27, 29a). As a result very high densities of population [4]) occur in this system (500 to over 1000 per sq. km. of land) (29a), as is also the case in the related system in use on the Malabar coastal region of India (24).

The Javanese village consists of scattered houses with mixed gardens adjoining, usually in the plain alongside watercourses or in irregular groups, but never

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2) "Maternal" is used as a more general expression than "matriarchal" same as "paternal" for "patriarchal".

3) See 27 and also 2, 4, 5, 8, 20, 35 and 36.

4) And also a great many excessively small farms and, despite the great labour intensity, a considerable partial unemployment. In Kutowinangun there was only 170 days work per annum per family in agriculture (18).

round a village square. Only the towns are grouped around a square (aloon-aloon), possibly under the influence of the princes. The house is always rectangular with a saddle-roof. Unlike the rest of Indonesia and most of south-east Asia, with the exception of the extreme south-east (parts of Timor) which moreover has round houses, the Javanese house is not built on piles but directly on the ground. On the other hand, old bas-reliefs (Prambanan temple) show rectangular houses built on piles (29a).

The tegalan is always planted in the rainy season, and as far as possible in the dry season as well. A crop raised during the rainy season is often allowed to continue during the dry one (e.g. cassava). If there is sufficient rain such crops as tobacco, maize, chillies, ground nut, etc. are grown during the dry period. The tegalan is never employed for dry rice.

In raising rice in the sawahs, the rice is laid out in the panicle on seed-beds and afterwards transplanted. Irrigated rice (padi gadu), as well as an occasional dry crop, can often be produced again during the dry period on sawahs capable of being irrigated during this period. Usually, however, there is insufficient water and the same crops are raised as on the tegalan. Where, however, there is sufficient land the sawah is usually only planted during the wet season. Occasionally, as in the case of sugar cane, it is planted for longer than a year. With dry crops there also occurs mixed cultivation of various crops (tumpang sari).

The carabao was originally the most important domestic animal, as it still is in the Mon, Khmer and Cham districts, but nowadays cows occupy the chief position in typical Central Java, except in the borderlands of the north-east (Bodjonegoro and Lamongan) where it is still ousting the carabao, in the north of Central Java (from Tegal to Semarang), probably the district originally invaded by the Javanese, where the carabao still predominates. It is thought that cows are more suitable for districts with a dry period, but that the carabao is superior in wet districts with heavy soils. The horse is of little importance and is not used in agriculture. The typical Javanese districts approximately corresponding to Kedjawen, extend in the west to the Kali Pemali near Tegal and the forest district of Larangan ("larangan" and "pemali" mean "prohibited"), thence south to the Seraju and in the east from Rembang along the Solo to the Sidoardjo delta, and then across the mountains to about Blitar. But a great part of the southern coastal range and of Kedu and Banjumas contain non-Javanese features (29a).

In this Javanese farm system in which the farmer has the right of property in the soil, in Kedjawan, the village council, consisting of the village elders (kamituwo), has the right of disposal [5]) of the desa or village lands, particularly the sawahs, and to a less extent the mixed gardens and the recent tegalans which in many cases have only been brought into cultivation a short while ago. It may be assumed that in consequence of this slight right of disposal still possessed by the village, the lands were shared out annually among all the inhabitants (communal possession with changing shares) when the so-called Sulture System was introduced in 1830 so that the burdens of this Culture System could be equally

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[5]) It seems that in the case of mixed gardens this right did not originally exist at all (42). It was general and well in evidence in Krian (45), for example, but of no importance in Kangean (45), on Madura, in southern Madiun and southern Wonosari (43).

borne by all. Hence except where sawahs occur in changing shares, the farm consists of fixed parcels of land, disregarding changes caused by leasing and later addition of foreign origin.

Fish-breeding is mostly carried on in the wet mountainous districts, in fresh-water fishponds, and along the coast in salt-water fishponds. It is apparently a later addition of Chinese origin.

The mixed garden cultivation of tubers (e.g. keladi and the like) is noticeable'; it points to a substratum also occurring elsewhere in Indonesia which chiefly cultivated tubers (Polynesian farm system).

The irrigated rice-fields guarantee a certain harvest, so that sufficient food is always assured, save in exceptional years of heavy floods, for instance. Consequently the population increases fairly rapildy, but the farms are too small to produce a fair capital surplus for an economic development of the society and the inhabitants are constantly nearing the verge of want. Where there is a low population density and hence fairly extensive landed property per capita, the food, based on rice which can be kept for long periods, is good, but not rich in animal protein. This is derived from the traditional supplementary diet of fish and from the consumption of meat at feasts. Thanks to the mixed garden with its vegetables, fruit and tubers the menu is varied and generally well provided with vitamins.

As the population density increases the tegalan will begin to replace the sawah, with the result that tubers will begin to predominate in the menu, thus adversely affecting the supply of protein and eventually the supply of vitamins and even of calories.

### Sundanese farm systems

The Sunda lands also have rain throughout the year, and here and there, particularly in the neighbourhood of Cheribon and on the plateaus, a longer dry season and chiefly rich volcanic soils in the mountain districts and less rich ones in the peneplain. Small and dwarf-sized farms are the rule. The original farm system consisted of the following agricultural systems :

a The swidden growing (5a) of dry rice by means of the dibble (ladang system).
b Semi-permanent growing of dry rice by means of the dibble (tipar system).
c Swidden growing by means of the dibble of all kinds of annual crops and tubers after the rice (swidden secondary-crop system).
d Growing of perennial crops, generally around the village, by means of the dibble (talun-system).
e Raising of carabaos, poultry and goats (stock keeping system).
f Breeding of fish in fresh-water or salt-water ponds (fish-breeding system).

Except for the Javanese North Banten, the Sunda lands were a sparsely inhabited ladang region several centuries ago, with a great deal of forest, scrub land and grass jungles (10) such as are still found today in South Banten and South Priangan on the lower mountains and mountain slopes, for instance around the Bandung plain, on the higher slopes of Sanggabuwana, and until recently (1930) in the entire West Indramaju plain, this resulting from the Sundanese combination of ladang and stock keeping in which the forest was cleared each year by burning and a part of the grassland and young forest was also burned

for cultivation as well as for supplying cattle with the fresh shoots of grass. This is why one still often encounters communal cattle pastures for the carabaos. Stock keeping is also carried on extensively in the southern districts, but the carabaos are usually tended (10, 29a). Horses are of little importance except in the mountains, and are not employed in agriculture.

Two farm systems seem to have originally existed here, viz. a combination of a) and c) with small livestock, as in the Baduïs district where after a) and c) fruit trees, etc. once planted remain on the old ladangs, and a second system based on b), side by side with a), together with c), d) and e). There are no mixed gardens in either system.

The first farm system had villages surrounding a restangular open space with rectangular houses built on piles and having a saddle-roof, the whole being encircled by a quick hedge of various trees, and having communal landholding. The swidden or ladang (here called huma or gogo) was usually without a hedge and only used for two years ; they were generally planted on slopes by cutting and burning low trees and bushes, after which the ground was cleared of other weeds, loosened with the dibble and provided with holes in which the rice was sown (29a, 43). This farm system may be termed the Indonesian farm system without livestock.

The second system had the same type of village, but the latter was surrounded by a communal garden with fruit trees (talun) and the ladangs (tipars) were fenced in ; usually these were situated more in the plains or in the lower hills ; they were cleared of weeds and occasionally ploughed. The fences were not provided with the usual gates or doorways, but with ladder-like stiles. In this system also the rice was sown in holes made with the dibble. These tipars are all of a more permanent character and are associated with more fertile soils. This farm system might be termed the Indonesian farm system with cattle.

In recent centuries, however, the Javanese farm system has also found acceptance in the Sunda lands. The first reports on the conversion of grassland and forest into sawahs come from Sumedang and Tasikmalaja (Sukapura) about 1750, and later from Kampong Djawa in the Bandung plateau and from Bogor. Under the influence of the Javanese and the migrations from these places, the grass jungles have been converted into sawahs, most recently in western Indramaju, and the taluns converted into mixed gardens, although uninhabited taluns still occur, for instance the coconut gardens in Tasikmalaja and Tjiandjur, as well as fallow fields, this being a transition from the old tipars to tegalans, e.g. the tegal let of Purwakarta. Many founders of new villages (1800–1850) in the vicinity of Bogor came from Sukapura. Hoe and ploughe entered the field, but the carabao is still predominant. Fish-breeding also occurred in these parts, coming either from China or being original.

Moreover the houses have often been surrounded by mixed gardens [6]), but these are often smaller, unfenced and not so well planted, despite the rainfall which favours mixed-garden cultivation. On the other hand, the mixed gardens derived from taluns are often much larger and usually more wildly planted than the Javanese ones.

The form of the village was often lost, partly because owing to the increase in the number

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[6]) The first mixed gardens belonged to the district headmen (kuwon) and were called pakuwon (38).

of inhabitants resulting from rice growing, the village had to be extended as well, and also because new hamlets grew up out of the temporary dwellings beside the ladangs which previously had always been more scattered (babakan). Despite this the old village lay-out with its square and fence, and talun often surrounding it, is very easy to trace in South Banten and in the mountain region of South Priangan. Humas and tipars are still quite common here (29a).

The fields were originally communal property, as was also the talun, but in the latter each inhabitant had his own trees. The land on which the house stood was also communal property. It is probable that these fields and gardens were originally clan property, as on Ambon, and later on family property in a paternal society, the headmen having the right of disposal. A century ago the inhabitants of this region were obliged to perform services both for the desa and for certain families (heads of clans?) who often lived elsewhere. This right of disposal formerly owned by the heads of clans seems to have gradually become weakened and to have disappeared altogether as a result of the inferiors migrating and mixed residence of clans. But the village administration still rests with the village headman and the heads of certain leading families, and not with the village elders (kamituwo) as in Kedjawan from Cheribon to Grobogan (49 : 158). Little is known concerning the former legal status ; all soils are now the property of individuals and there is no question of a right of disposal. The society now is parental. Only the cattle pastures are still communal, although in South Banten also the humas and the village lands are still communal. Everywere else the humas have been replaced by sawahs and tegalans, but in the mountains burning is still regularly carried out for ladangs, e.g. on the Tjerimai slopes.

Hence a new Sundanese sawah farm system has arisen which is similar to the Javanese system but still has relicts of the older system in the form of taluns and cattle pastures and less mixed garden, i.e. about 15 % (29a). Polowidjo is still rare in this system, more value being placed on several rice crops a year.

Originally, of course, this system had all the drawbacks of the impermanent systems which owing to their complete dependence on rainfall led to uncertain harvests and often to periodic famine. Dry rice, the dry crop associated with this system, is very sensitive to drought. In good periods the food, based on rice which keeps well, is good, as is also the protein supply. Animal protein is limited and is derived from feasts or hunting, but is sometimes very scarce (Baduïs). Ample supplies of green vegetables are gathered wild.

The increase in population was regularly interrupted or cancelled out by crop failures. Owing to the gradual penetration of the Javanese system there has been an increase in assured harvests and in population density and conditions have arisen such as are associated with this system.

### East Javanese farm systems and transitional forms

The entire region of eastern Java varies from wet with rain throughout the year on the southern slopes, to extreme drought on the northern coast and on Madura. The soils in the mountain region of eastern Java are fertile, but in the strip to the north of the Solo river they are fairly poor. The farms are mostly small and dwarf-sized.

The original Eastern Javanese farm system is in many ways similar to the Sundanese. Ladangs were to be found as well as coconut and banana gardens (kebonans) which also contained other fruit trees. For instance, as late as 1850 villages were still to be found in Banjuwangi consisting of houses without mixed gardens inside a communal fence, surrounded by coconut gardens, and with scattered kebonans outside the village. The gardens and ladangs were probably first of all paternal clan property, later on family or territorial property, and finally individual property. Strangely enough, the land inside the village where

the houses stood, the tanah kampong, remained communal to the last (25, 34). The entire society was a paternal one.

In the Tengger villages were found which had very dense clusters of houses (formerly long-houses?) with a farm system consisting of ladangs and banana gardens. (This district is too high for coconuts). The vegetable gardens for which this district is now noted are situated on very steep slopes, as are also the ladangs from which they probably originated. It is likely that this society was also a paternal one.

The Madura farm system extends over what is mostly a very dry region and is mainly based on dry agriculture which is now permanent (maize) with individual possession of lands and of the trees which are found scattered around the houses and on the edges of the plots, giving rise to a park landscape. The inhabitants live in scattered communities; usually a paternal joint family lives together en bloc. Separate gardens (lontar, sirih, mango and *citrus* occur). Originally this system probably extended on Java up to the Solo river and the Muriah and across North Bali (Bali-aga) to Lombok.

The above applies to northern Bali, southern Bali having an entirely Javanese farm system, but with smaller, square mixed gardens divided up into small squares for the married sons of the joint family, in villages combined into large, square blocks. The water supply for the sawah is better regulated than anywhere on Java. Though the mixed-garden type indicates relationship with Madura and the Bali-aga, the predominance of tubers in agriculture in addition to rice points to an older sub-stratum related to that of the Javanese system.

The Javanese farm system gradually penetrated into all these districts, apparently from about the year 1200, the mixed garden being introduced (although in dry eastern Madura it is still unimportant) and, what is more important, apparently the dry, permanent type of agriculture and the sawah, together with the hoe, plough and cows. For eastern Java the percentage of mixed garden is 17, but only 13 for the part comprising Madura (29a).

Since river water was in shorter supply, it often happened that the sawah was not irrigated, particularly on heavy soils, but *it was dependent on rain*, i.e. rainwater was dammed up inside the dikes. In other districts, e.g. the Southern coastal range (Tulung-agung), rice continued to be sown with the dibble, after which the water was dammed up. For this agricultural system (known as the gogo-rantjah system), which greatly reduces the hazard of lack of water, special varieties of rice were required.

Natural conditions in the dry northern district are less favourable for mixed gardens which consequently remained on the small side and only developed in the wetter Bangkalan district on Madura for Surabaya market, and in the northern coastal districts of eastern Java, which have probably been longest Javanised (Pasuruan-Probolinggo). But even where conditions were favourable on account of a better rainfall distribution, the percentage remained well behind that in Kedjawen.

Except in the Madura districts, the original food is the same as that in the Sunda lands, but the climate is drier so that vegetables are scarcer. Although maize, which is less sensitive to drought, predominates in the Madura system, this is nevertheless a drawback because maize protein is inferior. This protein

insufficiency is compensated for by a greater consumption of fish and meat, but this leads to difficulties as the population increases in density. In this case the menu is changed to that of the densely populated Javanese districts, but with much less rice and vegetables.

In the districts with sawahs dependent on rain there is a fairly great risk of bad harvests.

In a number of districts (e.g. Gunung Kidul) the staple food is almost exclusively tubers, chiefly cassava, resulting in a poor supply of protein and vitamins.

Javanisation did not always proceed equally smoothly, and occasionally there were also other tendencies. For instance, during the last century the Madurese have crossed to eastern Java in ever-increasing numbers and converted the familial mixed gardens there into joint family units. Wildernesses are to be found in Banjuwangi in which the former sawahs can still be distinguished, evidence of a failure to convert to the Javanese system, possibly as a result of malaria.

There may also be a great variety of ways in which the Javanese system is adapted to the existing one. Whereas rain-dependent sawahs were encountered in the north and "gogo rantjah" in the south, in the latter district there was also found a new variant of the mixed garden agriculture, viz. the tegal-pekarangan system wich is a kind of combination of tegalan and mixed garden arising from the fact that the tegalan was continually planted with several rows of trees, e.g. coconuts. The actual mixed garden remained very small.

It can now be assumed that the entire southern area of Central Java, i.e. the southern coastal range and the south of Kedu and Banjumas, was also Javanised during the period of the great central Javanese principalities. All manner of relicts are found in this region. Dense planting of all borders of plots is general in the southern mountain district of Banjumas, viz. a kind of enclosure system inside which mixed gardens or kebons are found, but generally an ordinary tegalan or a tegal-pekarangan. One finds here the kebon type in particular, viz. the kebons of Kaliwiro, the krakals of Purworedjo and the mlindjo forests of Ambal. These had often become the property of the prince. The same relicts are found in the southern border district of the Javanese in Banten, e.g. the mlindjo forests of Blagendong and Kramatwatu. They do not belong to the original Javanese pattern (29a). The carabao still generally predominates in these districts.

Stock keeping does not occur, having gone over to cattle breeding, as on Madura, together with breeding for the trade and for contests. Fish-breeding only occurs in coastal districts and where there is abundance of water.

In all these eastern Javanese and Madurese districts little is known of a right of disposal of the desa. Individual land tenure prevails. Sawah, mixed garden and tegalan constitute the farm, with stock farming and occasionally fish-breeding. Kebons and ladangs are the exception and only relicts; grasslands are still only found in the extremely dry eastern district. Fallow or rather wasteland on tegalan is only found in the southern coastal range and a few other divergent districts.

The most spectacular of all these Javanese farm systems is the occurrence of permanent dry agriculture. The tegalans are often terraced, but occasionally an entirely different agricultural system is also found in which the soil is worked into horizontal ridges alternating with gullies, usually only on very permeable soils as in Tawangmangu (22).

It would seem that this dry agriculture and the cows were foreign intruders

in the general Mon-Khmer pattern, since neither are found in the latter [7]). This becomes clear when it is known that Java was under the influence of the Mahayana Buddhism of the east coast of India (Madras) where there was permanent dry agriculture with cows in addition to sawahs, and the other districts of south-east Asia (the Mon, Khmer and Cham States) which are culturally related to Java were influenced by the Hinayana Buddhism of Ceylon where dry agriculture did not occur and is still only of minor importance (13). The maternal mixed garden-sawah unit was their traditional property, but only Madras was able to introduce new agricultural systems, viz. the raising of dry crops, the rabi crops of India grown after the rains, which were imported to Java on the dry soils and in the form of polowidjo, and cattle farming at the same time (24). There are indications that in the dry districts where cows are more suitable they have everywhere ousted the carabao, e.g. on Madura and Bali. But the small remaining islands east of Madura, e.g. Kangean, still have the carabao which was the original domestic animal of this entire region up to and including southern China (33).

To summarise, therefore, the original cultural pattern of the Mon-Khmer-Java group consists of sawahs and mixed gardens on a maternal basis, cultivation with the hoe, as well as the use of the Malayan plough (32) with carabaos. The latter together with the sawah has extended over the surrounding areas. Another typical feature is the bearded rice (*Oryza japonica*) which belongs to the India-Assam-northern China-Japan region, but may still occur among the above-mentioned peoples, albeit as an occasional relict, in the middle of the entire remaining area of south-east Asia, Indonesia and the Philippines, which has beardless rice (*Oryza indica*). With the Tibeto-Burmese and Chinese invasions the latter supplanted the bearded rice on the continent. From the other side the bearded type of rice, together with the sawah, has now penetrated beyond Java as well.

Throughout Java the family-sized farm seldom exceeds 1–2 hectares. It is rare to find other types of farms, and these are generally of foreign provenance, e.g. potato, vegetable or tea farms in the mountains. Thus except for these medium-size and large farms and the estates, nearly all farms are dwarf units except in the few districts with large estates where the form of tenure, however, (lease, share cropping) is nearly always a dwarf farm unit. Both men and women work on the land.

From the agricultural point of view, the development on Java was probably as follows. About the commencement of the present era or even earlier, Javanese, who probably came from Indo-China, settled on the northern coast of Java. It was only in these coastal regions where heavy, less permeable soils occurred, viz. in Banten and from beyond Cheribon to the Muria, that they obtained a foothold with their sawahs. It is true that many place-names [8]) between Banten and Cheribon recall Javanese settlements, but this dry coastal area, with its generally permeable, lateritic soils, was held by them in little esteem. From the northern coast they penetrated into Kedu and Banjumas,

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[7]) The disappearance of houses built on piles may also be attributed to Indian influence (see also 13a).

[8]) The coastal sawahs of Krawang with teki-tike (*Eleocharis dulcis*) near Tjemara and Sungeibuntu also recall the Javanese.

probably assimilated the nuclei they found where tubers were cultivated and the related Polynesian farm system was practised (see below), together with any groups of ladangers, and established large principalities (Borobudur). They subsequently spread out over Jogja and Solo and later on (about 1200) over Madiun, Kediri and the Brantas delta, where they set up new principalities which are recalled by Prambanan and the ruins of Modjopait. They afterwards penetrated into Malang, Pasuruan and beyond (Hayam Wuruk), and later still into the dry northern district of eastern Java (Bodjonegoro, Lamongan), the remainder of eastern Java, and southern Bali, while Macassar also came under the influence of their culture. The cultural expansion eventually extended to western Java, aided by the Pax Neerlandica. The southern stockkeepers, likely the Kalangs, probably put up a stubborn resistance, but it seems that any nuclei they may have established in Kedjawen were acculturized at a very early date.

### The Minangkabau farm system

In the Minangkabau region rain preponderates throughout the year; there are only occasional dry periods of a few months' duration, and generally very fertile young volcanic soils. The farms are small or dwarf-sized, usually 1–2 ha, although joint-family farms are naturally proportionately larger. Strangely enough this farm system, which belongs to the pure matriarchal sphere, differs considerably from the Javanese system. The rice consumed is the beardless type, although it is true that this and all other sawah rice is sown in Indonesia and then transplanted, but the farm system consists of the following permanent agricultural systems:

a Growing of irrigated rice with the hoe or plough (sawah system).
b Growing of mostly perennial crops in formerly uninhabited gardens (parak system) (nowadays these gardens are often inhabited).
c Cultivation of mixed garden crops in the mixed gardens (perumahan system).
d Cattle raising (carabaos) and small livestock farming (stock breeding system).

Only a small percentage of ladangs occur in the northern frontier area with the Batak lands and also, probably as a relict, in the mountain region above Painan.

Between the sawahs in the ancient central area of the Padang Highlands, unirrigated sites are to be found on which are built several long-houses, adat houses, accommodating a matrilineal joint family group, with an occasionally very small space (the perumaham) surrounding the house. Sometimes these sites are small and are only sufficient for one or two houses; in this case they are not planted or only very slightly, but usually they are amalgamated in large villages with a dense vegetation. One also encounters, mostly in the higher parts, large gardens (the paraks) which are planted with perennial crops and now usually provided with family dwellings; these paraks are usually fenced in and planted with coconut, banana, clove, fruit trees and sugar cane. The carabaos graze on the rice fields; only one crop is harvested a year. Polowidjo is more or less absent and tegalans are as rare as ladangs. Grassy plains are only found in the northern frontier area with the Bataks.

A similar system is found in Korintji which is situated to the south and also has abundant rain. The only difference is that the paraks, which in this

district are called kebon and are usually planted with cinnamon and coffee, are uninhabited, although houses are found on them which are used at harvest time. The sawah is cultivated with the hoe by groups of men and groups of women. There is an absence of both ladangs and tegalans. The villages are densely planted, but the plantation is situated more on the periphery of the village than between the longhouses where little room is left. The trees in the village belong either to individuals or families; the village land is communal (tanah kampong), unlike the Minangkabau where it is family property.

Both the carabao is to be found in Korintji and a small variety of cow which used to be exported to Singapore and has entirely deforested the slopes of many hills. Cattle are used in agriculture in the Minangkabau, but not in Korintji. Horses are not used in agriculture.

The sawahs and perumahans in the Minangkabau are the property of the joint family, with a tendency to split up; the paraks are individual property. In Korintji the sawahs are the property of the sub-clan, but the kebons are individual property. To develop land it is everywhere necessary to obtain permission from the village council which consists of the heads of the families.

In these regions the sawahs come under the right of disposal of the village, represented by the heads of families of the village.

Hence there are no great differences between these two districts. For instance, seen from the air the villages in the magnificent basin area of Tabat Patah in the Mingankabau resemble those in the Korintji plain, despite the difference in conditions of tenure. Both are surrounded by a dense vegetation of coconuts and other fruit trees round the village and between the small groups of houses. In Korintji, however, there are no separate mixed gardens around each house as on Java, although this is the case in the Minangkabau district.

It is probable that the pattern of Korintji society is more paternal than the Minangkabau. For instance, children-of-brothers are not permitted to marry. Burdens are carried by a band over the head, this not being seen in the Minangkabau, although it is encountered in the mountain area above Painan. Stiles and ladangs are also seen in the neighbouring coastal district. But the two systems resemble each other as well as those of various maternal peoples of Indo-China, e.g. the Jarai, Rade, and Muong which they also resemble in the use of water-mills (6).

The diet resembles that of Java, but is more extensive and more exclusively based on rice, with the addition of meat and milk products, although the latter only occur sporadically. The parak produces tubers, fruits and vegetables.

In Korintji vegetables, etc. are in shorter supply owing to the lack of paraks.

### The cattle-less Indonesian farm system

A large part of Indonesia, chiefly Banka, Billiton, Borneo, the Minahasa, Halmahera, and many islands of the Moluccas, which together with New Guinea and Molakka are all predominantly areas of abundant rainfall, is settled by mainly parental and paternal ladang cultivators with communal land holding, who have no cattle and have scarcely any method of cultivating the soil, making almost exclusive use of the dibble for planting their rice, maize, etc. in the soil. The farm consists of a ladang which in the first year is planted with rice or maize, and in the second year with tubers, vegetables, bananas, beans, trees, etc. Tubers are also occasionally planted in the first year (Tanimbar), followed by maize and then beans, etc. (7). On a farm of this type millet varieties (*Coix, Eleusine, Pamicum viride, P. colonum, Paspalum scrobiculatum* and others) were probably first of all cultivated in former years, or else more tubers in the farms exploited on a maternal basis. This is indicated, for

example, by the implement used (dibble or sharp-pointed stick). Certain plants, particularly fruit trees, often remain standing for long periods on the abandoned ladangs. Here, too, the farm is dwarf or small-sized.

In general this system consists of the following agricultural systems:

a Swidden growing of dry rice or maize by means of the dibble (swidden or ladang system).

b Swidden growing of a mixture of annual and perennial crops by means of the dibble after the rice (swidden secondary-crop system).

c Planting of perennial crops, generally around or near the village (talun system).

d Rearing of small livestock (livestock rearing system).

The Dayak village consists of one or more long-houses surrounded by a fence. Inside the enclosure there are usually a number of fruit trees which have to be protected from pigs, which are allowed to run loose, although most of these trees surround the village. The other resources are the swidden or ladang, small livestock, the forest, hunting and fishing. The fruit trees, but not the land, are the individual property of the villagers, usually the headman, which is different from the situation in a mixed garden where both the land and trees, etc. belong to the inhabitant of the house. When a village is abandoned the trees planted are allowed to stand; this is the tembawang.

The patriarchal Baduï in the wet Banten district have a similar system, as we have seen above, but there is no mention of gardens surrounding or near the village.

The system to which belong villages having a village square but scattered gardens also occurs on Halmahera. In the case of the very rainy island of Ambon, HOLLEMAN (12) gives the best description of the occurrence of ladang areas of plantations (dusun) of fruit trees, sago, etc., belonging to the sphere over which a patriarchal clan had the right of disposal, the trees being either clan or sub-clan property, and an account of how these became individual property. Here the farm consists of ladangs, shares in similar gardens, and as an acculturation, often a planted compound either resulting from the dusuns or laid out.

The sago gardens, which provide the staple food, often predominate here, or else banana gardens which provide a staple food consisting of boiled bananas (Mandar coast of Celebes) or roasted bananas (Halmahera), rice and maize being rare. Hence it is probable that these are societies which in their sub-stratum were originally maternal and had the Polynesian farm system.

In general, however, the large gardens are characteristic of the east; VINK (30) terms them "plantsoen". Clove, nutmeg and coconut gardens are found in the Moluccas, coconut and clove in the Minahasa. All kinds of transitional systems are found between the Ambon and Minahasa systems and those of the Dajaks and Baduï, for example on the small eastern Sunda islands (Alor) and in dry Portuguese Timor, on wet Tanimbar, already referred to above, with the Aluné on wet Seran, and possibly also with the Dongo of dry Sumbawa and the Redjang of wet Upper Palembang. Many small groups of farm systems of which the details differ exist side by side, occasionally beside groups having entirely different agricultural and farm systems, e.g. the maternal Wemale on Seran (referred to below) who have a Polynesian farm system, side by side with the paternal Aluné.

Agriculturally it is probable that the cattle-less Indonesian system corresponds to that of the second B group of Indonesians of BEYER et al. (3). Here also

the farm size per family rarely exceeds 1–2 ha. Occasionally, however, tribal, clan and joint family farms occur in which large areas are jointly prepared for production and burnt, after which each family is allotted its own plot. This considerably adds to the risk of large-scale fires, so that particularly on poor soils difficult to regenerate, grassy plains are formed with increasing fire-risk and hence increasing erosion. In general, however, there is very little danger of erosion in this system; grassy plains are fairly scarce.

In a detailed description AZAHARI (1) depicts the development in rainy West Borneo of self-supporting tribal or clan farms into family-sized farms partly based on the market, with joint family farms as intermediate stages (according to VINK (30) the latter are also occasionally village farms).

The Dajak agricultural systems were ladang, tembawang, social livestock rearing (pigs and chickens as sacrificial animals), hunting (for meat), and occasionally some fishing, in addition to handicrafts. Vegetables were not supplied by the tembawang, but by the ladang. The average total family share varied between 1.5 and 6 ha of ladang.

Buginese, Malays and Chinese settled along the coast, and from the outset were more based on the market. The Chinese had family-sized farms with swamp ladangs, later swamp sawahs, permanent cultivation of vegetables and fruit near the houses, pig breeding, and an irregular income derived from outside wage work and mining. The Buginese also laid out swamp ladangs which they converted into coconut gardens. Their family-sized farms were operated by credit bondsmen. The Malayan family smallholdings cultivated swamp ladangs, coconut gardens, sago gardens, and there was also fishing and a certain amount of trading.

The Chinese farms developed into small family and family-sized farms with random-irrigated sawahs and swamp sawahs of 0.8 to 1.5 ha, a small compound of 0.25 ha, 0.3–1 ha of rubber, a small tegalan (0.2 ha) supporting dry crops, a large number of ducks and chickens, and in particular a great many pigs. In addition to the mandarins and coconuts grown in the compound, there are pepper, coffee and gambier of which larger plantations may also be found. There are even commercial gambier farms as well as vegetable farms for the market (Pontianak).

The Buginese slave farms were occasionally as large as several hundreds of hectares of planted and fallow land; coconuts, rubber, areca, (to a lesser extent) coffee and dry crops occurred, the land sometimes being partly leased for a share in the tap or crops; there was also trading in houses. From these there eventually developed family smallholdings of 1–1.5 ha of rain-dependent sawah, 0.3 ha of dry crops, a small compound of 0.2 ha with areca and coffee, for example, and 0.5–0.7 ha of coconuts and rubber. Stock keeping also occurred, resulting in deforestation (pastures), particularly along the rivers (Melawi).

Many Malayan farms also developed into joint family farms, but usually on a share cropping system as regards the crops and rubber. From the beginning, however, they developed more in the direction of family-sized farms with 0.8–1.5 ha of swamp ladang, swamp sawah or rain-dependent sawah, 0.5–1 ha of rubber or coconuts, a small compound and some dry crops such as water melon, and occasionally trading, fishing and handicrafts. In the upper districts which were further from the market dwarf farm units arose with 0.5 ha of ladang, 0.4–0.6 ha of rubber, gathering of forest produce and minerals and some incidental fishing.

When the farms were opened to the market and contact was established with the coastal population, the Dajaks also developed family-sized farms which were increasingly based on the market. They have a ladang, e.g. 0.5 ha of dry ladang and 0.2 ha of swamp ladang, afterwards converted into swamp sawah, on which rice, maize, cassava and tobacco are grown. Coconuts, rubber, coffee and tengkawang are also planted, e.g. 0.3 ha of rubber with a share in the tembawang where the cultivators may tap arèn for sugar. Occasionally a compound is attached which is generally small owing to lack of space, 2–4 pigs and some chickens are kept, and in addition there are casual labour and collective gathering of forest products.

The diet is similar to that of the Sundanese farm system with a greater consumption of meat as a result of pig-breeding and hunting. Food supplies fluctuate on account of bad harvests.

As regards its distribution over the archipelago, this farm system is the most important. As far as can be ascertained, it is similar to that of the Malays of BEYER et al. (3), who also states that this system, which is very widespread in the Philippines, has its origin in the south. In the corresponding cultural pattern in Indonesia one usually sees carvings and the like with rectilinear ornamentation.

The agricultural systems are the same as those of the cattle-less Indonesian farm system with the addition of cattle keeping in a cattle keeping and pasture system. The farm size is the same as that of the previous farm system.

Cattle keeping is of great social importance, however, and dominates the entire cultural pattern. The possession of carabaos confers social standing on the owner; consequently most carabaos are owned by the headmen who slaughter them in great numbers on the occasion of wedding or funeral feasts. Moreover they are indispensable to everyone as a bride-price. Hence they possess a kind of right of primogeniture; they wander about unattended on the harvested ladangs, and in the dry season the dry, bushy grass is burnt down to provide fresh shoots for the cattle, as a result of which the grass acreage is being constantly increased and the forest is only regenerated with difficulty. Burning the grass for stag-hunting, particularly along the margin of the forest, leads to further deforestation, while the herds of untended goats, which nibble off every fresh shoot of the young and remaining trees, ensure that the land remains bare. Thus there is a steady increase in erosion which has obtained a hold on the burnt grassy plain.

Hence even in districts with rain throughout the year, which are associated with a rain forest, extensive grassy plains arise on which grass ladangs have to be laid. This is done by turning over the turf with sticks. The ladangs also have to be protected with heavy fences against the depredations of untended cattle, and these fences often require more work than agriculture itself. Moreover, in order to economize on fencing the cultivators have long been obliged to lay out the ladangs collectively, particularly in the drier eastern districts with less forest, and this is a hindrance to individual initiative. Typical is the use of stiles, instead of gates, for giving access to these ladangs, their object being to keep out cattle, and also the zigzagging paths of cattle on the slopes of the hills (Fig. 1).

Since cattle was not normally eaten and not traded in, it had no economic importance and was even harmful. Some dealing in cattle has gradually grown up (horses from Sumba, carabaos, and especially the cows which were later imported into Flores and Timor, for their hides), but the income derived from cattle is still relatively very small. The small livestock kept comprises chickens and goats, and often pigs and dogs as well. Horses are not employed in agriculture, but in the mountains and grassy plains they are generally used as mounts and for transport.

The cultural pattern of all these districts is one of villages with rectangular houses built on piles (in the central district of Timor they are sometimes round and built on the ground), situated around a rectangular village square, without compounds, (Fig. 2) inside a fence, and surrounded by a garden (mamar, Timor; porlak, Batak) in which each villager can have his own trees or plantations. Such gardens are also frequently found outside the village. With

FIG. 1 CATTLE PATHS, ZIGZAGGING ON THE SLOPES, IN THE INDONESIAN FARM SYSTEM WITH CATTLE IN A DRY REGION (NIKI-NIKI, TIMOR).

*(Photo van Naerssen)*

the exception of the Toradja the society is extremely patriarchal, viz. Gajo, Alas, Batak, Pasumah (37), formerly the Sunda lands and eastern Java, the Sasaks and other peoples of eastern Lombok up to and including western Timor. All the patriarchal societies have the custom of bride-price.

As we have seen, this farm system and the corresponding extensive grassy plains are to be met with in the wet districts of Indonesia, e.g. the Gajo, Alas and Batak lands, in Upper Palembang (Pasumah) and the Toradja district and in the districts where these people were formerly active, the north coast of Atjeh, the Padang Lawas south of the Batak district, in the lower districts of Palembang and the Lampongs, in southern Priangan, and in the whole of southern Celebes, since it was only in recent times (4, 50) that the Gajo and Alas were driven away from the coast by the Atchinese, the Padang Lawas is an ancient Batak district, as also large parts of Palembang, and the Lampongs were formerly under Pasumah influence. The Buginese and Macassars were people with the same cultural pattern as the Toradja, although they have long been javanised, but the extensive grassy plains which arose under their influence have still not disappeared even in the very rainy district bordering on the Toradja.

It is obvious that this farm system is very soon bound to create extensive grasslands in the drier districts, and this used to be seen in the north of Indramaju and is still found sporadically in eastern Java, although to a greater extent on Sumbawa, Sumba, Flores and Timor and the smaller islands where cattle are tended, i.e. not on Alor and Adonare, for example, where no carabaos are found. Even Rekas and Ruteng in western Flores, which have rain throughout the year, are characterised by extensive grassy plains. It is possible

FIG. 2 ERODED BASE HILLS AND TYPICAL VILLAGE OF THE INDONESIAN FARM SYSTEM WITH CATTLE, IN A DRY REGION (WOLO-ONO, NDONA-VALLEY, FLORES).
*(Photo van Naerssen)*

that the system of large-scale collective cultivation in the form of starladangs which is practised in these districts is somewhat more conducive to deforestation. The latter is also assisted by the burning for stag-hunting which is known from the Buginese, and also from Komering in Palembang (47).

In many districts which have this farm system milk is still produced from carabaos and a kind of cheese made, this probably being a relict of a former environment outside the pure tropics where it was more successful. We know, for instance, that these peoples, or at any rate their culture, originated from Indo-China to which cattle farming penetrated from the north or west at some period. The milk is usually thickened to cheese, viz. minjak kerbo in Komering, Middle Palembang and Pasumah, termed dadi by the Buginese, Macassars and Toradja, bagot ni horbo in the Batak lands, and dadi in the adjacent Minangkabau district, susuriti in Timor where it is obtained by coagulating with juice of the fruits of *Wrightia calicyna* (15).

These regions sometimes contain areas with a noticeably different type of agricultural population which is often maternal, in which case the area also has an entirely different appearance, as for instance Tanah Ai to the east of Flores which lacks the grassy plains typical of Flores, but with swiddens, without cattle, in bamboo, brushwood and dense savannah, the rainfall being the same. Southern Belu in Timor also differs considerably from the northern Belu and Atoni district in being more wooded, having better vegetation and practically no grassy plains, but the rainfall is also higher here. It has some swiddens with infiltration of cattle, in addition to semi-permament agriculture (19).

It will be clear from this that in these dry districts settled by swidden cultivators there is no reason why grassy plains should arise. On the other hand, of course, not all grassy plains have grown up under the influence of the patriarchal cattle farmers. Another cause may be the repeated burning for hunting. The sparse, swidden-cultivating and sago-eating population surrounding the Sentani lake and Cyclops mountains in New Guinea were probably thus responsible for extensive grassy plains. Annual floods caused by rivers or lakes may also give rise to grassy plains in the flood area. Moreover, collective large-scale cultivation is often fatal as it may lead to repeated and extensive fires in the resultant wide, open areas. The duration of the dry season and the fertility of the soil are, of course, natural factors which determine the rate of growth of the area under grass.

The various districts practising the Indonesian farm system with cattle, have, of course, their own peculiarities. Thus in the Gajo and Alas lands the right of disposal of the land has entirely disappeared, and VINK (30) believes, rightly so in my opinion, that this is connected with the fact that different clans live together in the same village, with the result that the relevant authority of the head of the clan has been entirely lost.

In the Batak lands a maternal basis can still be observed, probably originating from the Simbiring which they recall by their dog breeding and the fact that only a family with a married woman was regarded as representative. Sawahs have been introduced here on a large scale, and consequently hoe and plough as well, particularly in the Mandailing district, bordering the Minangkabau, which has adopted the Moslem faith at the same time. Despite this, the inhabitants have succeeded in deforesting almost the entire plateau, even where the dry season is only of very short duration, and despite the fairly fertile volcanic soils. Nowadays there are even occasionally small compounds with dispersed settlement. Many of the ladangs have been abandoned in the neighbourhood of the Pasumah, the inhabitants having gone over to sawah cultivation. The traditional village square is to be found, but planted with coconuts. The grassy plains belonging to the old farm system still extend far into Palembang and the Lampongs, and the kebons have developed into coffee, pepper, coconut and rubber gardens.

The latter are also found in the Lampongs adjoining the Sundanese district. Here the form of the village has been lost; sawahs and small compounds everywhere occur, and along the coast (Kalianda) tuber growing and maternal influences go hand-in-hand.

In the Sunda lands most relicts of the old farm system are to be found in the south, viz. taluns, grassy plains, carabao keeping, houses built on piles, rectangular village greens with a grass cover, fenced-in villages, and customs recalling the bride-price. Little of this is now to be seen in the dissimilar areas of central Java, but the form of village in the Gunung Kendeng and, unlike the remainder of Kedjawen, the very bad erosion conditions in the Gunung Kendeng and the Gunung Kidul may well be connected with the old system of farming. The dissimilarities in the eastern Javanese and Madurese districts have already been touched upon. As in the Sunda lands, the compound or mixed garden is much smaller even where ecological conditions are favourable, and the agricultural systems often have divergent traits. It is noticeable that the practice of planting trees on the sides of fields recalls

FIG. 3 ERODED BASE HILLS, IN A WET REGION WITH THE INDONESIAN FARM SYSTEM WITH CATTLE (TORADJA COUNTRY, CELEBES).

*(Commercial photo)*

certain parts of China (23). This is also found in Pampanua on Celebes, for example.

The sawah and the hoe and plough have also penetrated into the original farm system of the Toradja which also comprised the Buginese and the Macassars, so that the south-western arm of Celebes now has a landscape resembling the Javanese one with sawahs, mixed gardens and tegalans. The right of disposal of the land has mainly devolved on the princes. Despite the lack of a dry season which may last three months or more in the south, extensive grassy plains remain scattered over the entire region; in the central area these plains extend from the coast in the west to the plains in the east. Despite the fairly recent penetration of the sawah into the Toradja lands, this region is now mainly bare and sensitive to erosion, the sawahs being chiefly found in the valleys, while the ladangs and carabao keeping continue on the slopes, the result being constantly increasing erosion (Fig. 3).

On eastern Lombok and Sumbawa, the sawah with hoe and plough, and here and there the tegalan also, have penetrated the Indonesian farm system with cattle, but there is no influence of the mixed garden system (14). Here there are to be found, probably as a result of the great increase in population caused by wet-rice growing, large fenced-in villages in which the former rectangular village square can still often be recognised from the air, despite the fact that houses have now been built on it. The village is surrounded by large gardens with trees, and encircling these are large sawah complexes in the lower parts of the area. In this system of farming the villages were formerly practically always situated on the tops or slopes of hills where many an-

cestral burial places can still be pointed out on the former central square, even though the village itself has been moved to the plain in the meantime. In this system livestock is usually allowed to run about untended, although on Sumbawa and Lombok it is tended and kept in kraals, a fact which has made it possible for agriculture to develop, as mentioned above (in this district shallots, for example, are grown on a large scale). The influence of the Dongonese, who practised the cattle-less Indonesian system of farming in which they incorporated cattle farming, is perhaps also noticeable in this district.

The sawah is still rare on Sumba, Flores and Timor, as also in the dissimilar districts which have a cattle-less system of farming. On Sumba there has been a large-scale change-over to horse breeding; in the more maternal south-west (Kodi) where there is semi-permanent cultivation of tubers the problem of keeping untended cattle outside the plantations has been solved by constructing a continuous fence which separates the coastal district with gardens from the typical Sumba interior with untended cattle.

As we have seen above, even the wet western district has been deforested on Flores; the traditional system of cultivation, the 'star ladang', in which the sectors allotted to each person for cultivation are marked out on the periphery of a circle from a central point, favours the occurrence of large-scale fires. In the very dry eastern district, in the maternal Tanah-Ai and on the island of Paloé, there is an absence of cattle and consequently of grassy plains as well; a type of agriculture is found which is based on tubers and millet varieties, but the agricultural and farm systems of this region have not yet been adequately studied. Larantuka, which is still further to the east, again has a swidden system with few or no cattle. In this district the bride-price is paid in elephant tusks, beads and silver currency. The voluntary associations for the communal laying-out of ladangs (gemohin, etc.) are characteristic.

Where cattle has not principally a social function and is therefore only slaughtered for certain feasts, as on Flores and Timor, the diet is good in favourable years, as it is in the Sundanese system, rice being the basis, adequately supplemented by meat (pigs, cattle), and often also milk products such as thickened carabao milk, but usually with few vegetables or fruits which are scarce in the extensive grassy plains and have to be supplied by the ladang. But the diet is always in a state of fluctuation and famine regularly controls increases in the population.

Where the cattle is chiefly social property and maize is also the staple diet (Flores, Timor) the menu is reduced to a minimum. Palm juices have to supplement the vitamin supply, and the meat eaten at the infrequent large feasts and derived from pig-breeding appears to be insufficient to compensate for the deficiency of animal protein.

### The Polynesian farm system

Probably the most primitive type, in the sense of being the most ancient in Indonesia, is that in which mainly tubers, bananas, etc. were grown in permanent gardens (28). It is a sub-stratum that is encountered in many districts of Indonesia and was incorporated in to later farm systems. Hence it is still found in ancient, isolated remnants of peoples, usually with a marked weddoid characteristic. Their agriculture greatly resembles that of the first B

group of Indonesians of BEYER et al. (3). It chiefly occurs in more or less maternal societies, occasionally in parental or paternal ones, but in this case the cultural pattern seems to have been modified by foreign infiltration without agriculture having undergone any change (possibly on account of the lack of the necessary plant material or livestock).

In addition to hunting, fishing and gathering, the farm system comprises the following agricultural systems:

a (Semi-) permanent tuber-stick- (hoe) system, sometimes irrigated.

b Permanent tree-stick- (hoe) system.

c Small-livestock system (dogs, chickens, pigs).

The plants cultivated are chiefly such edible tubers as yams (*Dioscorea aculeata* and *D. alata*) and keladi or taro (*Colocasia esculenta*) and occasionally *C. antiquorum* as well as bira or sente (*Alocasia macrorrhiza*), soeweg (*Amorphophallus campanulatus*), *Tacca, Cyrosperma* and various *Zingiberacae* (e.g. *Curcuma*). In addition to this original assortment comprising coconut (*Cocos nucifera*), breadtree (*Artocarpus communis*), bananas (*Musa paradisiaca* and *M. sapientum*) and such plants as *Nothopanax, Cordyline, Saccharum, Morinda, Excoecaria,* bamboo and pandan, most of which probably originate from a wet region without a long dry period, e.g. Assam, there now occur much later importations such as *Xanthosoma violaceum* which resembles keladi, *Canna edulis* and *Marantha arundinacea,* and especially ubi (*Ipomoea batatas*) and cassava (*Manihot utilissima*). In some districts sago gardens are also found in this system.

In general the village consists of scattered houses interspersed with trees and shrubs which belong to the house together with the land on which they grow. There are surrounding gardens which are regularly planted. When they are planted with tubers a rest period generally occurs after a number of years; when they are planted with banana the plantation can be maintained for many years. On fertile soils in particular the agricultural systems are almost permanent (Nias, Mentawei); on poorer soils new plantations are laid out after a rest period (Enggano). Plants are often grown on beds; irrigation is occasionally employed.

Men are responsible for preparing the soil and sometimes for planting as well; thereafter the gardens are distributed and allotted to the women who are responsible for the subsequent cultivation. Inheritance, where permanent, is usually matrillineal, so that this is thought to be the origin of the matriarchal cultural pattern. In fact, the system also commonly occurs in maternal districts, e.g. Bantik, Sangihe and Talaud (40), Sula (44), Kalianda (39), Kodi, Tanah Ai and with the Wemale. Where the soils are too poor to allow a permanent system to grow up, this development is obviously less important.

Mixed gardens often occur, viz. when the land surrounding the house still belongs to the house, since a characteristic feature of most of these societies is that the land is not the communal property of the village, but sub-clan or family property, the joint sub-clans or families having a right of disposal. But the compounds are not always planted (Bantik). Although they are now planted in Taland and Sangihe, probably as the result of acculturation, this was not formerly the case.

The farm system still occurs in its purest form in many parts of Oceania,

mostly in Polynesia where other crops which afterwards penetrated into the system in Indonesia, e.g. hoeing grains such as millet and maize and later a normal cereal such as rice, are still absent or are recent introductions. The corresponding social system has, however, often been greatly modified by the penetration of patriarchal elements, since all kinds of compromises have developed between the old and the new systems (Trobriand, Dobu, Tanimbar), the old agricultural systems being occasionally retained (7, 9, 16).

In Indonesia this farm system still forms the basis of the society in Nias, Mentawei, Enggano, Sula, Talaud, Sangihe, with the Bantik in the Minahasa and the Wemale on Seran, while very marked influences may still be perceived in the Lampongs (Kalianda), Kodi (Sumba), Tanah Ai and Paloé (Flores) and in southern Belu. This system also recalls the neglected tuber fields (*Colocasia esculentia*) of Padang and Priaman and parts of Benkulen and the extensive cultivation of these tubers in the Bogor district (Tjiawi), in the mixed gardens of southern Java, and in southern Bali. The cultivation of bananas as a staple diet, boiled or roasted, as practised on the Mandar coast of Celebes, in Halmahera and on Sangihe and Talaud, may be a similar relict, as also the growing of tubers in certain Toradja districts (Bare'e, etc.).

As stated above, this ancient cultural pattern in Indonesia has been penetrated by other patterns which have sometimes introduced new crops into agriculture (varieties of millet, and later maize and rice), e.g. a patriarchal megalith culture which probably changed Nias from matriarchal to patriarchal, resulting in an entirely different form of village. Mixed gardens are to be found on the neighbouring island of Simalur which has the same farm system, but this may be Atjeh influence. On the other hand, Enggano has entirely different divergences, but permanent agriculture was also unable to maintain itself in this district, if this stage was ever reached by the inhabitants.

In most cases this farm system probably formed the sub-stratum of a later farm system with sawahs, often the Javanese system as in Benkulen, on Java and Bali, or of the Minangkabau system as in Padang and Priaman. The use of the tuber and banana fields for wet rice ousted all the trees from the field and necessitated a denser and more extensive planting near the house. We may imagine that this process also went on in the original area of the Javanese farm systems and the related Mon-Khmer systems.

A curious situation prevails on Timor where there is little uniformity. Kupangers, Rotinese and Savunese live in the west in a mixed, uncharacteristic area. Adjoining them are the Atoni, followed by the Belu and sporadic, isolated lesser peoples (Kemak, Maroe) in the centre and the Portuguese area.

The patriarchal Rotinese and Savunese have broadly the Indonesian farm system with cattle, but less characteristic villages. The patriarchal Atoni also have this farm system but round houses built on the ground, while small scattered groups of houses with mixed gardens and the same houses are found in the mountains (See Fig. 4). The northern Belu district resembles the Atoni district. Probably it was formerly a matriarchal area ; the southern Belu district is still matrilineal and consists of large villages with irregular rows of rectangular houses built on piles. But in the Belu district of Portuguese Timor smaller villages are found with the houses on the ground and often mixed gardens, frequently on permanent fields. Maize is now everywhere the chief crop.

Ormeling (19) says that the carabao is comparatively new to the Atoni in northern Belu, but older than the horse. We may imagine that the Atoni orignally had the cattle-less Indonesian farm system, as also Alor, for example, with tubers and millet, and were completely acculturised by the patriarchal Belu who came at a later date and introduced rice and carabao. In the more southerly district invaded by them they encountered both the

FIG. 4 HAMLET WITH ROUND HOUSES, BUILT ON THE GROUND AND WITH MIXED GARDENS (KAPAN, FLORES).

*(Photo van Naerssen)*

paternal Atoni and the matriarchal Melu who also predominate and are acculturised in northern Belu but are still in a complete state of transition in the south. The (semi)-permanent agriculture of southern Belu and Portuguese Belu, the absence of wide grassy plains in southern Belu, despite the great density of population, and in the Portuguese area, do, in fact, indicate that stock keeping, which is still unknown in Portuguese Timor, entered the scene at a very late stage. But horses are to be found everywhere.

The institution of land wardens also points to an earlier situation in which the right of disposal of the soil was owned by the head of the clan. In most cases these wardens are not the present headmen of the chief clans or the princes, unless as a result of usurpation, the dignity being transmitted by inheritance in certain families formerly residing here, being known as pah tuaf, moselaki or tuan tanah in Malay. The institution is still known to a slight degree in northern Belu where it is termed rai-nain, most of the Atoni who formerly lived here having moved to the west (19). This institution also occurs throughout the east of the archipelago (30), e.g. on Seram (latu), Ambon (latu kwanno), Roti (langgak), Savu (deó rai), Flores (kolu) and Sumba (mangu tanah). The land warden gives permission for the land to be used for agricultural purposes and makes the neccessary arrangements. He is regarded as the descendant of the first proprietor of the land and as consequently having a magic link with the land. These land wardens appear to be entirely lacking in southern Belu.

It should be noticed that the dry season is much shorter in southern Belu and the rainfall heavier, so that a farm system based on the cultivation of tubers and possibly millet was able to maintain itself for a longer period than in the drier centre of Timor.

However, conditions in Timor are very intricate and only a personal view can be given.

The tuber-growing system soon leads to serious difficulties in drier regions because the tubers, with the exception of cassava which was introduced later, cannot be stored for long and can, of course, only be harvested during the wet seasons or soon after. The cultivation of cereals by hoeing (millet, and afterwards maize) then was often introduced. This agricultural system is dif-

ficult to trace; whether it ever formed the basis of a farm system or is to be regarded as a later addition to the Polynesian system is difficult to ascertain in Indonesia because nowadays it nowhere occurs as the chief agricultural system. But if they were originally present the millet varieties were fairly recently replaced by maize, viz. subsequent to the discovery of America. But farm systems occur in Africa which are mainly based on the cultivation of varieties of millet, e.g. the Sudanese cultivation of cereals which is carried out by men using a hoe and which appears to be connected with the ancient agriculture of Egypt and the Fertile Crescent, so that it is quite possible that agricultural systems with millet may have infiltrated into the Indonesian farm systems. The early names of Java would even render it probable that a great deal of millet was formerly grown in this region.

But millet varieties can also be grown in one of the two Indonesian ladang farm systems before or at the same time as rice. These systems have superseded the ancient Polynesian system in the dry districts to which they were better suited. It is possible that they have partly adopted root crops from the Polynesian farm system, and partly introduced their own crops into the Polynesian system, particularly maize. It is noticeable that on a number of very dry south-easterly islands (Timurlaut, with Leti, Laker and Roma) which have a maternal (11) population, a farm system occurs with maize and citrus cultivation in large mixed gardens. Where these peoples with their maternal societies in combination with the Polynesian agricultural system find themselves in dry districts as a result of voluntary or forced migration, the only alternative to extinction is acculturation.

It will be obvious that most farms are of the dwarf type. They consist of various gardens to a family as well as a number of trees in the vicinity of the house. The total area rarely exceeds a hectare. Swiddens have been occasionally introduced, e.g. on Tanimbar, without this increasing the size of the farm. It is remarkable, although understandable, that the swiddens are also allotted to the women in these systems (Tanimbar).

Both these primitive agricultural systems and the Javanese mixed gardening which may be regarded as a particular form thereof, are sometimes called horticulture, a term which includes everything known as primitive hoeing agriculture and hence also the cultivation of cereals (maize, millet varieties) with the hoe or stick.

This is quite clearly wrong if by horticulture is meant a labour and capital-intensive form of agriculture; the cultivation of cereals with the hoe is often anything but labour-intensive, e.g. the Sala in Northern Rhodesia who plant maize in family-sized farms with outside help and thus reach a farm size exceeding 10 ha (21). On the other hand, the intensive forms of rice-growing are certainly not horticulture, e.g. the intensive sawah system of Java with 1000–1500 working hours per hectare per annum.

If by horticulture is meant the growing of products which cannot be kept for long (daily market produce) and are in demand and consequently have to be planted and harvested throughout the year and require considerable tending, then horticulture covers the growing of tubers, which cannot usually be stored for long, as well as most kinds of vegetables, fruits and flowers (26). Modern horticulture would then be a differentiation of this into a capital-

and labour-intensive direction, and Javanese horticulture in the direction of a multiplicity of products.

As a result of the excess of tubers there are sufficient calories, but protein supplies fluctuate. Moreover, most tubers do not store well so that a harvest failure may lead to famine.

The diet is very voluminous; on Mentawei, for example, five meals of sweet potatoes a day are required to provide sufficient calories. In this respect keladi and ubi (Dioscorea) are better and also have more protein.

It is only rarely that hunting and fishing are able to make up entirely for this lack of protein, and the same applies to pig and dog-breeding, but the vegetable supply is usually adequate.

There is seldom a great increase in population.

### Divergent farm systems in Indonesia

In the west of Indonesia in particular there occur other farm systems, as we have already seen in the Minangkabau and Korintji, and in Azahari's description of Borneo. The chief districts which have other farm systems are Atjeh, Palembang, Benkulen and the Hulu Sungai near Bandjarmasin in Borneo. Direct influence of China, Indochina and Siam is likely.

In Atjeh we find a farm system consisting of a permanently irrigated, hoe-(plough)-rice system, a permanent mixed hoe system near the dwellings, a permanent hoe-tree system, a swidden rice-growing system with the dibble, and a cattle-keeping system, or in other words sawah, mixed garden, ladang, and untended carabaos, as well as small livestock, but no tegalan.

The coast was originally inhabited by patriarchal Gajos and Alas who were driven inland by the Atjeh who settled here (27, 50). The former left behind in a wide strip along the drier coast as well as in the wet inland district (Blang Rakal, Gempang, Tangsé) the extensive grassy plains which belong to their farm system. The Atchinese, who are apparently related to the Chams or were under Cham influence (4), had sawahs and mixed gardens, and apparently also adopted the kebons and livestock keeping from the Gajos and Alas. The kebons developed into coconut, banana, rubber, pepper and gambier gardens. In this way there arose a cultural pattern with highly maternal traits as well as paternal ones. The latter pattern was also helped by Mohammedanism which had been introduced long before. The population lives in villages consisting of houses which are sometimes contiguous and sometimes scattered. Right of disposal only applies to wasteland.

In the maternal district of Benkulen and the Semendo district of Upper Palembang we find the permanent, irrigated rice-hoe-(plough) system and the permanent mixed hoe system around the houses, as well as the permanent tree system with hoe or dibble, viz. sawah, mixed garden and kebon, as well as livestock breeding. The clove gardens are characteristic; ladang, tegalan and wild livestock keeping are absent, as are also grassy plains. The climate is rainy, however. The populated is housed in villages consisting of scattered houses, as is also frequently the case in the maternal Batin district (40).

Palembang is different again from the first two. The farm system is a combination of the permanent, irrigated rice-hoe-(plough) system, the permanent

hoe-or dibble-tree system, a swidden rice-growing system with the dibble, and a livestock keeping system, viz. sawah, ladang and kebon, carabaos and small livestock, but no mixed garden.

The sawahs only lie in the hollow (lebak) behind the levess (renah) of the rivers, whereas the kebons with fruit-trees occur on the renahs, as do also the villages which are usually stretched out.

The kebons have developed into rubber, coconut, pepper and coffee gardens. In Central Palembang in particular, keeping of carabaos still occurs on a large scale. Despite the very rainy climate the grassy plains are extensive and are extending still further. The influence of Pasumah is noticeable, and possibly also that of the paternal Redjang Lebong district (48).

This district, the ancient Srividjaja, has, however, been subject to many influences besides Javanese and Chinese ones. Remarkably enough, the mixed garden has been unable to gain a footing in this district. The society is parental. The right of disposal is in the hands of the territorial community, the marga, with individual right of possession.

The Hulu Sungai near Bandjarmasin is a typical sawah area. The farm system comprises a permanent, irrigated rice-hoe-(plough) system, a permanent hoe-tree system, a swidden rice-growing system with the dibble, and a livestock keeping system, viz. sawah, ladang and kebon in addition to wild livestock keeping. The farms are larger than the average size found in the other systems.

The sawah cultivation varies; rice having a very long growing period is planted out from floating seed-beds on periodically flooded fields. The system recalls the one practised in Siam, as does also the growing of fruit-trees on the dykes, here mainly citrus and rambutan. Mixed gardens are often found, but scarcely if at all planted. The kebons have developed into rubber, pepper and coconut gardens. Ladangs are the rule, especially in the extensive grassy plains on the eastern border of the flood area.

The Banjarese themselves have comparatively few carabaos, but the latter are common in the grassy plains of the east. On the one hand this grassy plain is probably caused by the periodic floods, and on the other this region has long been colonised by the paternal, livestock-keeping Buginese who burned vegetation for the cattle and hunted deer (41), as was also the case in Kotawaringin in the central south-western part of Borneo where extensive grassy plains also occur.

The society is parental and highly individual, and there is no question of a right of disposal. This recalls the cultural pattern of the coastal Malays who have settled everywhere along the coasts of Sumatra and Borneo in unconnected groups and have no local authority outside the family, although territorially most of them have always lived under one or other principality, often with a Buginese characteristic. They, too, are highly individual, have sawahs, ladangs, kebons as the case may be, and trade or fish, but they have no mixed gardens or tegalans and seldom raise cattle. The paternal suku (subclan) has the right of disposal of the land. Conditions here are however, not yet clear.

Probably the Malays are derived from tribes such as the Jakun, nomadic food growers and gatherers. They show that under certain conditions: small

scattered groups, no strongly organised community, no specialised cultural and agricultural pattern, acculturations are rather easy, as is shown also by the Bandjarese.

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