of reaping and threshing. "Water entering the fields at harvest time" implying all these disabilities was always regarded by cultivators assisting in soil classification as one of the chief defects fields could have The entry of tide water in the hot season is generally associated with a heavy growth of weeds In some of the worst parts the water which enters at every spring tide all through the hot weather impregnates the fields with salt, and in some of these cases the cultivators must wait till a month of the next rains have passed to give the salt time to be washed out before they can undertake agricultural operations Some cultivators by making bunds keep out the water from December to May, but some cannot afford to do that and frequently it would hardly be possible without adventuring on a large joint undertaking which might cause damage to other property by obstructing drainage But even in these kwins it is generally true that the tides on the whole are of value to the cultivator, doing more good service in the growing season than harm later on In some of the areas which have only fresh water the tidal influx is the most valuable property of the land and a bund to keep them out would be unthinkable The low-levels of Myaungmya Township are also irrigated in this way by the tides to some extent ; but the area so irrigated with any great advantage is small because of the salinity of the water there and because the low lands generally form deep grooves in the general shelf and tend to be flooded

13 In the wide group of saucer-kwins to the north-east the tides have quite a different significance There they bring only fresh water, but they are no longer a valuable gift of nature , they are the source of the greatest dread, and the principal aim of the cultivator is to protect his land from the floods they cause The effect of the tides is emphasised by the swelling of the Irrawaddy by rain in the upper parts of its basin, but the regularity of the floods would show the part spring tides play even if it were not clear that they help to cause the overflows by damming up the lower river During the wet season there are nine spring tides which fall into three groups of three Of these the middle group of three coming in July and August are the most important and generally the middle one of the group the most important of all The rise is said to be greatest in this middle group owing to the volume of fresh water coming down the river , but whether that is so or not the cultivator in low-lying kwins fears them most because his seedlings are then in the nurseries or newly-planted and unable to withstand so high a flood as they can a month later The first group affect generally only the lowest lands from which the smallest crops are expected , the last group generally find the plants well-established and able to keep their heads above water , but they are a trouble to those cultivators who have to practise late planting in the lower levels, or, having lost crops in the earlier floods, have at this time their last opportunity of patching or replanting to reduce the loss The principal interest with regard to the tides *in this area resides, therefore, not in the action of the tides themselves but in the* measures taken to reduce or exclude their influence the discussion of these will be attempted in a later section dealing with floods and bunds

14 In this report the term *tidal* will be used to describe areas in which the ordinary levels are irrigated in the rains by the tides, as in the greater part of the settlement area, *flooded* for those in which the water does not enter and leave at each tide but stands or flows with a depth inimical to the crop for some days or even weeks or is only prevented by bunds from doing so The lower parts of kwins which are generally tidal are often flooded and their higher parts may be out of reach of the tides ; but such kwins will be described as tidal Naturally there are parts of an intermediate character ; and there are besides small continuous tracts which are independent of tides because elevated above tide-level. The latter will be described as non-tidal although there are always tides in their streams. The cultivators use the words "*byaik*" and "*kôn*" to distinguish low and high lands, but the meanings of these are purely relative and local Where much land is flooded *kôn* may be used for land which is irrigated by the tide ; but similarly situated land is called *byaik* if there is much high non-tidal land in the neighbourhood. *A kôn* in the lateritic area around Myaungmya is thus a very different

thing from a *kôn* near Mawlamyainggyun, where also *byaik* is very different from *byaik* in the north-east of Wakèma Township. The terms are convenient for local use but should be eschewed in any statements covering an area of over a few hundred acres and will therefore be avoided in this report.

Floods and bunds

15 In the flooded saucer-kwins of the north-east the water sometimes flows over the bunds, streaming down the slope across the higher and more valuable paddy fields to the lower, and thence to the uncultivated portions. Some kwins near Shwelaung are efficiently protected by an embankment built by Government in 1884;* but that only protects the higher fields. In those kwins as in most others the flooding wells up from the low lands in the centre of the saucer, into which the water flows by numerous channels connecting with the rivers, and hence the characteristic of the flooding of these kwins is that for the whole of the rainy season they become lakes of which the cultivated areas are the banks and the shallow margins. The level of the water varies from time to time, but there is not generally any strong flow across the cultivated area except in some of the kwins shown as Tract 17 in Map III. The cultivators along the northern edge of North Kyônpauk Circle in the extreme north-east of the district by Pègôn and Kinwagyi still practise the system, described in the original settlement report of 1880, of digging channels to convey silt-bearing water from the Shwelaung River to build up the lower levels behind their gardens, and the cultivators to half the way down South Kyônpauk and Hngetpyawchaung Circles blame them for letting in the water and say this practice is the main cause of their loss by floods. But the great volume of the water of these kwins enters from the Irrawaddy side and from the Sabayo Creek, filling the saucer of North Kyônpauk and streaming down thence to the south where it floods all the eastern part of Tract 17 and escapes again by the Hngetpyawchaung *chaung*. In the western group of kwins of Tract 17 the flooding is due to the sweep of water of the Wakèma *chaung* through a depression in the rim of the Kyônpadôk saucer and to the drainage of the Shwelaung Circle and to water entering on the eastern side at Ainggyi by the Ma Nan Dôk *chaung* which was formerly an artificial channel made by a woman, Ma Nan Dôk, to convey silt to her fields but has now been included in a leased fishery and cannot be closed to exclude floods. The water escapes by the Kasagè *chaung* on the west and the Kawe-in *chaung* on the south. Interspersed among the kwins of Tract 17 on Map III will be found the kwins of Tract 16 in which the flooding is practically confined to standing water and little damage is caused by water flowing across the kwins except now and again when the rivers climb over the bunds. The whole length of the banks of all the larger streams in the area occupied by Tracts 16 and 17 has been bunded by the cultivators, except the nine miles near Shwelaung bunded by Government. As an example the bund surrounding the Hngetpyawchaung Circle may be taken; this was built by the cultivators in 1805 and 1806 each subscribing Rs 64, and damage is now repaired by the nearest cultivator. In all this area the close relation between tides and floods is clearly shown by the periodicity of the latter which was noted in the discussion of the tides, but when the level of the Irrawaddy in its reaches above the delta begins to fall the effect of the tides in banking up the water in these kwins is also reduced and at about the middle of October a considerable fall in the water occurs. In some kwins in which the saucer-rim slopes more steeply than in others the edges of the flooded land then become dry too rapidly to be planted successfully, and as will appear in Chapter III can only be cultivated on a system which gets the plants established before the water gets deep and accepts the damage done by it then. Two large schemes have recently been put forward by cultivators of North Kyônpauk Circle and of Shwelaung Circle by which co-operative action would be directed to improve the conditions and reclaim extensive areas for cultivation without excessive expenditure or interference with fisheries: but although a beginning has been made in the case of the former scheme both have met difficulties of organisation and neither has yet become an accomplished work. In the former

* In 1908-09 a proposal was made to extend this bund, but the matter has been put aside for consideration of a much wider scheme.

case the scheme aims at fending off the floods which come from the Irrawaddy just where it gives off its great branch, the Shwelaung River, but it aims also at conserving water at the end of the rains. In the Shwelaung scheme too, while the reduction of the level of water in the middle of the rains is planned, the main emphasis is perhaps laid upon the conservation of a reasonable quantity of water in October and November. So too, many of the small bunds built by individual cultivators aim at conserving water when the river falls, while reliance is placed upon the major bunds built by joint action and encircling whole islands or groups of kwins to withstand the floods of the rising river. Although in the cases of Shwelaung and North Kyônpauk and in some other cases the cultivators believe that either without injury to fisheries, or with injury to them which would be negligible in comparison with the benefits obtained for cultivation, they could effect improvements in considerable areas and convert extensive areas of unculturable land into land which, though flooded, would be culturable, it does appear that the protection of the low lands from flooding is probably impossible without large schemes of river training and bunding of great expense and doubtful net profit. The existing bunds generally afford no protection to the lowest lands, which are flooded just as deeply as they would be without them because the water goes in by innumerable small channels. The benefit of these bunds is almost confined to the first-class lands, which without them would have the overflow of the rivers sweeping across them and carrying away the plants by the force of its motion and also washing away the soil. In Tract 20 of Map III, just north of Kyaikpi the flooding has become more pronounced since 1917, and this effect is ascribed locally to embankment work going on near Yandoon. Here the floods are due to great rises in the Irrawaddy; they come suddenly and pass away again, and differ from those of the tracts to the north because although the lowest parts are flooded continuously throughout the rainy season, most parts are submerged for a few days at a time and the damage is due largely to the motion of the water for short periods at a time. West of this in Tract 18 the conditions are intermediate between those of the two areas just discussed, and the cultivators are of opinion that they could reduce the flooding immensely if they were allowed to build bunds in some of the fisheries for the cultivating season. East of Kyaikpi again a small area has been affected unfavourably by the changes in drainage caused by the construction of the Kyaikpi-Kyawzan bridle path which has led to local flooding and to considerable changes in the soil-classification in the course of the present settlement operations. The land-holders were compensated for land taken up for the road, but it did not occur to them to ask for compensation for the deterioration of the drainage and possibly they did not realise the effect the road would have in holdings at a considerable distance from the road until they had had experience of it. After they had learned the effect they did not petition for compensation because characteristically they thought it was their business to bear what Government caused them to suffer. It would be too old a question to reopen now, but it does seem to suggest that in such cases in low-lying areas it would be proper to consider the question of drainage in supplementary land acquisition proceedings one or two years after the work has been constructed.

16. Passing from the areas described towards the south-west the tidal areas are reached in which the entry of the river-water into the better lands is natural irrigation rather than flooding, and only the lowest lands suffer from excess of water. Here bunds are built, not as lines many miles in length surrounding a whole saucer, but on a small scale, each man attending to his own holding, and consist often of short dams across water-channels the cost of which ranges from Rs. 10 to Rs. 150 but is generally about Rs. 40 or Rs. 50. The object of bunding too is different. Some bunds are for keeping water in the fields instead of keeping it out. Some keep water out in the dry season when the river is brackish or salt and are opened in the rains to allow free flow. Others are opened and closed according to the state of the fields lands and often function by keeping water in at the end of the rains and out during the dry season. Many were built solely to keep out the water at the harvest-time and are neglected at all other seasons. Sometimes

the object of a dam is to keep out tidal water in the dry season so as to avoid the heavy growth of grass which that encourages and so to reduce the labour and expense of ploughing, in the rains these are opened to allow free irrigation of the fields In some places the damage caused by rats if the water is allowed to flow away naturally was given as the principal reason for bunding the drainage channels. In other cases the dam is intended to retard the exit of the water so as to prevent the silt it brought from being scoured away again. In the case of new land bunds are often instruments for removing the *kanazo* jungle, all drainage channels being blocked up the level of water is kept above the breathing spires of the trees which are then rapidly suffocated, so that the task of clearing the jungle is greatly reduced, and particularly so because the breathing spires rot away fairly readily when the trees die. In many such cases the bund has to be made to encircle the holding because most holding boundaries in these parts are streams, these being so numerous as to divide up practically all the land into small blocks of ten to twenty acres.

Fisheries.

17. There are approximately 128 leased fisheries, yielding about Rs. 1,50,000 per annum as revenue, included in the present settlement area, the greater part of these lying, as might be expected, in the flooded parts in the north of Wakèma and the east of Mawlamyaing-gyun Township in the tracts numbered 16 to 18 in Map III. A few petitions were received during the settlement operations from cultivators who claimed that it would be more advantageous to the revenue and incidentally to themselves—the latter effect always being represented as a bye-product—if they were permitted to modify the drainage in some way or other. The petitions were sent to the Deputy Commissioner with such notes as seemed likely to be of use to him in an enquiry, and in some cases led to the discovery of matters which could be improved without sacrificing the fishery or of dams improperly constructed by the fishery lessee The chief antipathy between cultivators and fishers was met in the area shown as Tract 18 in Map III, and at Ainggyi in the north-east of Kyônpadôk Circle in the middle of the wide northern part of Wakèma Township In both these cases the cultivators claimed that artificial channels originally dug by them for draining their fields or for carrying silt to them have been taken into the fishery so that the cultivators have been deprived of control. In the former area the cultivators tried by bidding at the auction to force up the price of the fishery license and annoy their enemy the licensee; but the adventure resulted in the fishery being left on their hands at double its usual price, and they decided that it had burned their fingers. In the Ainggyi case it was alleged that the Township Officer had put Ma Nan Dôk's channel into the fishery in the very year after it was dug. The Deputy Commissioner's enquiries were not yet completed when the settlement of these parts was in hand. It does however seem probable that a further enquiry to bring up to date the observations and conclusions of Major Maxwell with regard to some of the fisheries would demand changes in some localities, and I have been led to understand that the maps kept for fisheries and used in the issue of licenses are not altogether above reproach.

18. Down near the sea fishing of a different order is practised. The regular fishermen supply the material for the manufacture of *ngapi* (fish-paste) at Labutta and a considerable number of agricultural labourers and some tenants make some income in the hot weather by prawn-fishing in the mouths of the estuaries.

General aspect of the Country in the Rains.

19. With the surface lying between tide levels the general aspect of the country is naturally very different at different seasons of the year. In some places indeed it differs largely at different states of the tide; but during the rainy season the larger part is continuously inundated. Towards the north-east the difference of tide-levels on any day is not very marked and the stream runs continuously downwards, merely banking up water on flood tide against the tidal pressure from the south.

20. Along the edges of streams in the tidal area there is often a fringe of mangrove vegetation in which the *kyi* (*Barringtonia*) is plentiful and the *lamu* tree (*Sonneratia acida*) is prominent by its long arms stretched out over the water and occasionally obstructing the narrower passages and by its numerous round breathing spires standing out of the mud between tide-levels. Through occasional gaps in this screen the passenger along the river in July spys what appears to be a second river flowing behind a screen of jungle which grows upon a narrow wall of tidal mud; but later in the rains the second river is seen to be the continuous stretch of water covering the paddy fields with the tips of the plants standing out above its surface. In places in which brackish or salt water arrives intervals in the mangrove screen are formed by dhani plantations especially in the smaller creeks. In other places again cultivation has been carried to the edge of the stream and the screen of mangroves is replaced by a narrow ridge on which grass or paddy is seen growing above the water. At neap tide, or later in the season when the paddy has grown tall, the edge of the land is more marked, but navigators are still glad to have posts and marks set up here and there to mark the course of the stream through what is apparently one great lake The more northerly parts of the tidal area are now completely cultivated in wide continuous stretches of paddy fields, broken up by streams with a fringe of jungle along their banks but including no extensive uncultivated parts. Travelling towards the south, the colonisation becoming steadily more recent, more and more uncultivated land is met until at length cultivation is in rare isolated patches amongst almost continuous *kanazo* jungle Everywhere then the background of the landscape is a high wall of *kanazo* growing along the courses of small streams crossing the cultivated plains or forming one face of extensive patches of jungle in the less cultivated parts, and in the south reaching often to the mangrove strip on the water's edge. Even in the cultivated and cleared portions odd trees often still remain as reminders of the *kanazo* jungle which formerly covered the whole. The river-bank, built up by silt, is generally the highest land, but the streams sway to this side and to that as they erode their beds, and the bends tend to move along the course according to the ordinary fashion of river-action; the high ridge is therefore missing in places, the middle levels being contiguous to the rivers Here, if the stream is large the paddy suffers from the waves continuously beating upon it, and along the main rivers a fringe of jungle has commonly been left to break the force of the waves and screen the cultivation behind The cultivators villages are squeezed into small areas of land which is uncovered at neap tide or sometimes at all ebb tides, and in lucky cases land is found for the village which is hardly inundated at all; generally these sites are along the banks of the smaller streams, the force of waves on the main rivers being an objection to building there. But commonly in the rainy season, and in the case of a large number for the whole year, the cultivators live in isolated huts or in small groups of two or three houses out in the fields. The highest available land is chosen and its level raised by layers of earth, and on that the house is built; and the whole family group of wife and dogs, cattle and children are accommodated n the closest associaton The man and his cattle go out to plough, but except for an occasional journey to buy something to vary a diet of fish-paste and rice the wife may not leave for months this small area of thirty or forty feet square in which the children too must build all their houses, wage all their wars and hold all their *pwès* and processions, romping with the dogs or dyeing the chickens in their leisure hours.

21. In the flooded areas to the north-east there is frequently a narrow strip between the bund and the river which is cultivated as a continuous line of gardens. Sometimes the silt builds up the bank to a suitable height for consderable width, and in the gardens the houses are built sometimes wide apart, sometimes in a continuous row of small holdings each with its own house. The families which have no garden cluster together in groups of houses here and there along the bank, no possible place of habitation existing anywhere else. Where the paddy land is cultivated by constantly changing poor tenants, as is so often the case, there is often no sign of a garden but only a collection of poor ill-thatched bamboo and

dhani huts beneath the floor of which the cattle are stalled. The Karen villages generally look more opulent than the Burman because the primitive Karen custom of accommodating the families of sons and daughters in the house leads to the erection of large houses even when the cost of the house has to be met largely by a mortgage upon it Some older settlements too built large houses with the timber cut down in clearing the land or went a little way south to cut it in the jungle of the tidal area which was not opened up till later But the small groups of poor huts and the houses in gardens are typical Behind the narrow edge of garden which is often flooded up to the bund– lie the paddy fields, sloping down to the unculturable lake which covers everything all the way across the saucer to the opposite rim on the bank of the next river Along the banks of the small drainage channels, where the level is raised by annual additions of silt, the paddy fields commonly reach almost to the edge, but isolated *letpan* and *sit* trees remain as witnesses of the vegetation formerly prevalent on these higher parts

22 In the west the Myaungmya domes and the ridges radiating from them are covered with jungle and gardens, the low levels resemble generally those of the tidal areas, while the intermediate levels resemble the sterile plains found in parts of more northerly districts In the extreme west the jungle includes many *salu* palms (*Licuala peltata*), and in many places a dense growth of these with only low rank undergrowth and little or no other tree-jungle brings to the mind a vivid reminder of the ideal pictures of the Carboniferous Age. Nearer the middle of this township the prevailing tree is *danyin,* and it is so common for a clearing made as a *taungya* for a single crop of vegetables to develop of its own accord into a *danyin* garden that many regard this procedure as the normal way of making such a garden

General aspect of the country in the Dry Season

23 In the dry season the country is transformed The central parts of low saucer-kwins, drained of water, become wide stretches covered with a dense, sometimes impenetrable, growth of kaing grass often as much as ten or twelve feet in height, or with a heavy growth of the *daungsaba* weed which usually reaches a height of only one or two feet. The higher cultivated parts near the rim present the usual glistening yellow or charred black appearance of stubble in paddy fields; but the middle levels are covered with a dense growth of grass which often remains green all the time and buries the paddy stubble almost out of sight and is sprinkled with a growth of *kyu* or *kyi* and other plants developing from seeds carried by the floods and often growing quite stout and woody In April the horizon is a circle of fire and smoke representing the efforts of men to clear the growth in the low lands in readiness for early cultivation before the floods occur. The fire sometimes spreads into the *daungsaba* or kaing grass in the middle of the saucer and threatens to consume the unwary traveller or the Settlement Officer preoccupied with his maps.

24 In the tidal areas only the highest land of all has the ordinary appearance of a stubble field. The first-class levels watered by the tides have a heavy growth of grass and in many places have several inches of water at high spring tides all through the dry season. Even where tides do not enter the sub-soil is usually moist immediately below the surface and the fields covered with green grass. The lower second and third-class levels have a much heavier growth of grass and often have small *kyi* trees and *kyu* canes springing up in them. Some of these low places have quite deep water in which water-lilies and other acquatic plant flourish; and those which are not so low as this retain a soft muddy surface and are always green.

25. In the non-tidal areas of the west there is not much change in the general appearance of the gardens. The paddy fields are often quite bare, showing only quite small clumps of poor stubble or are covered with the *shwelanbu* weed, which only grows on a very stiff sterile soil.

26. Except in the flooded areas and in parts of this sterile area a striking feature of the country is the nexus of water channels which divides it up into small areas which commonly amount to only ten or twenty acres and even then often have some sort of low drain somewhere in the middle. The common boundary of adjacent holdings is generally a stream; often some small part of the boundary is an artificial line on continuous ground, but, except in a few localities, a holding with all its boundaries on dry land is a rarity. As a result of this it is often only possible by making detours to walk from one holding to another, and the tour of a kwin visiting every holding involves a long journey with many retracings of parts of the path, and is indeed not generally possible without using boats at one or two places or at least crossing flimsy bridges of a single slippery loosely supported bamboo which make a Settlement Officer wish he had a different vocation. An important result of this state of affairs is that cultivators rarely see the holdings of others and consequently have surprisingly little knowledge of the holdings near their own. Generally the smaller streams have mangrove jungle growing on the tidal mud on each side, so that one holding cannot even be seen from the next, and very little of other holdings is seen in going to and from one's own holding and the village. In the flooded areas this nexus of streams is not found, but there are innumerable natural or artificial channels ten to twenty feet wide, which are opened to drain the interior lands when the river falls or have been designed to let in silt-bearing water to reclaim them. All these drains run at right angles to the river, so that, although in the dry season it is generally easy enough to walk from the river bank straight down into the jungle in the middle of the saucer it is not possible to walk straight along the rim. One must go up one ditch and down the next seeking bridges, and naturally the traveller prefers to go by boat. But whether in these flooded areas or in the tidal areas, if the object is not to get from one point to another but to see the land to classify it for assessment, it will be clear that the necessary path is long and tortuous. In the tidal area (and in the flooded area to a small degree, but in a similar manner) the task of the settlement party in soil-classification was the greater because in the first place the higher level of land near every stream required the whole perimeter of every mesh of the network to be carefully examined and generally to be distinguished in classification from the rest of the holding, and again because each holding thus isolated presents a fresh problem to the classifier requiring fresh enquiry and consideration *ab initio*.

Water and Soil

27. Two important conclusions are to be drawn from a consideration of the facts outlined in the foregoing paragraphs. One is the great importance in this settlement of water as compared with soil as a factor in the cultivation of paddy which so much exceeds all the other crops in importance. Not that the soil is a negligible consideration; it is far from that. But the paddy plant has such great adaptability to varieties of soil, provided there is a sufficient water-supply and proper drainage, that it will yield some harvest in almost any soil. In the area of the present settlement the higher tide-irrigated fields generally produce an abundant crop; but the still higher lands are commonly regarded as reliable though not so abundantly fertile, and, except on the peculiarly sterile soils in the higher levels of parts of Myaungmya Township, all the non-water-logged land is commonly regarded as producing a certain crop. The crop varies from year to year more widely than most officials suppose but there is a certain magnitude of outturn which can fairly be counted upon. In the water-logged areas the case is different. The combination of rain and river-waters leads to such large variation in conditions year by year that the crop is exceedingly uncertain. The governing consideration is always the surface drainage. In these low lands cultivators never on any occasion suggested any consideration of the soil as a factor in determining classification of fields for assessment; it was always drainage; the soil is of almost no importance apart from its function of supporting the plants. The other conclusion to be drawn is that agricultural conditions are generally more subtle (and therefore the work of the Settlement Officer more complex) than in districts with a less copious supply of water, where also the soil which is then the principal factor in classificaton work can be

studied equally well at any time of the year and samples representing wide stretches of it can be taken away to the laboratory if so desired. The shortest visit to the fields during the rains will convince an observer that inspection of paddy-lands in the dry season in the present settlement area gives no real conception of the state of affairs in the cultivating season. Moreover the variation from field to field though much less obvious in the dry season is sharper in fact than in drier regions and more frequent and irregular. Small differences in level in those drier regions are met by the field-bunds which maintain an equal depth of water. With such a heavy water-supply as generally obtains in the Myaungmya District, where the water so frequently covers the field-bunds, every difference of level means a difference of quality: so that the blocks of land of approximately equal assessable value which the settlement party had to form are numerous and have extremely tortuous boundaries. The description of the country too is more difficult and necessarily less precise; everywhere it is a matter of a little more or a little less, embodying indeed all the conceptions of subtlety and fine graduation associated with the idea of fluidity. The common view that physical and economic conditions in the delta are uniform is mistaken; there is at least as much variation in both as in an upland area, but a closer analysis is required to perceive the differences and present them to other minds

Forests and Wild Growths

28. The Myaungmya District contains 460 square miles of reserved forests, the greater part of which is in the south amongst the numerous estuaries of the rivers There are also 724 square miles of "unreserved forests" This is a term of very wide meaning, but in this district it covers large areas which are or were similar to the reserved forests, the dominant tree being the *kanazo* although many other varieties are represented. Fuel is obtained from the forests for use both within and without the district Some people of the district cut what they require for home use, others cut to hawk round in sampans; while contractors from various parts cut for the steamboat companies large quantities which are towed in flats to Ma-ubin or Rangoon and others take barge-loads, chiefly of *kanazo*, to sell for domestic use in all parts of Hanthawaddy District where fuel is scarce. The regulation of this fuel-cutting on lines which would avoid or diminish the enormous waste involved under the present conditions and would be so designed that the fuel-cutters should assist pioneer cultivators in clearing their land has been proposed, but there is no such organisation yet. Other products of value are various canes and reeds which are growing scarce now but furnished to the cultivators who first came to open up the jungle some income for their support while engaged in developing their land.

Forests and Settlement Colonisation.

29. In relation to a land-revenue settlement one of the most important aspects of the forests lies in the indications which they give of physical conditions. By continuous comparison from one locality to another with the aid of information derived from cultivators and of the relics of the original jungle which still remain in the cultivated areas it is possible to construct a picture of the forest as it was originally and so to learn a great deal of the fundamental conditions of soil and water-supply in each neighbourhood. During the operations of soil-classification described later in this report this was continually borne in mind and great assistance was often derived from it. As time goes on conditions change, particularly when the original jungle has been replaced by paddy cultivation with its attendant drains and embankments. But the colonization of a large part of the settlement area is so recent that allowance could be made for all this; and it was particularly in these newly-colonised areas that the information obtained was of value, because where the soil-conditions have not yet reached the fullness of their inevitable development under cultivation that development was shown by the examination of an area which had been brought under cultivation earlier but had originally had the same forest. If a reference is made to Map III of this report a large area will be found to be occupied by Tract 12 in which, when it was settled in 1902-03, the larger part of the paddy cultivation was quite new and large blocks of forest still stood intact. A few older parts in the north-west of the tract had

been cultivated for forty or fifty years, but ten or fifteen years was probably the age of the greater part of the cultivation; while in the south-west the cultivated patches were small and sparse. There are still patches of jungle standing in the south-west of this tract but they are no longer extensive; in the tracts bordering on its south-western side the forest patches get larger as one travels further south until first the forested area exceeds the cultivated and then it comes almost to monopolise the whole, while the cultivated patches become at the same time more and more encumbered with dead or fallen trees which the pioneer has not yet been able to clear away. Northwards in the flooded areas a similar study of the conditions can be made, but no longer is it a study of tree-jungle. Here the vegetation consisted of elephant grasses and the *daungsaba* weed and such trees as the *tein* and *kyi*. But the matter is generally of less importance as the cultivation of the higher parts of these areas is generally older than that of the areas further south and their quality depends more upon artificial changes in the conditions, while in the lower lands there are generally other readily seen indications of soil quality. It is rather in the south and west that the jungle conditions are of interest, and there the importance of the *kanazo* tree to a clear understanding of the development of soils—and so to an appreciation of the soil-classification—is so great that a separate section must be devoted to it. But other trees such as the *kyi, sit, letpan, pyinma, nyaunglan, bamaw, thayet, tein, ma-u, thitpyu, myinka thinban, damôn, thabaw,* all have their value as indications of the conditions of soil and water prevailing around them, and repaid at the time of soil-classification the time and trouble given to their study.

The *Kanazo*.

30. After the flooding by the tides the *kanazo* tree (*Heritiera fomes*) is the most striking feature of the southern and western parts of the settlement area. The *kanazo* is essentially a mangrove; although it attains a height of eighty to a hundred feet it stands upon soft tidal mud, supporting itself by wide-spreading roots, from which spring breathers which stand up above the surface of the ground and by means of their large stomata enable the roots to obtain the air which they require but could not get in the water-logged mud in which they grow. A breather is usually a round-pointed stump two to three inches wide, an inch thick, and a foot or so high. The *kanazo* trees have no branches near the ground and grow only a few feet apart; each has a large number of these breathers so that the ground below them is covered with a dense cluster of vertical stumps two, three or four inches apart. The number of these indicates the intense need of air which is felt by the *kanazo* and explains why it flourishes only within a comparatively narrow range of levels—measuring levels in relation to the tides. The *kanazo* cannot grow unless its breathers are exposed to the air for a considerable part of the day. Advantage is taken of the latter weakness by cultivators who wish to clear *kanazo* jungle; they close up the exits by which tidal water escapes and so kill the trees by suffocation; the roots and breatheres rot away and cultivation can begin long before the trees are cut down. At the same time the *kanazo* cannot grow unless the tides reach it practically all the year round as it requires soft mud for soil. As the forests have much *kanazo* practically all the way to the sea salt-water appears to be not unfavourable; on the other hand *kanazos* are found a little way north-east of the limit of dhani growth, but it is probable that quite fresh water all the year round is not favourable and that these are the relics of a forest which developed when the delta was lower and tides reached higher. It appears however that quite recently all the middle levels south-west of the dhani-line were covered with *kanazos* which still remain in many places along the beds of drainage channels in cultivated areas. They never grew upon high lands above tide-level and those accordingly are quite clear; so also are some village-tracts in which cultivation has been extended as far as possible and the demand for fuel has finished off the remaining trees. But as one travels south-west from the dhani limit the number of *kanazo* trees steadily increases so that they are the characteristic feature of the landscape. At first they are seen in isolated clumps with long arms reaching out along the streams; the clumps get larger and the arms thicker until the *kanazo* forest is in large

continuous stretches joined up, in spite of small pieces of cultivation here and there, with the great forests which reach to the coast.

31. The importance of the *kanazo* to the Settlement Officer arises from its narrow range of optimum soil-level and its indication of the kind of soil; the difficulties attending the clearing of *kanazo* jungle have also had a bearing upon the history of cultivation which will appear in the sequel.

Wild Animals.

32. The colonists who opened up the district found all kinds of wild animals in the jungle, some of which affected them by attacking their crops, some by attacking their persons. Elephants wild pig, *sat*, monkeys, crabs, rats, parrots and even the very fish attacked the crops, tigers, leopards, crocodiles, pythons, hamadryads, cobras and other snakes took toll of their families in a way remembered in many a sad and gruesome story. When the land had been sufficiently developed for cattle to be used these too fell victims. Meanwhile voluminous insect life carried on an insidious warfare which was far more effective than that of the larger animals. Tsetse flies, sand-flies, ticks and mosquitoes attacked the colonists in their blood, and taken together formed the most formidable enemy of the people. In the extreme south, beyond the settlement area, the conditions are still something similar, but they seem to be a little milder than formerly because many of the animals have deserted the steadily diminishing blocks of jungle which remain and afford less cover and food than before and are so disturbed by the wood-cutters and by the boats and even steamers which pass along the numerous creeks. Nature seems to have recognised that unconquerable man has already planted his outposts. Within the settlement area the larger fauna no longer live Elephants swim across occasionally at Kyahôn from the forest reserves to eat and trample the succulent crops on the opposite bank; a tiger appeared in 1919 near Kyagan and Labutta; a crocodile nearly interrupted the labours of the Settlement Officer of this report some way above Mawlamyainggyun in 1918; but these are rare or local occurrences Destruction of crops by wild pig is commoner, particularly near the domes of Myaungmya Township, where also leopards prowl after the village dogs. But from the greater part of the settlement area these larger animals have vanished completely, and man has no longer to fear them on account either of his person or family or stock or crops. Jungle-cats steal chickens near the Myaungmya domes and are sometimes found even in the northern parts of Wakèma Township, but they also supply a meal for the less fastidious occasionally and do a useful work in destroying rats. Pelicans, storks, adjutant birds, wild geese and other kinds of birds are to be found, and huge fleets of teal are to be seen on some of the rivers. Flying foxes attack the fruit trees. Leeches worry the cattle everywhere, but I have not heard any economic loss ascribed to them by cultivators. Various sorts of terrapin are found in the low saucer-kwins of the north-east; and in all the flooded and tide-irrigated parts there is an abundance of snails (*kayu*) brought in by the river floods and littering all the fields with their empty shells in the dry season. In the south-western parts of the settlement area, particularly in the portions shown as Tract 26 in Map III, shells of the salt-water mollusc *Pecten* (Burmese—*Gôk-kayu*) are to be found in numbers in the paddy fields Cobras are still found all over the settlement area but they are not so numerous as in some parts of the country and nobody is worried much by them although they take a small toll of both people and cattle. Rats fill a much larger place in the minds of the cultivators than any other quadrupeds or snakes, and in some places parrots and crabs are of importance. But the palm has still to be given to the mosquito which swarms incredibly in many parts. Ma-ubin district has the reputation for mosquitoes, but the mosquito tract of that district runs into Myaungmya District near the north-east corner and appears now to have the greatest intensity of its conditions in this district. Shwelaung is perhaps the worst place generally known, travellers by the Rangoon steamers making its acquaintance and generally believing no place could be worse; but a visit in the rains to Hngetpyawgyaung, six or seven miles to the south-east, would correct that belief. The settlement work was delayed in this neighbourhood

by the frank impossibility of enlisting the attention of the people anywhere in the fields after four in the afternoon in the early part of the open season; and often reaping cannot be done in the afternoons. The centre of Mawlamyainggyun Township has much fewer mosquitoes, and Mawlamyainggyun Town is a comparative haven to the traveller from some neighbourhoods. But in the south and west again the mosquitoes increase enormously. In the rains *Anophelines* are said to be commonest; in the dry season the relative proportion of these and *Culex* varies. *Stegomyia* too is disgracefully common in the towns, from which it ought to be eradicated, not because of its relation to yellow fever but because of the nervous irritation it produces and because then the *anopheles* problem would be seen more clearly. The people generally recognise different varieties of mosquito, but in some places the general view is that expressed by an old Karen who assured me there was only one kind in his village, and on further enquiry with a view to identifying that kind explained that it was "the biting kind" In the south and west the sandfly adds his bite to the other terrors of the insect world, and some of the people compare these parts to Nga-yè (hell), saying that the water is all salt, the country is always submerged and the mosquitoes and sandflies are the masters and asking what further misery could be devised besides this of revising the settlement.

Temperature

33 The average minimum temperature is about 65° F. and the average maximum 95°, the average mean being about 80°. The variation from season to season is not very great and is probably about the same as at Rangoon. During the rains when the paddy is growing the temperature rarely varies beyond the range of 76° to 80°.

Wind.

34. The prevailing wind is from the south and south-west in the rains as in all Lower Burma, but there is not the common prevalence of north-east winds in the hot weather when cooling winds from the sea usually blow. Strong winds blowing at times have the usual effect of reducing the fruit crop by destroying the flowers, but of much greater importance in the present settlement area is the effect of quite ordinary winds as well as of occasional storms upon the paddy crop. In many fields lying along the edges of the larger rivers there is the effect of the waves beating upon the paddy, especially in the parts to the south of Mawlamyainggyun where the rivers are wide and cultivation has extended quite to the bank. When the tide is too low to overflow, the high waves are sometimes thrown on to the fields, but when the tide is high the waves of the river run straight into the fields and continue till they are broken up by the resistance of the plants, which of course suffer in the process. The surface rooting is of importance as giving small support to the plants, and in some fields the crop is very largely reduced so that quite commonly fields which in every other respect enjoyed first-class conditions have had to be classified in this settlement as second or even third-class. The strip of jungle along the river bank is retained in many places to be a screen against this effect of the waves. Another effect of the deep water in the fields is that the plants besides being lightly rooted grow very tall; in the flooded areas in which the water suddenly retires in October the tall plants deprived of the support lent by the water are very susceptible to the wind and bend over very far so that their flowers or ears often reach the water which remains. In the tidal areas the stalks are generally less flexible, but the spring tides maintain the high level of the water for at least some days. The effect of wind upon the plants is particularly objectionable when the bloom is on or if the seed touches the water, and especially if, as happens to some plants, winds earlier in the season have broken or weakened the stem. In the earlier stages of growth too considerable harm is done to paddy plants by the rough treatment they receive from the wind; if blown over to reach the water at that time they are apt to draggle in it and be drowned or carried away by any current, and the leaves of transplants are shortened for this reason before they are set in the ground.

Rain.

35. The recorded figures for rainfall for the last twenty years at Myaungmya and Wakèma in the settlement area and at Einmè which is in the same district and just outside the

settlement area are shown in Statement 8. According to Sir Alexander Binnie who had great experience of waterworks in India, the proper period to establish rainfall statistics is thirty to thirty-five years, but in the present case there is no need to go back so far. The total rainfall is always ample for the paddy crop, but variations in the seasonal distribution are troublesome as is shown by the table in section 106 of Chapter III in which the relation of the rainfall to agriculture is more closely considered. The relation of rain to the supply of drinking water is treated in the succeeding section.

Potable Water

36. The principal source of drinking water is the river system. The water is muddy in the rains but nobody seems to mind that. In the hot weather the water of the Shwelaung River especially below Shwelaung and of the Pyanmalaw, Yazudaing and Irrawaddy is of beautiful clearness, its blue and green pellucidity a delight to the eye so accustomed to the muddiness which still persists in a reduced degree in the smaller streams and in a few, which though narrow are stirred up by heavy steamboat traffic, seems to be even more marked than in the rains. In the towns and some of the larger villages are wells or tanks ; but wells are rare because if the river water is potable they are hardly required and if the river is salt the wells would often be salt too. Low down in the estuaries the river water can only be used for drinking in the rains, and in some places can be used even for cooking only from May to December ; and generally Burmans object to bathing in water as brackish as that. Tanks have then to be relied upon, and people who live out in new settlements in the jungle often travel long distances in their boats every day or two or three days to obtain a supply of fresh water. In a large area, however, fresh water can be had on the ebb tide although the flood tide is too brackish to be used. It is noticed too that in the main rivers the water becomes fresh enough for cooking nearly a month before the local rains begin ; the saltest time is in the month of *Tagu*, not in *Kasôn* as would naturally be expected. Cattle generally drink the water in the creeks even as far south as Hlaingbôn, but are liable to digestive disturbances at salt and from the change of season from fresh to salt to fresh water. Only in a very small part in the south-west of the settlement area are tanks really necessary to water cattle, but tank-water is given in some places where the river water is not more salt than in others where it is drunk. Sometimes it is possible to supply the cattle by closing a stream filled with the fresh water of the rains so as to prevent the entrance of the salt tides of the dry season. In some of the kwins of Tracts 25 and 26 where the water is salt there are no residents the cultivators all live at Kyagan where there are tanks and only go to live near their fields in the rains and again, after an interval, at harvest.

37. The cultivators say that even the tank water in the southern tracts is salt although tidal water on the surface cannot mix with it. They say that when tanks are first made the water is very salt, but it grows fresher every year ; and as a large tank made by Government at Hlaingbôn thirty years ago for the benefit of rattan cutters has now perfectly fresh water they expect all their tanks to become perfectly fresh in time. It is probable that the saltness is due to the percolation of salt subsoil water, which however becomes less salt as the flooding of the hot weather is diminished by the bunds constructed for the purposes of cultivation. Another interesting statement, of which however the meaning has not been satisfactorily elucidated, was made by cultivators along the Ananchaung and was to the effect that the reason why the water becomes unsuitable for cooking so early as December is that it contains (except at neap tide) the "Bahika Po." *Bahika* is Pali for "outside," and the meaning may perhaps be related to the sea and salt, as indeed the relation to the neap tides also suggests.

Diseases.

38. The ordinary diseases of the delta prevail, the principal being consumption and the various fevers, while local outbreaks of small-pox and cholera are frequent and occurred during the

settlement. The influenza epidemic of 1918 took a particularly heavy toll in this district. The ordinary death-rate totals about 23·5 per thousand per annum for the rural area or 25 including towns; the statistics by causes are too unreliable to be worth discussion. Towards the south where much jungle remains and clearing is still going on there is much malaria; indeed malaria has always exercised the forest, being more important even than financial considerations because it has been principal influence upon the clearance of the jungle and the development of the the principal cause of the financial difficulties of pioneer cultivators. An attack of fever which at any time in the rains incapacitates the cultivator or members of his family who help in the fields prevents the reaping of such a harvest as will pay the interest on the borrowed capital and enable the work of developing the land to be continued. In the Kazaung and Hlaingbôn village-tracts, which are the areas most recently developed to a considerable degree, almost every family sacrificed the life of one or more of its members to fever in the first two or three years, and some families died out completely. At Yakaingkwin a whole colony of families from Arakan died off after a couple of years. But the deaths are only indications of the general malaise which is of the utmost importance in its effect upon the colonisation of these tracts. It is said that when clearing first begins there is not generally much malaria; that becomes serious when much jungle is being burned and is often ascribed for that reason by the cultivators themselves to the ashes of the burned jungle in the river-water, which they drink even in the salter tracts in the rains when the ashes are being washed from the surface into the streams. This later development of malaria seems however to square very well with the mosquito theory, the infection becoming serious when the supply of malaria parasites from human reservoirs has become large enough to affect the mosquito population. In some parts, too, it was said that mosquitoes were few when jungle-cutting first began and became numerous afterwards when a considerable area had been cleared. In the more developed tracts the prevalence of malaria is generally denied, they have no malaria, they say, but only "good honest fever" (ကောင်းကျိုးပေး). But the probability is that the fevers are of a malarious nature, the symptoms perhaps being masked through partial immunisation after long experience of the disease but appearing more clearly amongst people exposed to the stronger infection of the newer tracts and generally, while engaged in starting new holdings, rather insufficiently nourished and often seriously over-fatigued. In support of this view there is the idea expressed by many of the people that a change of the drinking-water is a common cause of fever. They say that people are always liable to fever when they migrate to a new locality, and that the fever which attacks colonists is only a special instance of this truth, and that the particular virulence of their fever is connected with the salinity of the water, all the scenes of colonisation being lower down the salt-water axis of the district than the older established areas. That the change of water must be a matter of importance to the digestive organs is clear at once when the large amount of foreign matter in suspension or in solution in the river-water which they drink is considered; latent malaria may very well become active under these conditions. Of similar character is another explanation which ascribes the fever of pioneers to their diet, consisting chiefly of rice, fish, prawns and sugarcane. It is said that the consumption of sugarcane renders one particularly liable to fever, and that if a patient recovering from fever eats sugarcane he suffers a relapse. The relation between constipation and attacks of fever is well recognised in many parts.

39. Quinine prepared by the Government is on sale at the post offices, but that is not near enough to the people and the supply unfortunately broke down during the war. Commonly the people buy American tablets of the bisulphate at the local Chinaman's store, but the price is too high for enough to be consumed, and the fact that each tablet contains only three grains is harmful because one such is not enough as a rule for a dose. An effort should be made to improve the supply of quinine in the more jungly tracts just being colonised. Some arrangement for sale on the numerous little steamers would suffice in some tracts, but some attempt

could perhaps be made to make it worth the Chinaman's while to sell the Government preparation. Sale by headmen is not to be neglected, but headmen in these parts are few and far between. The district is in need of a travelling dispensary and of a Civil Surgeon freed from jail work and supplied with a launch and house-boat so that he can tour freely amongst the people and especially amongst the pioneers who are opening up new areas to cultivation.

Famine.

40. Famine is one of the ills which the people of Myaungmya District have never experienced. In the sense of such a failure of the harvest that not enough rice is produced to feed the local population famine can hardly occur. But the more complex situation of a large class of labourers and tenants in a position of economic weakness and unable to pay the price which is fixed by the world-market is another matter. In an annual report of the distric for 1911-12 (when the wholesale price of paddy in Myaungmya rose to Rs. 152) the Superintendent of Land Records expressed a fear that rice would become too valuable an article for consumption by ordinary wage-earners, and the Deputy Commissioner supported this opinion. But details of their reasons are not available, and there is no Famine Main File kept in the District Office.

Towns, Markets and Villages.

41. The largest town in the district is Wakema * (7,031) which is a busy centre of miscellaneous trade and activity. Myaungmya Town (6,561) however is not much smaller and on account of the Government offices of the district is quite busy. Mawlamyainggyun (4,092, but much increased now) is a comparatively new town and is chiefly concerned with the two sides of the paddy business, the financing of the cultivator and the export of the crop. Kyaikpi (2,999) and Kyawzan (2,649) in the extreme east have lost much of their former importance through the formation of sand-banks, and Kyaikpi probably has a smaller population than in 1911. Kyônmangè, a busy centre of trade and finance in the middle of the district, seems in spite of being some little way off the Rangoon-Bassein steamer route to be likely to rival Wakèma in the near future although its population in 1911 was only 1,235. Shwelaung (1,443) is a sleepy hollow compared with Wakèma or Kyônmangè although it was once the headquarters of a district and the steamers from Rangoon call regularly. Several villages, amongst which Thayettaw and Pyinywa are conspicuous, are important as the residences of Burman money-lenders who finance paddy cultivators on a large scale; Chetty money-lenders however are generally found in Myaungmya, Wakèma and Mawlamyainggyun near the Courts and registration offices. Myaungmya and Wakèma are municipalities and a Town Committee was constituted for Mawlamyainggyun in 1917. All these towns and also Shwelaung have been surveyed on a scale of 64 inches to the mile and Town Lands Rolls have been prepared for them. Kyaikpi, as well as Shwelaung and the three municipal towns, is a town for the purposes of the Lower Burma Town and Village Lands Act. There is a Government (or municipal) bazaar at all these five places and also at Kaikpi, Kyawzan, Thayettaw and Kyônmangè. There are twenty-seven paddy-mills in the district with a total nominal horse-power of 320, and of these twenty-three with 270 nominal horse-power are in the settlement area; several of them are concentrated in each town but still more are situated in small villages scattered about the district. All the towns are marked by an entire absence of any aesthetic motive or of any attempt to minister to any needs of the spiritual life of their people beyond the ordinary worship at the pagoda.

42. Villages vary largely in size and condition from large semi-urban groups like Pyinywa, Yanmanaing and Kyunpyathat with populations of a thousand or more to small groups of ten or twenty houses. Many of the so-called villages do not really exist at all as villages; the houses are scattered all over the village-tract in small groups which are too small to be called hamlets and consist commonly of the house of the land-owner or tenant and his relations or dependants. Kazaung,

*Numbers given in brackets after names of places shew the population at the Census of 1911.

for instance, was shown even at last census (1911) with 625 houses and a population of 2,581 ; but in fact the village was no more than the house of the headman who went there some years before to carve himself a paddy holding out of the *kanazo* jungle ; the remainder of the "village" consists of small groups of one or two families scattered through an area of twenty-three square miles. Some "villages" are even more extensive. The reason is simply that the area has only recently been opened up to cultivation and each family lives on its own clearing or as close to it as possible. In areas in which cultivation is a little older the same thing evidently occurred ; the present development being that villages often consist of a large number of small hamlets comparatively widely separated. Originally these were built on the high ridge along the very bank of the river, and unfortunately (in spite of the warning given by Mr. Lowry in paragraph 17 (*f*) of his report on the settlement of 1903-04) no provision was made by the district officers for village sites at the time when cultivation was extending. The result is that cultivation has absorbed all the land except small and quite inadequate pieces of "village-land" dotted along the river-banks. Many cultivators prefer to live in isolated houses on their own revenue-paying paddy land all the year round ; and although this is not the state of affairs contemplated in the Village Act there is a good deal to be said in its favour. But for those who do not own land there is and has long been a serious deficiency in house-room. It is quite common for cultivators to permit others who cannot find room for a house to build a small hut on the high bank of some stream in the holding, and often quite a large hamlet exists on sufferance in this way. Some of its inhabitants are tenants or labourers of the landowner ; they were not always so originally but naturally seek to work on the land nearest to their homes. But trouble arises when the landowner dies or sells his land. Often the new owner knows not Joseph, and often he thinks he should have all the land for which he paid a price and is now paying revenue ; the guests who are not his tenants or labourers are then evicted and find themselves homeless. This is a difficult business ; but it has a still worse influence in other cases in which the houses were an original group built before the land behind them was cultivated. The area they occupy is very small and narrow, and quite frequently revenue surveyors, either by design or by careless copying of maps from year to year, have drawn the holding boundary of the paddy land which lies behind the houses so as to enclose them in the holding and have included their sites in calculating its assessment. There is thus nothing in the revenue records to distinguish from the case already described and the Settlement Officer on a dozen occasions was met by a group of tearful homeless families evicted by the owner of the paddy land from the sites they or their fathers cleared many years before and had inhabited continuously since. The evictor relies upon the map of the land attached to the deed of transfer and is unconscious that he is doing injustice. Evidence by residents of neighbouring groups that the house-sites are older than the cultivation appears to be of no avail in the courts against the views of the revenue surveyor, who declares the truth to be according to his map and has no other knowledge of the matter ; and serious distress is often caused by these evictions which naturally takes place generally at the beginning of the rains when the cultivation wants to enter on the land for ploughing. Improvements in the provision of land for residence is one of the most pressing needs of the district. In particular, special care should be exercised to forestall these difficulties in all new areas taken up for cultivation. All these are in the salt area and need tanks ; Government should build tanks and reserve suitable areas in their vicinity against cultivation. Tanks should be as small as hygiene permits so that a number can be provided and water made available within a convenient distance of every hamlet or group.

43. It has already been noted that very few important villages are situated on the banks of the large rivers ; most are a short way up some small river where they are protected from the violent wind and high waves from which they would suffer on the larger streams.

Communications.

44. There are post offices at all the places which have bazaars, but even Myaungmya has only a sub-office. Villages have post-boxes from which collections are made once a

week. There are also collecting boxes on many of the steamboats. More use might advantageously be made of the post-office by allowing headmen to post reports to the Township Officer more freely instead of wasting time by travelling to the township office. There are telegraph offices at Kyaikpi, Kyawzan, Kyônmangè and all township headquarters but that at Shwelaung has been closed in 1919, all are used considerably for conveying news of the paddy markets at Rangoon and Bassein.

45. There are almost no roads outside the towns. A "circular road" at Myaungmya five miles long with a short branch of three miles to Kôntha and another of two miles to Môksôkwin completes the list. There are also unmetalled footpaths from Kôntha to Pyinywa, Sagamya to Ywathagyi, Kyaikpi to Kyawzan and Pègôn to Kyônmangè with a total length of about twenty miles. But that is all. In some parts of flooded area it is possible to cross from one side of a saucer to the other on foot in the dry season and there are a few cart-tracks. On the low ridge to which the land rises along the western edge of the flooded area there are also some cart-tracks two or three miles in length and so too in various parts of the area east of Kyaikpi. But all these are exceptional and there is practically no cart or foot traffic at all in the tidal area, the whole of which is cut up into small areas by a net work of tidal drainage channels. In some tracts cultivators own carts but these do not travel outside the holding; they are only used to collect the harvest. Ponies are almost never seen; there are a few east of Kyaikpi and in the outskirts of Myaungmya town but elsewhere they do not exist at all. Practically all the communications indeed are by water. The large steamers of the Irrawaddy Flotilla Company which ply between Rangoon and Bassein travel across the middle of the district calling at Shwelaung, Wakèma and Myaungmya, and a large number of their smaller launches carry passengers and goods on other regular daily runs; while launches carrying goods and running regularly from Rangoon to Bassein and from Rangoon to Labutta serve the larger traders who distribute to retailers. Besides these there are many steamers belonging to owners of small means which ply in smaller rivers neglected by the large Company and there is no part of the settlement area which is at any great distance from the route of some regular steamer by which one or other of the large junctions can be reached. The chief part of the goods traffic however is in barges or in Burmese country-boats for large cargoes and in sampans and all sorts of small boats and punts for small cargoes. Large sampans up to a capacity of five hundred baskets of paddy are used as well as the ordinary small ones carrying fifty to a hundred. Barges are the principal means of conveyance of the exported paddy. Canoes and punts are generally used for passengers, and, as may well be imagined from the foregoing portions of this report, they are found in numbers everywhere; indeed without boat life would be impossible for many of the isolated homesteads and even in many of the villages. Many cultivators travel daily from their home or temporary hut to their fields, convey seedlings from the nursery to the planting field and convey the grain home at harvest all by boat, their buffaloes swimming and apparently enjoying the journey. Even oxen are quite good swimmers here.

46 There are eight leased ferries in the settlement area and several of these have at their stations small shelters which are extremely useful both in the rains and in the hot weather, and should be provided at all ferries with a small improvement in the amount of seating accommodation which is dry on a windy rainy day. There are of course landing-stages provided at all the ferries, and in addition quite a large number of villages have useful landing-places of reinforced concrete steps bolted to H-iron girders. More of these are required, but equally important is the need for organised supervision to keep the existing structures in repair. Local government is the only satisfactory agency for such matters, but village-headmen should be encouraged to report when repairs are needed, and it should be recognised that accidents and damage are part of the normal course of things so that only in exceptional cases should a village be asked to pay for the repairs. At present, largely as a result of war conditions, a large proportion of these stages are in bad order. The stages are used, it may be noted, not only for landing from boats but

in bathing, in washing clothes in the river, and for drawing water for domestic purposes. Most houses near the river-bank have some ram-shackle sort of steps down to the water and a few public benefactors have built larger wooden stages, but the former are inconvenient even when they are available for public use and the latter soon get destroyed by the Toredo *navalis* in the rivers. At the larger villages some sort of smooth platform for washing clothes is a much-needed supplement to the landing stage.

Retail Prices of Household Requirements

47. In Statement 14 at the end of this report is exhibited a record of the ordinary retail prices during the settlement operations at three large bazaars and in ordinary villages of selected localities distributed all about the settlement area. The latter prices are generally of greater importance to the agricultural community than the prices in the bazaars, as they are the prices ordinarily paid for daily requirements at local shops or to pedlars and relate therefore to the larger part of their purchases. In a few cases in which prices had been exceptionally enhanced, apparently temporarily, by war-time conditions the price just before the large rise was recorded as giving a fairer general view of the matter.

CHAPTER II —THE PEOPLE.

Enumeration.

48. The population of the settlement area is a difficult matter to determine owing to the confusion relating to the names of some village-tracts; but Mr. Duffin attempted in 1910-12 the problem of discovering the population of the area with which he dealt, and, as the present settlement area is the greater part of the remainder of the district, the balance of the district population may be assigned to it without an error of more than about seven or eight thousand for 1911 and with much less error at the earlier censuses. With this limitation the population of the settlement area is given in column 3 of the accompanying table 1. The total populations shown in the table have been corrected to accord with the changes in the district boundaries so that they correspond with the same area in all cases, and the densities of columns 4 and 5 have been estimated on the assumption that of the populaton shown in column 3 one four and eight thousands respectively belonged to the area outside settlement and the remainder to the settlement area. The distribution between urban and rural areas in 1911 is shown in table 2, from which it is clear that the population is principally rural. The Census Table showing the distribution of the population by village-tracts is misleading if taken to show the normal size of village, as in most village-tracts the population is made up chiefly of small scattered hamlets.

Table 1 —Total Population

Year.	Whole District	Settlement Area		
		Total	Per square mile of Total Area	Per square mile of Assessed Area
(1)	(2)	(3)	(4)	(5)
1872 ..	56,845	...		
1881 ..	105,369	...		
1891 ...	181,792	113,705	93	..
1901 ..	282 932	192,501	155	331*
1911 ...	334,852	225,537	178	334*

Table 2.—Urban and Rural

Myaungmya Town	6,561
Wakema Town ..	7,031
Mawlamyainggyun Town	4,092
Kyaikpi ..	2,999
Kyônmangè } Kyunpyathat }	2,285
Total of Five ...	22,968
Rural .	202,569

* Approximate estimates of the assessed areas of 1901 and 1911 have been used.

Race, Religion and Language.

49. That portion of the population which is neither Burman nor Karen numbers probably about ten thousand, of whom a little over two thousand are Chinese, and all the rest except five or six hundred are Indians of different sorts Mahomedans slightly outnumbering Hindus. Married Hindu males however slightly outnumber married Mahomedans males, approximate figures for these (taken as two-thirds of the district figures, being 1,200 and 1,100 while the corresponding numbers for married females are 230 and 400. Burmans probably numbered in 1911 about 150,000 and Karens 65,000, the latter being chiefly Pwos but including some Sgaws. Practically all Karen men speak Burmese as well as their own language and most use it fluently; Karen women more often are confined to their own language or have small knowledge of Burmese. About twelve thousand of the Karens are Christians, all the others and all the Burmans being Buddhists Burmans and Karens, Buddhists and Christians, live amicably in the same village. The fact that many villages are purely Burman or Karen or purely Christian is commonly due not to militant exclusiveness but to an origin as a settlement of a group of common interest or even of common blood, and the natural tendency of later comers to prefer neighbours of their own kind. Both Hindu and Mahomedan landowners when successful tend to live in large farmsteads surrounded by a group of dependants who regard them in a patriarchal light They tend thus to form communities separate from the Burman village; but there is easy intercourse between Burmans and Indians, as is evidenced by Indian labourers who eat with the family of Burman employers—the rarity of the converse phenomenon being due chiefly to the preference of Burmans to live with their wives and families if that can be managed Several Burman villages have Indian headmen Generally these headmen would be headmen *de facto* if not *de jure* because they hold the village purse; in their case at least economic has preceded political power. Karens have much less intercourse with Indians than Burmans have, they seldom have Indians in a purely Karen village. Karen women, too, do not seem to be attracted by Indian suitors although a small number of Burman women have accepted them.

Emigration and Immigration

50. As is suggested by the rapid growth of the population which was shown in the table given in the first paragraph of this chapter there is little emigration from the district, which is essentially a newly-colonised area. It will be seen also by a reference to the same table that the population of the settlement area has grown at an even greater rate than that of the district as a whole. But from the whole district the number of emigrants recorded at the census of 1911 was almost negligible (2,327) and a half of those went to the Ma-ubin and Bassein Districts and probably started as a rule from the Einmè Township which is outside the present settlement area. Immigrants (in the whole district) were born chiefly in Ma-ubin, Bassein and Henzada Districts which together supplied 29,000; but 36,000 more came from other parts of Burma. Some of the latter came from Prome and Thayetmyo but more came from further north in the general stream of emigration to the delta which took place twenty years ago. This influx from Upper Burma will probably be found in the forthcoming census to have fallen off very largely, the general impression obtained in discussions with the people being that the Henzada District is about as far north as immigrants start now, and that large numbers of the new colonists in the southern parts have come only a comparatively short distance. Moreover it is to be observed that Yandoon is generally spoken of as the extreme point of Lower Burma; most refer to places north of Yandoon as the Upper Kingdom and it is possible that the records of immigrants from Upper Burma have been exaggerated in this way while it is certain that exaggerated general impressions of the matter have been carried away by many on this account. Of the Indian population recorded in 1911 for the whole district about seven-eighths (10,625) consisted of persons born in India and the remainder of persons born in Burma.

Occupations.

51. Mahomedans are largely dealers of various sorts, in the towns and many of the Hindus are town labourers; but a considerable portion of both are agriculturists. Many Mahomedan traders in the towns have invested the profits of their piece-goods or imported manufactures in land which they have thus come in many cases to own on an extensive scale; some of this is let to people of all races, some they work through agents or labourers generally of their own religion and often specially brought from that part of India to which they or their parents belonged. The Hindu agriculturists are generally poor; often they are very poor indeed, being coolies who have taken up flooded land rejected by everyone else but culturable for them because their standard of living is so low that it is hardly a standard of living at all but rather a standard of not-dying. The Chetties belong of course to the Hindu group, but they are not generally extremely wealthy, being only sub-agents of the Rangoon houses which are branches or agencies from Madras; a few Chetties have settled down as genuine yeoman agriculturists, lending money as a subsidiary activity with no more concentration upon it than is found in the case of the ordinary wealthy Burman. The Chinese are almost entirely retailers of imported goods. They have large shops in the large villages where the non-cultivating landlord and money-lending classes are numerous and at centres of trade to which villagers come to purchase such imported goods as they require There is a Chinese shop of a smaller kind in every village of considerable size, and a number of such shops are situated in small hamlets in the sparsely populated tracts at points on the river-bank which can be visited with moderate ease by the inhabitants of the isolated hamlets of the surrounding country In the case of these small shops the Chinaman frequently combines cultivation with his other activities and nearly always does some paddy trading. There seems to be no real foundation for the common view that the Chinaman's shop is invariably an opium den or a centre for the distribution of opium. Bad sheep no doubt exist in every flock; but the ordinary Chinaman appears to be a well-behaved and industrious fellow holding aloof from the village partly from the mutual misunderstanding of character and motive and of the differences of culture, partly from the deficiencies in his knowledge of Burmese and the entire ignorance of Chinese on the part of his neighbours, partly from the inadvisability of being too intimate with persons who buy largely on credit and would be apt to ask concessions leading to the loss of both loan and friend The Chinaman charges prices which cover his risk and the delay in payment, but there is no suggestion of unfair pressure being exerted He often serves a useful purpose in collecting to make a cargo small parcels of paddy which would otherwise not attract the dealers who export to Rangoon; he sometimes makes considerable profit here, but the cultivators still get a better price (or get it sooner) than they would by any other system available at present His wife is usually Burmese and has reason for regarding herself as very lucky in a husband who relieves her of all the heavy work she would do for a Burman husband and in many cases even does the cooking and washes the children while she looks on.

52. The Karen is generally an agriculturist. The majority of the Burmans are agriculturists too, but they undertake non-agricultural work more often than Karens and indeed carry on all the miscellaneous activities of Burma life outside the towns and to a large extent those within the towns too. No gangs of Madrasis visit the district seasonally to reap the paddy as they do the areas in the vicinity of Rangoon and Bassein. In a negligible area on the western side where labour is particularly scarce the cultivator sometimes goes to Bassein to find a labour contractor and bring him with his coolies to reap, and occasionally a gang of Madrasis working in Pyapôn District will cross to the neighbourhood of Kyawzan to reap; but neither of these cases is an important exception to the general statement that the whole of the agricultural work is done by the local people. Earthwork is done by Burmans and Karens sometimes, but more generally it is done by Zoringhis who are invited out from the nearest town or town like village by one employer and linger in the neighbourhood doing work for others who want such

work done. Agricultural operations thus furnish the chief occupation of the great majority of the people either as cultivating owners or tenants or as labourers; but in the case of labourers this employment is discontinuous and must be supplemented by other work, and most of the whole-time non-agricultural activities about to be mentioned are carried on by them for this short season as well as cattle-herding or cutting grass for those cattle which have to be stall-fed on account of the deep water. Some tenants and owners, too, who are particularly energetic and have a small holding in which the harvest can be completed early follow the same course. There is no practice of residents going outside the district to earn a living except in so far as taking cargoes to such places as Yandoon, Bassein or Rangoon is held to come under this description.

53. The principal non-agricultural occupations are fishing, making fish-paste, fuel-cutting, boat-transport, cattle-tending, weaving mats of *thinbyu* or more generally of *thabaw*, and basket-making; and besides all the forms of buying and selling connected with these industries there is the peddling of the miscellaneous requirements of villagers in boats which traverse creek after creek calling at each hamlet or house to sell a water-pot, a shirt, a bangle, or a piece of meat or what not. Most of the barges which convey paddy in large bulk to Rangoon or Bassein have generally been worked by Indians; but a number of these were noticed to be worked by Burmans in the last year of the settlement operations, and the sampans which convey small parcels of paddy to collecting centres are usually worked by Burmans. A considerable amount of employment is furnished for Burmans too by the conveyance of the paddy retained by each family for home consumption to the local mill and the return of the rice produced from it. A few belonging to families who have connections with Upper Burma make annual ventures in goods from that part of the country, going up in boats loaded with fish-paste and bringing back lacquer-ware, sessamum oil and other goods not produced locally; the usual cargo in these cases seems to be worth about Rs. 1,500.

Character of the People

54 The number of immigrants from other parts of Burma in the whole district at the census of 1911 was about 65,000, and these with their descendants born in the district must account for many more and probably represent within the settlement area (which has much the larger proportion of immigrants) quite one-third of the population, while at least twice that proportion and probably more must be derived from stock which came to the settlement area within the last forty years. The people may therefore be expected to have the individualist character associated with the adventurous spirit which must animate people who emigrate from such a region as the middle zone of Burma to such a region as was the delta when they first came to it. No doubt this accounts in part for the scattering of the population in small hamlets, and for the difficulty in starting co-operative societies.

55. It is of the first importance that the current false impressions of the character of the delta population should be corrected; there has been too much of the superficiality which represented them as capable only of a lazy Arcadian life in a region in which, according to a former Settlement Commssioner, one has only to sprinkle a few seeds to obtain an abundant harvest. The conditions under which the fathers of the present people colonised the area must be visualised if present conditions are to be appreciated. There was often no potable water near the colony and journeys of fifteen or twenty miles were made once a week or oftener to obtain a supply. For food there were rice and fish, and generally fish were much more plentiful than now; but the rest was made up only with coarse jungle products, and at the same time there was frequently overstrain from excessive hard work. There was the lack of numerous domestic conveniences and of society; and especially the intense loneliness at night when the animals of the jungle prowled around the twelve-foot palisade which had to be constructed to protect the household from them, or when, as so often happened, an attack of fever or dysentery was suffered by some or even by all of the family at one time. In addition there were

the various and multitudinous insects which know so well how to make life hideous. In the fields there were floods as well as the parrots and crabs and elephants and other animals who damaged the crop, and the tigers and the crocodiles and the snakes who lay in wait for man or his cattle. Besides these there were the spirits of the jungle which were so real to those earlier men though they get little attention now. And the soil did not really laugh with a crop when it was tickled with a hoe; it was equally likely to give an ugly leer, and often the crop would not be sufficient for the food of the family if there had been much fever early in the season or at harvest time. And the loans that were necessary initially to provide food and clothes were to be obtained only at a distance at high rates of interest, which in a year of fever could not be paid but must go to swell the debt which, as it grew, first nibbled at the *morale* of the pioneer and finally swallowed him up completely. There was some gambling no doubt to wile away the *ennui* of fevered bodies in the stormy days towards the end of the rains, but the failures were due not to that nor to weakness of character but to the immensity of the difficulties. Whole families and even whole settlements succumbed to the fever; others who failed financially generally owed their first difficulty to a season of fever which increased the debt beyond their power to meet its interest

56. Nor are the sons and daughters of those pioneers lazy It is fashionable to accuse them of a fondness for luxury and for hiring others to work while they look on. The principal basis for this is the disinclination of their accusers to go out into the villages where they would suffer for a while some of the conditions which the cultivators suffer all the time without the alleviations which the accuser enjoys Some changes in the domestic economy suggest easier conditions than before. Matches are used now instead of tinder, and no weaving is done now at home More than that there is rarely any paddy husked at home; the paddy set aside for consumption by the family is sent to the local steam paddy mill to be husked at a cost varying from Rs. 5 to Rs. 8 per 100 baskets *plus* the equal or larger cost of transporting to and from the mill, and the women of the family are thereby saved much arduous labour A few families, generally Karens, husk their own paddy still, but the reason is never economy but fastidiousness, a preference for home-ground rice. This grinding by steam mills is so universal that some mills now take parcels of five baskets at a time for milling at a charge of four annas nine pies. Fuel too is bought now in many parts instead of being cut just round about the fields and carried home. Fish, meat and vegetables are bought where formerly fish and jungle products were caught and collected. Altogether it appears at first sight that the people have a much easier time. But they say they have no more leisure than before because they must give so much more time to cultivation. Formerly they left the work in the fields to husk rice or catch fish; now they pay for those services and stick more to the fields.

57. Unfortunately the basis of the statistics available for the area worked by a family in the past is vague; and without a precise description of that basis the figures cannot be compared with figures compiled now on what is probably a different basis. Generally all the able-bodied members of an agricultural family take part in the cultivation. When enquiring into the cost of cultivation for this settlement a note was made of the members of each family who worked in the fields so as to afford some check upon the information elicited about the labour employed in the holding. The figures obtained for Tract 12 of the new settlement are tabulated below. This tract has been selected because (as may be seen by reference to Map III) it is an extensive area of uniform conditions and gives a broad basis, and because it occupies the main part of the most fertile tract of Mr. MacKenna's settlement area, and because it is the area to which the charges of luxury and indulgence have had most particular reference in the mouths of critics. Men, women and children are denoted in the table by M., W., C. respectively; and the figures are given for 100 households in every line. The definition of an adult was a person recognised in the family as grown up and requiring an adult's diet; usually this means persons over

Analysis of Cultivators' Households in Tract 12.

Race	Status	Number of Households examined.	Per 100 Households.											
			Average number of persons.	Adults working whole time in the fields.		Working part time in the fields			Not working in the fields			Partial and non-workers with other remunerated employment.		
	2	3	4	5	6	7	8	9	10	11	12	13	14	15
				M.	W.	M.	W.	C.	M.		C.	M.	W.	C
Burmese	Owner	51	514	98	2	24	69	10	31	106	174	...	10	...
	Tenant	277	557	133	21	14	57	26	1	73	219	8	8	1
Karen	Owner	36	576	133	45	15	55	12	18	55	248	6	3	...
	Tenant	48	571	146	52	8	48	21	19	62	215	13	4	...
Indian	Owner	3	900	100	...	33	...	...	67	367	333		..	..
	Tenant	55	180	116	...	7	4		10	18	25	4	.	...
Burman...	All .	328	564	131	18	16	60	24	17	82	216	6	8	1
Karen ..	All ...	84	575	140	50	11	50	17	18	60	229	10	4	...
Indian ...	All ...	58	217	116	...	9	3		12	36	41	3	.	...
All		470	525	131	21	14	51	20	16	73	197	7	6	1

N B—Persons shewn in the last three columns are included also in columns 7 to 12

about seventeen. The number of women workers does not include women who cook for field labourers although many are fully employed by this work. Cooking, it must be remembered, includes searching for wild vegetable products and going perhaps one or two or ten miles by boat to buy necessities as well as mere kitchen work. If allowance is made also for duties and restraints connected with children and for aged parents and invalids residing with the cultivator's family, and if it is remembered that the children generally marry and go away from the house at a fairly early age, it will be seen that there are few drones. Women take part in all agricultural operations; they sow, transplant, reap, carry sheaves, thresh, winnow and in exceptional cases even plough and cut weeds The above table shows only two Burman owner's wives (or daughters) working whole time as compared with twenty-one tenants' wives; but there are more wives working part-time amongst the owners and the difference is not really very great. But there is an evident tendency for Karen women to be more largely employed in the fields than Burman. In most other tracts the amount of labour supplied by the family in the fields is larger, as may be seen by a reference to columns 5 and 6 of Statement 12B which show the average number of male and female adults who gave their whole time to this work.

58. The charge of laziness against the cultivators ignores not only the need to have a supervisor as soon as more than two or three labourers are employed but also the normal course of development. Strong young men are required for labourers; older men do not find it so easy as they to get remunerative employment as labourers except in the limited and poorly paid sphere of cattle-herding, and if they are unable to manage as tenants they have often to take to non-agricultural employment. It is difficult for a man above thirty-five or forty to find work as an agricultural labourer, and he would probably die early if he got it. Moreover, the labourer when he gets married prefers to live in his own house instead of going to live in his employer's house or in an isolated field-hut. With a family too it becomes more necessary to stay at home because the cost of supporting the

family is not proportionately diminished by the father living with his employer, and the full value of his wages is therefore not received. There is also the liking for independence, a point frequently mentioned in this connection being the desire to choose one's own diet. Then again there are advantages for a tenant in case of slight illness for which he can make up by harder work afterwards or by suffering the expense of temporary help; but the labourer perhaps loses his employment for a whole season. Thus there is a tendency for younger men to secure the more remunerative employment as labourers and for older and less vigorous men to seek the less profitable but more congenial status of tenant; these older men cannot in the average case exert themselves like the younger even if they wish, and naturally they assign the hardest work to the younger labourers whom they must employ. In the landowning classes there is a similar effect because owners more often become owners at middle life than before, and while they are young they do the hardest work either in their father's holding or in another. Besides all the considerations adduced above there is also the influence of the wife and children who would rather work on the husband and father's tenant-holding than hire themselves out to others as they must if he remains a labourer. They get thus the immense advantage of working in one place near home besides the all-important more agreeable psychological conditions The transition from labourer to tenant cannot be discussed on a purely economic basis; neither Burmans nor Karens live by rice alone

Method of Enquiry into the Cost of Living.

59. In Statement 13A are tabulated the average results obtained by the examination of 814 families with regard to their incomes and cost of living. It is the fashion to suggest that the figures collected in this connection are of little value That may often have been the case; the enquiry is certainly very difficult. But an endeavour has been made in this settlement to obtain something approximating to representative figures It is certainly necessary to confine the enquiry to cultivators whose expenditure is normal; figures for households taken at random are almost valueless unless a very large number of examples are taken The enquiry into the cost of cultivation was confined to persons who represented the average of their neighbourhood in their area and manner of cultivation and in their practice with regard to the hiring of outside labour From these were selected for enquiry into their cost of living persons whose house and general standard of living were locally regarded as approximating to the normal; and due arrangements were made so that the selected families should be evenly distributed all over every tract. The enquiry was always conducted in the house of the person examined because the presence and aid of his wife are essential, and yet if she were called to be examined elsewhere her mind would be continually wandering off to the children and their relation to the fire and the river. Moreover, in the house the household effects could be seen and correct answers were inspired by them. The enquiry for each family is a lengthy matter and one of the causes of error is the fatigue of the examinees; this was mitigated by holding parts of the enquiry on each of two or three days The usual method of enquiring is to ask point-blank how much had been spent on onions or some other article during the past twelve months; the examinee is as dumb to such a question as the Revenue Secretary himself would be; the enquirer then records a figure which he believes to be the conventional figure for the matter and has probably no basis whatsoever in fact—even if he happens to know something of what the figure would be for his own household that figure is quite irrelevant and averages based on such figures have no intelligible meaning. It is impossible of course to ascertain the actual expenditure of any family. But a different line can be followed. The object of averaging actual expenses of a number of families is to learn the normal expense. An approximation to the normal expense on many heads of the family budget can however be obtained also by careful enquiry of a single sample, and by multiplying enquiries the errors involved in this can be averaged out in the same way as variations from the normal. The party proceeded on this line. For the annual provision of grain were shown the actual amount of *wunsa* for the current year and the

actual purchases made to supplement this. As a check the number of tins of rice habitually taken from the store for each meal was noted for each season of the year; two milk-tins of rice per day being equal to ten baskets of paddy in four months discrepancies were easily discovered and could then be subjected to further enquiry. For housing, the date of construction of the house having been learned, the cost of the house divided by the number of years estimated for its endurance and the result increased by the average cost of re-roofing calculated on a similar basis and by the normal cost of other repairs as nearly as could be estimated were recorded—the last item being erroneous but small. For household requisites an inventory was made of all in the house—one reason why the enquiry was conducted there—and the normal cost estimated on the same lines as for the house. For clothing and bedding the cost for each member of the household was taken separately and tabulated on the back of the form, each article also being treated separately; a proportionate annual cost according to their estimated durability was recorded for blankets, pillows, festival clothes and other things which last more than a year, while for articles of which several are consumed in one year the record was made according to the number normally consumed in a year. For vegetables, meat, tobacco and other articles bought retail the usual manner and place of buying were the first subject of enquiry. Commonly these articles are bought at such intervals as three or five days fairly regularly on the average; and every family has its customary magnitude of purchase on each occasion. Given the customary magnitude and frequency of purchase the expense for a given period can be estimated. The person examined was asked initially whether purchases were made on the same scale all the year round and of course replied that they were not. Expenditure is on different scales when two or three labourers are added to the household in the rains or at harvest, in the interval between those seasons when labourers are not being fed and money is short, and in the months after harvest when money is a little more plentiful and easier conditions of communications on the one hand lead to an increase in the number of pedlars who come to sell in the village and on the other hand in combination with the respite from field work facilitate a visit to a bazaar. In some households fish-paste and cooking oil and some other things are bought soon after harvest in quantities large enough to last through the greater part of the year; enquiry was then made for the time when this supply was exhausted and the manner of meeting the need for the remainder of the year, which for these articles was defined to begin and end when the stock of these goods was annually laid in. If this need for the remainder of the year was met by another large purchase the balance still in hand was inspected and an estimate agreed upon for what would be in hand at the end of the "year" and a deduction from the actual expenditure was made accordingly. If, as is the ordinary practice, the need for the remainder of the year was met by retail purchases the frequency of purchases and the normal expenditure on each occasion were made the basis of an estimate as for other retail purchases. Deductions to correspond to the part of the expenses which was due to feeding labourers were calculated as proportional parts of the whole cost according to the number of months each labourer and each member of the family was fed, children being reckoned on an average basis of every child equal to half an adult.

60. The head "Communal contributions" has been substituted for the usual head "Festivals and Charity" which is vague in application. Communal contributions include all subscriptions made to defray expenses relating to the communal life of the village; such as contributions to pagoda or funeral expenses, shares in the cost of village improvements and all similar payments which are not a matter of individual volition but are demanded and assessed by the general will of the community. Charities which are customarily given by everyone, *e.g.* to beggars at the pagoda, should also be included here, but it is difficult to estimate them and they amount as a rule only to few annas in the year. Daily gifts of food to priests could not be reckoned in; their cost is included with the food of the family. Special gifts to the priests on duty days are included, as it is usual for all to give these on some occasions. But special entertainments given to priests and the cost of individual works of merit are included under "Extraordinary," as also are the large

share of the funeral, marriage or initiation (*shinpyu*) expenses sustained by the household in which these events occur. The purchase of medicines, fees for doctors, and the cost of journeys are included in "Miscellaneous."

61 The price assumed for paddy in converting into their cash equivalents all quantities of paddy which enter into Statement 13 has been based, as explained at the end of Chapter X, upon the course of prices in recent years as shown in the series of average prices of each year and four years before and after. These nine-year averages, as shown in the graph in Chapter X, indicate a price about Rs. 12 above that based on the average of the last twenty years and used for calculating rates of assessment The entries for the cost of food grains include the cosf of milling the paddy and the transport expenses incurred in that connection.

62 Working on these lines it is believed that at least for Burmans and Karens a real approximation has been made on the whole to the expenses of living of normal families cultivating on a normal scale ; but everyone who reflects upon the universal experience of householders of the total cost of trifles which are individually inconsiderable will realise that the estimates are most probably a little too low. The same accuracy cannot be claimed for separate items of expenditure as for the totals because it is often difficult to allocate an expense to the proper head. For example, the distribution of the cost of food between grains and other articles is not shown quite correctly because some of the grain represented by the figures was bartered for other foods , only cash outlays are recorded under the heading "Other food " Similarly a small part of the entry for "Food-grains" should really be transferred to "Tobacco and Betel" and to "Household Requisites" on account of barter

63 The averages for all tracts given at the end of the statement are the means of the figures for one average representative from each tract in which a sample of the class under discussion was examined. The average cost per head was calculated from the average total cost for the average household of the class. The distinction between adults and children was drawn at the time of the enquiry according to the view of the head of the household , children were those young members who required distinctly less than the full diet of adults and the age of seventeen or sixteen seemed to be the ordinary limit for them Allowing for the very young children included and for the superannuated amongst the adults the proportion of half an adult for each child is sufficiently near the truth and was adopted.

64. The figures for Indians vary widely because many classes are included and no reliable conclusions can be drawn from them. As the number of Indians in the settlement area is comparatively small this is of little consequence and the figures for Indians will not be discussed.

The Cost of Living

65. The average cost of living per acre of land cultivated varies from tract to tract as shown in Statement 13A. There are few wide variations from the averages of Rs. 17 and Rs. 16 per acre shown at the end for Burmans and Karens respectively in all tracts, and comparison with neighbouring tracts of similar character suggests that these variations are chiefly due to the accidents of sampling. Karens tend to spend a little less per acre than Burmans on an average, but the difference is not large enough to be certain; the errors in the figures are sufficient to account for this. General observation in the district suggests, however, that there are less differences of wealth amongst Karens than among Burmans. The cost per head of both Burmans and Karens varies more widely from the general averages of Rs. 95 and Rs. 83 respectively. It is lower generally than elsewhere in the west of Myaungmya Township and the north of Wakèma Township (Tracts 14 to 17) and in the tracts on the edge of the forests (26, 29) and the impression gathered in travelling in those parts was in agreement with this. Owners of land generally spend about Rs. 10 per head more than tenants. The average cost of living per family is generally rather above Rs. 400 per annum for owners and rather below that sum

for tenants. The average cost per family recorded by Mr. Lowry in the Settlement of 1903-04 was Rs. 188 for Tracts 8, 9 and 10, and Rs. 181 for Tracts 14 to 17; that recorded by Mr MacKenna in 1902-03 was Rs. 144 in Tracts 24 to 26 and about Rs. 200 in the main part of this settlement area (Tracts 12, 13, 18, 19, 23); that recorded by Lieutenant-Colonel Ormiston in 1905-06 for Tracts 20 to 22 was about Rs. 300. If the consumption of paddy included in those estimates were valued at the price used in the present case these figures would be increased by Rs. 20 to Rs. 40. But it is not possible to draw conclusions as to any change in the real cost of living because those officers gave no detailed account of their method of collecting their figures. The figures moreover could only show changes in actual expenditure and could not indicate whether a higher or lower standard of living is attained. Enquiry into this was rendered difficult by the conditions which resulted during the settlement operations from the German War and reduced considerably the standard of living. But when the obsession of current conditions could be removed cultivators seemed to agree that just before the war both cultivating owners and tenants maintained about the same standard as they did ten years before that. There had been changes in articles consumed and in the methods of obtaining them and in their cost; but measuring by the degree of satisfaction obtained the standard was neither better nor worse. There are exceptions; one Karen village declared that now they get two meals a day while formely their mouths were never empty. But generally the exceptions proved to have some special conditions, and whatever the change in the cost may be the standard of living appears to have remained fairly constant. The effect of the German War was to diminish resources by reducing the price of the paddy sold or given in satisfaction of cash advances and to raise the cost of articles purchased with cash. This rise was met in part by reduced consumption, but many estimated that they still required fifty per cent. more cash to make ends meet in 1918 and 1919 than in 1913. How far this 50 per cent. was due to an attempt to maintain the pre-war standard I have been unable to decide satisfactorily; probably it is fairest to assume that 25 per cent. was the actual increase in expenditure and the remaining 25 was met by reduced consumption.

66. In the tracts treated in the last year of the operations a record was made of the proportion of families who reached one or other of four well-recognised standards of living. The results are tabulated in Statement 13B. The column headed "Low" shows families who suffer distinct privation, and in the opinion of their fellows are not sufficiently fed and clothed to maintain proper health and efficiency. The "Frugal" column shows families who make ends meet with great difficulty; who often, having no prospect of obtaining further resources in view, must reduce their consumption below a proper standard; the amount of rice cooked each day must be carefully measured according to the mouths present at meal-time; there is general parsimony though not privation. "Average" households have to exercise care not to cook excess but they can afford to keep a dog and feed him with leavings, and it causes no distress if when one member of the family is temporarily absent enough is mistakenly cooked for him too A "High" standard of living covered households which can afford to buy dainties. The persons examined were those selected as representative of cultivators of the region for enquiry into the cost of cultivation. It will be seen that in the particular tracts treated owners are generally better off than tenants. A similar enquiry was made in a few villages taking every house in the village, but the enquiry could not be extended wide enough to be worth tabulating; so far as it went it showed, as might be expected, that agriculturists were rarer in both the "high" and the "low" classes than others, but many families in the "low" class were those of widows of cultivators or of former cultivators now too old to go out to the fields.

Extravagance

67. There does not seem to be any reason for regarding the cultivators as extravagant. Tea is drunk in large quantities in the hot weather; but it is taken very weak without milk or sugar, and four annas' worth in a month is a large consumption for a family. Pendulum wall-clocks are found in the houses of some owners and have

been cited as evidence of extravagant expenditure. But their owners did not pay Rs. 30 for them; the clocks were of Japanese make and their price before the war was Rs. 4 to 10. Bentwood furniture and mirrors are to be seen in the houses of landlords and money-lenders; they are not seen in those of cultivators. The Chinese shops stock many things in the towns but the amount spent on these by an average cultivator is small. Soda-water and tinned fruits are bought chiefly for the sick, especially those with digestive ailments; even tinned sardines and salmon are believed to be good for invalids. Tinned foods are also given to priests as dainties on special occasions and are used by travellers for whom something of the kind is often almost a necessity. The tide may change before one can reach a village where food can be bought, food carried in a boat readily becomes inedible as every boat leaks a little. Fuel-cutters who go far away from inhabited parts often take some tinned foods; they could manage otherwise but it is no great extravagance, and the conclusion from a view of these goods in the Chinaman's shop that cultivators live extravagantly is unwarranted. Some will consider it extravagant to buy three tins of condensed milk in a year, bringing them home for the children after a visit to the town to contract or discharge a debt; but it is difficult to agree with them An index to the degree of extravagance amongst ordinary people is seen in the use in many parts of fish-oil instead of sesamum-oil This is only available in the hot weather and it is disliked because it burns the throat, but it is eight annas per viss instead of twenty Where fish-oil is not available ground-nut oil at one rupee per viss is used or none at all. The latter solution is approached by many tenant families who regard oil as a luxury and use it only once or twice a month One kind of snail (*the kanazo kayu*) is considered rather a delicacy by some, but the ordinary snail of the paddy-fields (*kayu-myet-pyè*) though despised is eaten by some two to six times a month according to poverty For vegetables leaves of various trees are picked and eaten, and in the southern tracts the pith of canes is eaten to diminish the cost of pumpkins, marrows, brinjals, beans and other garden products bought from pedlars in boats at intervals of a few days. Meat is usually eaten two to five times in a month, fish one day in three to five. Funerals of wealthy money-lenders conducted in barges towed by motor-boats are to be seen; but in the case of the ordinary cultivator in the villages there is little extravagance for this or other ceremonies More than half of the money spent on these occasions is obtained by a collection throughout the village, everyone subscribing according to his means or to the general opinion of what he can afford, and real extravagance is frowned upon by the majority.

Indebtedness

68 Enquiry was made into the indebtedness of the 2,022 cultivators who were examined with reference to the cost of cultivation, these being selected, as already noted, to be persons who represented the average of their neighbourhood in their area and manner of cultivation and in their practice with regard to the hiring of labour in addition to that provided by the family. As no discussion of indebtedness was permitted in connection with this selection, the enquiry should yield figures representing the condition of the normal cultivator. It must however be borne in mind all through this discussion that only cultivators were examined, and statements made of cultivating owners may not be true of the whole class of owners who are the assessees of the land-revenue. Two main causes operate to invalidate the figures for indebtedness usually recorded in settlement operations. One is the failure to discriminate between debts taken seasonally for recurring working and living expenses and those of a more permanent nature; the other is the fact that some cultivators are examined early in the harvest season before any debts are paid off and some after the end of harvest when every possible debt has been paid off. The figures thus become almost meaningless, and, even if taken as a rough indication of a loosely defined average state of affairs in the area as a whole, become seriously misleading when used to compare two tracts examined at different stages of the process of the harvesting and the disposing of the crop. It is clear that the two classes of debts—which may here be called temporary and permanent—must be distinguished. Temporary debts are defined as those taken and repaid in the interval between the closings of accounts in two successive harvests. A knowledge

of both classes of debts is desirable, and in the last year when the party had learned to distinguish them a separate record of the two kinds of debts was made ; but, on account of the necessity for simplicity when training the settlement party to record correctly, the enquiry was restricted in the first two years to the permanent indebtedness. Further, only those permanent debts were recorded which existed at the end of harvest when as many as possible had been paid off. Where the enquiry took place after harvest, new debts incurred since harvest were ignored ; where the enquiry took place before harvest the cultivator was asked whether he had a good crop or not and which of his debts he proposed to pay off—and such debts were thereupon omitted. No doubt there were a few cases in which the cultivator failed to achieve his expectations and this omission was erroneous ; but the proportion of these to the whole would be small because the harvest was always on the threshing-floor at the time and it was only in a very few cases examined at the very beginning of the season that even this error could arise, and in most of these the subsequent check of the record by the Assistant Settlement Officer must have led to the necessary correction, so that the error arising in this way is negligible even if it exists at all. Particular care was taken to make a constant comparison for mutual check of records in this enquiry and records of sales and mortgages of land and of enquiries into the cost of cultivation and the cost of living.

69. Two cautions are to be borne in mind in all the following discussion of indebtedness The first is that it is important to distinguish cultivators and assessees ; the indebtedness of cultivators becomes an important consideration in determining new revenue rates when most of the assessees are cultivators, but the matter is more complex when cultivators form a minority amongst assessees. The second is that different results would perhaps be obtained if persons who were cultivators ten years ago were examined , from the present enquiry all the worst cases of indebtedness which have caused men to become herdsmen or to fall out of the class of agriculturists altogether were automatically excluded, and full recognition is not given to the case of men who paid off their debts by forfeiting the status of owner and becoming tenants. The enquiry in fact is static, whereas a dynamic attitude is required ; but a proper enquiry into indebtedness would be a larger undertaking than the whole settlement.

70. Statement 15A is a tabulation of the records of the permanent debts of the 2,022 cultivators examined. But here again was felt an inexorable demand for a departure from the ordinary practice. Settlement Instructions 241 and 275 require not only that if either the creditor or the terms of repayment or the rate of interest or the security differs in parts of a cultivator's indebtedness those parts shall be tabulated as separate debts but also that if a sum borrowed on one occasion is applied to two or more separate purposes the part applied to each purpose shall be tabulated as a separate debt. This has led to numerous misunderstandings and serious misinterpretations of the figures presented in this statement, the most striking example perhaps being the error into which it led the Financial Commissioner of 1914 in his Note on Mr. Duffin's settlement of the part of the district omitted in the present occasion. The prescribed form for Statement 15 too asks for a tabulation of the "Number of Debtors" although the instructions for preparing it lead to the insertion of the number of debts In Mr. Duffin's settlement the numbers recorded followed the instructions and showed the number of debts. But in spite of the loss of the opportunity to compare with his results I have prepared the statement on the personal basis, so that a debt means the total liability of the household examined immediately after it had paid off all the debts it proposed to pay off with the harvest. This seems to give the more intelligible result because under the prescribed system if two successive loans taken in the same year are both used in two parts for the same two purposes they count as four loans. Only an odd case here and there was found of a loan repayable in paddy being still unpaid and not converted to a cash loan ; since this latter procedure is the invariable practice in such cases all such loans were converted to their cash equivalents at an estimated price for the particular year and tabulated accordingly as cash.

71. Rather less than half the families examined were found to be involved in some degree in permanent debts. In one-fourth of the indebted families the total debt is between Rs. 100 and Rs. 200; but there is a large number of families with a debt between Rs. 200 and Rs. 500, more than one-third of all indebted families falling into this class. More disquieting is the number of owners and owner-tenants (that is, owners who hire additional land) whose debts exceed Rs. 1,000; not only are these numerous but their debts are large. In the class of debts ranging from Rs 500 to Rs 999 the average debt is Rs. 639, but as soon as debts reach the Rs 1,000 limit they seem to increase enormously so that their average exceeds Rs 2,000 for either owners alone or for the general class of all cultivators. Averaging over all the families examined the average debt is Rs 203, while corresponding with this the average area worked consists of eight acres of land owned and sixteen hired Tenants necessarily have less debts than owners, not merely because they have less security to give but because many of them are former owners who have cleared off their debts by surrendering that status. The owner-tenants are a small class and only a few were examined; they include tenants who own a small portion of the land they work, owners who own nearly all and hire a little, and other owners who have a full holding but are able to undertake an additional area with the aid of a responsible *gaungsaung* ploughman The staff were directed not to examine members of this class in the second and third years because their averages are so difficult to interpret.

72 Taking the tracts in detail it is found that more than half the cultivating owners were indebted in Tracts 11 to 14, 18 to 21, 23, 28 and 29, and that the list of tracts in which the average debt per indebted household is large is almost identical as may be seen in the marginal table in which the second column shows the percentage of indebted owners' households amongst those examined and the third shows the average debt per indebted household, and the fourth the average number of acres owned per household examined. This heavily indebted area includes practically all the settlement area except the three Tracts 8, 9 and 10 in the Myaungmya Township and the two Tracts 16 and 17 in the north-eastern part of Wakèma Township In Tract 18 the proportion indebted and in Tract 21 the average debt Rs 2,065, not shown in the marginal statement have probably been exaggerated by the accidents of sampling.

Tract.	Per cent.	Debt	Acres.
11 ...	50	1150	26
12 ..	56	2042	28
13 ...	67	1000	26
14 ...	61	611	18
15	33	028	18
18	100	467	19
19 ..	58	882	21
20 ..	86	733	23
23 .	72	707	23
24 .	23	577	30
25 ...	45	498	24
28 ...	83	788	28
29 ...	61	565	22

73 Comparing with the conditions at the beginning of the current settlement a large increase in debt is indicated Mr MacKenna's Tracts I and IV were situated chiefly in the present settlement area; the former corresponds roughly to Tracts 12, 18, 19, 23 in the table above, and the latter to Tracts 24, 25 and 26. Mr MacKenna found one-sixth of the cultivators indebted and Rs 700 for the average debt per indebted household in Tract I and Rs 300 in Tract IV. There is no record of what proportion of tenants was included in recording the figures, and this makes comparison a little risky, but although tenants were fewer than it seems clear that, since Mr MacKenna's figures include also temporary debts, indebtedness amongst cultivating owners has increased both in intensity in indebted households and in the number of households affected. Mr. Lowry found that in the area of his settlement (corresponding to new Tracts 8, 9, 10 and 14 to 17) 39 per cent. of cultivators were out of debt and 39 per cent. were only slightly indebted, while of the remaining 22 per cent. a half owed less than half the value of one crop. For the Tracts 20, 21, 22 Lieutenant-Colonel Ormiston gave figures showing an average indebtedness at the end of the season of Rs. 91 per indebted household and 51 per cent. of households out of debt and only 8 per cent. with debts exceeding Rs. 100. In these cases too it seems clear that, whatever differences there may be in the basis of the statistics at the two settlements, there has

been a large increase in the indebtedness of cultivating owners. Unfortunately Mr. Clayton's enquiry into indebtedness in the Irrawaddy Division in 1909 was closed before he had made any considerable enquiry in the present settlement area, and it is therefore not possible to institute comparisons with his figures. But special instances can be quoted and as an example one may take Saneik village in kwin 818, almost in the centre of the district, which in 1909—the time of Mr. Clayton's enquiry—was a village of Upper Burmans with good houses, a good monastery and a good brick path, where everyone had land and the whole was so prosperous as to attract the special attention of Mr. Dunn, now Registrar of Co-operative Societies, who as Deputy Commissioner assisted Mr. Clayton in his enquiry. Ten years later, in 1919, the village has 200 houses, but there are only nine or ten unencumbered resident landowners. One resident of Kyônmangè (who made his fortune chiefly by strenuous work in miscellaneous trading with Upper Burma) owns the largest share of the land and pays Rs. 1,500 a year in land-revenue there; another pays about Rs. 500. The best building in the village is now the granary of the latter. There are only about fifteen plank houses, mostly very old, the monastery is dilapidated; the brick path has largely disappeared. The village consists chiefly now of huts and mud, having lost of both. All this although the fertility of the neighbourhood is a byword for miles around.

Security for Loans.

74. Tenants have one-sixth of their debts secured upon their houses and more than two-thirds without security. Five-sixths of the debts of cultivating owners are secured upon their land and houses and nearly all the remainder is without security. In the case of Tracts 8 and 9 in the extreme west of Myaungmya Township and Tracts 26 and 27 of Labutta Township, all being closely connected with the dome of Myaungmya Township and having much hard sterile soil affected by salt-water, land is less favoured as a security than elsewhere; in flooded Tract 17 in the east of Wakèma too land is less favoured than elsewhere. But amongst the heavily indebted tracts there seems to be little distinction on this head as a rule; the newly cultivated Tracts 28 and 29 which are now undergoing original settlement both show 90 per cent. of debts of cultivating owners secured on land and houses, the latter however being generally of low value in those parts.

75. The fact that so large a proportion of the debts is secured on land shows that the cultivating owners are solvent. A debt secured on land is never allowed to exceed the value of the land; rarely does it exceed two-thirds of that value. So long therefore as there is no general withdrawal of credit precipitating a large number of sales of land at one time the liabilities can generally be met. But a fall in the price of paddy lasting for any considerable time would bring down the price of land and cause double disaster to the cultivating owners who would find their income so reduced that they could pay the interest on their debts with difficulty if at all, and would bring the price of land still lower by offering so much land for sale at one time.

Rates of interest.

76. The tabulation of rates of interest like that of debts has been made on a personal basis because the interest payable is related to the total indebtedness and credit of the borrower much more closely than to the sum borrowed on a particular occasion or to the part of that sum used for a particular purpose. Indeed the purpose to which a loan is to be put seems to have little or no effect upon the rate of interest, although it may decide whether the loan is to be made at all or not. Two and a half per cent. per month seemed to be the commonest rate of interest when the enquiry was being made, but in the compiled statistics it appears that three per cent. is nearly as common. There is a general tendency for tenants to pay higher rates than owners, probably as a result of the difference in the security offered.

Utilisation of Permanent Loans.

77. For the utilisation of loans statistics are given showing the average amount of debt per family utilised in each of five ways. Here must be noted the extreme difficulty of discovering the proper record to make on this

head. If a man who has enough to pay his way under normal conditions for the whole season loses a yoke of buffaloes by rinderpest early in the season he uses most of his money to replace them and later borrows "for household expenses," describing the matter so because the borrowed coins and currency notes were actually used in that way. But the correct record is obviously "to replace cattle." An attempt has been made to meet this difficulty by a close enquiry into the circumstances in each case but complete success is impossible; even with a successful enquiry difficulties arise in the classification. If cattle die of neglect while the owner is sick, is the debt incurred for replacing them properly assigned to "Sickness" or to "Cattle"? Similarly how should one tabulate debts incurred to employ extra labourers when the wife's illness prevents the cultivator from doing his usual share? Some part of many debts goes to household expenses because a little of the money is taken for those; conversely much of the debt for household expenses is due to earlier payments made for other purposes. As a particular result of these considerations it is impossible to separate debts incurred for household expenses from those incurred for current expenses of cultivation, and any separate tabulation for these is a mere delusion and a snare. It is in fact exceedingly difficult with the staff available to classify the causes of debts at all minutely and it is better to make broad classes and endeavour to assign debts correctly to these according to their true causes. It is of course impossible to tabulate under the heading "Number of Debtors" as required by the prescribed form of Statement 15 in any intelligible way; each part of each loan has been assigned to a class according to the way it was used. Five classes have been adopted to indicate principally the distinction between debts which are fixed capital and debts which are economically unproductive. The classes are (*a*) Debts incurred for the improvement of land, purchase of land and cattle and permanent productive agricultural purposes; (*b*) debts incurred for trading capital which is still held intact either in cash or goods; (*c*) debts incurred for building a house; (*d*) debts incurred to meet recurring cultivation and subsistence expenses but not paid off at the first harvest; (*e*) debts incurred for (economically) unproductive purposes or used as capital in trading and lost. The last head was subdivided into (i) debts incurred to pay off earlier debts and (ii) others. The average per head taken over all the households examined has been shown for each class and also the percentage distribution amongst the five heads; it is believed that this double tabulation gives the most satisfactory view of the conditions which is possible without much more complex tabulation. Even with this broad classification errors are inevitable. Some part of 'cultivation expenses" is certainly debitable rather to "land improvement" as well as some debts which were incurred for "household expenses" because resources had been exhausted by earthwork or purchase of cattle earlier in the season. On the other hand, when the interest due on a loan contracted for some purpose is left unpaid through sickness or purchase of cattle or some other cause not related to the purpose of the original loan the total of principal and interest is assigned to the purpose of the principal and cannot easily be treated otherwise without introducing new errors. Again money available to pay off an existing debt may be diverted to some other purpose; for instance, the failure to repay a debt incurred to celebrate a wedding may be due to an investment in land. Too much stress therefore should not be laid upon the absolute figures which must serve only as general indications. The figures given for debts incurred to pay off earlier debts ought perhaps to have been ignored when calculating the percentage distribution amongst other kinds, as they were presumably distributed amongst those kinds originally in the same proportions as are found for those kinds now, and this would increase the percentages on all other heads proportionately, but it was decided not to introduce this assumption; the result can be calculated with ease for any tract in which it is desired to do so. The general indications of the figures are not seriously affected.

78. Bearing these reservations in mind one may say that two-fifths of the debts amongst cultivating owners are ascribed to investment in land and cattle and land improvements, and may notice that amongst the heavily indebted tracts the percentage of debt in this class is generally above this average. Tracts 13,

14, 19, 20, 24, 29 all show one-half or more of their indebtedness as due to this cause and Tracts 12, 15, 18, 25, 28 show about the average percentage; Tracts 11, 21 and 23 are exceptions with 5, 11 and 21 per cent. respectively. Economically unproductive debts account only for 13 per cent. on the whole; but it appears probable that the classification is again vitiated in some degree by the differences in custom of some tracts in paying off debts as far as possible at harvest and borrowing again for specific purposes later on and in other tracts of letting the debt carry on like permanent capital if the creditor is an agreeable person and the interest perhaps no more than on the constantly renewed loans for short periods. For the large Tract 12 in which most persons were examined and where extravagance and culpable indebtedness should be found if anywhere the analysis of the economically unproductive debts according to their causes is shown in the margin. The loss by trading is nearly all due to trading in paddy, a diversion which so fascinated many a few years ago that they mortgaged their land to indulge in it, naturally without experience in watching markets and arranging freights, and perhaps most serious of all without close communication with the central markets and without instant information when any variation of the market occurred, they could not hope to compete with the regular brokers and dealers. The third item in the list, 'Standing Surety' might almost be added to the first item as it nearly always relates to cases of paddy-trading by friends. "Festivals and Ceremonies" occupy only the fourth place and there is general agreement that little debt is due to these now amongst the agricultural classes. "Sickness" stands seventh, but this is misleading because it covers as a rule only expenses of medical treatment whereas it ought to cover all debts which were incurred for any purpose and would not have been incurred or would have been paid off if the sickness had not occurred. Considerations like this show that further analysis on the basis of a settlement enquiry is useless, permanent indebtedness can only be properly treated in an enquiry concentrated upon the one subject. So far however as an enquiry of the scope possible in a settlement party goes, some interest attaches to the schedules printed at the end of Statements 17 and 18 showing the use of money obtained by selling and mortgaging land. It may be desirable however to point out that for a landless man seeking land two ways are open. He may adopt the difficult way of carving a holding out of the jungle or he may buy a holding in more settled parts by adding a little to the money obtained by mortgaging the land he buys. Others again prefer to be tenants and pay rent instead of interest—all of which only makes still clearer the contention already put forward that indebtedness is a difficult subject for enquiry by a Settlement Officer.

	Rs
1 Lost by trading	6,050
2 Works of Merit	5,710
3 Standing Surety	2,800
4 Festivals and ceremonies	2,345
5 Litigation	1,050
6 Paying land revenue	820
7 Sickness	460
8 Miscellaneous	1,124
Total	20,965

Temporary Loans.

79. In nine of the tracts treated in the last year of the operations a record was made of the temporary loans taken by cultivators to finance themselves through the cultivating seasons, and the information obtained is shown in Statement 15B, which shows that 59 per cent. of the cultivating owners and 75 per cent. of the tenants examined took such loans. The persons examined were in each case the same as those examined for permanent indebtedness. The loans of tenants are larger than those of owners. These temporary loans are chiefly taken without security. The figures show a great preference for loans at cash interest rather than for loans on *sabape*, but tenants are more addicted to the latter proportionally than owners. The usual custom is to borrow at cash interest if the loan is taken early in the season, say before August or September and at *sabape* later. Lenders naturally ask higher rates for loans taken late in the year as they have to borrow at higher rates themselves then unless they have had money lying idle. In some places ten months' interest is charged, if cash interest is allowed, for a loan taken from January to March; even the most ruinous *sabape* rates are preferable to this and generally from November onwards only *sabape* loans are taken. The *sabape* rate

is usually Rs. 60 for 100 baskets in October and Rs. 70 in December; but the baskets used to measure these payments are larger than those used when selling paddy. In Statement 15B the paddy payments have been valued as if measured in the same baskets as are used to sell because this approximation is near enough for the purpose, the price being taken on the same basis as was used in discussing the cost of living.

General Conditions of Borrowing

80. There is no system by which any cultivator can take a loan for current expenses by instalments as required. He must borrow a round sum at the beginning of a season and use it as required. He has thus to balance the relative cost, so far as part of his loan is concerned, of borrowing for a long term of several months and of borrowing later on *sabape*, not over-looking that in loans used for buying some foods he may save by buying on a large scale early in the season. Leakages of the money borrowed are bound to occur. There are often the expenses of a journey to the creditor, including fares, sustenance *en route*, a new *gaungbaung* to make oneself look respectable When the money has been received it burns the hand if some little dainty for the children is not purchased; and the wife is sure to have been needing a new skirt for a long time Often the purchase of many things urgently required has been delayed until a large loan is taken on cheaper terms than those of buying on credit, and some of a loan taken to pay labourers is used in this way. In loans taken for other than current expenses similar effects occur Burman and Karen cultivators usually borrow from men of these races, the Karen preferring a Karen creditor; they find difficulty in dealing with Chetties because they do not understand Burmese as these talk it and because of the Chetty custom of changing the agent every three years Some however prefer Chetties because they charge a lower rate of interest Karens often lend to poorer Karens at reduced rates, taking 2 per cent where others would ask 3 per cent or insist upon *sabape* conditions and often foregoing interest when these Karen debtors are hard-pressed, and sometimes forgiving the capital too. Lenders often borrow from Chetties or more wealthy persons on a comparatively low interest of Rs 1 75 per cent per mensem—which they pay however for longer periods than they can lend again—and lend at a higher rate Usually creditors like to have the larger part of their income derived from rent of land because their capital then is safe, and to obtain about one-third or one-quarter from money-lending which is more profitable though more risky. Recourse to the Courts to enforce repayment is not frequent if regard is had to the number of transactions; but the lenders have other ways of enforcing payment and borrowers submit to seizure of property without going to Court. There is little risk due to bad character; the risks are chiefly due to misfortunes or death of the borrowers The smallest loans are made by the more wealthy local villagers everywhere; many of the larger annual loans are made at certain centres like Kyônmangè or Thayettaw; the smaller permanent debts may be contracted at these centres too, but those which involve a deed are usually made at places where there is an office for the registration of deeds It cannot be said of moneylenders as a class that they are land-grabbers. As a rule they seem to lend for interest and to be rather disappointed when they are compelled to seize the debtor's land. There are of course exceptional cases of men who grant mortgages in the hope of getting land cheaply but they seem to be a small minority. Chetties do not seem ever to have desired to hold land. But since 1907, when for many reasons credit was restricted, a few have developed into agriculturists who combine local lending in temporary loans with their agriculture. The Chetties are said to have been responsible for a great deal of the indebtedness because previous to 1907 they used to thrust money upon cultivators on apparently attractive terms, painting glowing pictures of the profits they would get by paddy-trading or investment in land. It is not clearly proven that the Chetty was solely to blame, but there appears to be some foundation for the allegation that a great deal of the blame should be his.

Loans by Government to Cultivators.

81. Apart from a single advance of Rs. 3,300 made in 1910-11 of which nearly Rs. 3,000 were remitted in 1914-15 the district knows nothing of loans under the Land Improvement Loans Act. Under the Agriculturists' Loans Act an

average of about Rs. 25,000 is advanced annually in the district. This is such a minute sum compared with the total need of the paddy crop that no further discussion is worth while in this place.

Co operation.

82. It is in fact clear that the financing of the paddy crop must be based upon associations of large masses of people if sufficient credit is to be obtained; and the only kind of organisation suited to this purpose, at any rate in the present stage of political thought, is that of co-operative credit societies. A very few such societies have been established amongst Karens for a few years, but unfortunately they have acquired a savour of religious propoganda in the minds of many of the people. There is no reason for this beyond the fact that it is to the praiseworthy efforts of missionaries amongst their flocks that the formation of these societies has been due and that until very recently no other societies were formed. A new feeling is now beginning to appear though faintly, and a beginning is being made. Here as elsewhere in Lower Burma there is the problem of the large amount of credit required. It seems desirable for the present to confine societies to three classes: (1) for the colonisation of new land or improvements of large areas, (2) for non-agriculturists, (3) for cultivating owners in other than newly colonised tracts. For the present tenants should be rigorously excluded. The provision of cheap credit for them will inevitably be translated to an increase of rent and do them no service; on the contrary the enhanced rents will make all other methods of tenancy reform still more difficult. Tenants would benefit indirectly from the second class of societies because these would withdraw some from the class of tenants and diminish the competition for leases and raise the general standard of living.

83. The slowness of the people to respond to co-operative teaching has been due in part to the less concentrated efforts made in the delta than in other parts, partly to the lack of solidarity necessarily existing in a population composed of colonists from many sources or of their immediate descendants and living in an area in which the physical conditions (especially in the rains) make social intercourse difficult and encourage the establishment of isolated homesteads. Both the latter effects being enhanced by the independence of character naturally found in people who were sufficiently adventurous to leave such an area as middle Burma to seek a fortune in so different an environment as they found in the delta. Some interesting examples of co-operation have however appeared. In the north-eastern corner of the district under the leadership of a local Chinaman who is both a trader and a farmer an association was formed to embank a great length of the Irrawaddy and of its Shwelaung branch. The project has met some difficulties and it is not yet possible to foresee its result, but the will to co-operate was exhibited. Another instance is the project of the headman of Shwelaung to close up for certain months certain streams through which water enters to flood all the low parts of the island behind Shwelaung.

CHAPTER III.—AGRICULTURE.

Chief Crops.

84. The area under rice represents 96 per cent. of the whole cultivation of the settlement area, and this crop is the only one of real importance. There is some cultivation of miscellaneous vegetables on the hills behind Myaungmya and there are also some gardens in the same locality which produce pine-apples and a very few oranges and mangosteens for consumption in Myaungmya Town. Further west are the *danyin* gardens on the slopes of the middle dome of the Myaungmya Township, and further south on the slopes of the larger dome there are a few *taungyas* and some miscellaneous vegetable gardens partaking of the nature of *taungyas*. In the extreme north-east corner of the district there is some *kaing* cultivation, chiefly on silt conducted by river-water along artificial channels made

for the purpose. The villages chiefly concerned are Pègôn, Kinwagyi and Nyaungngu (see frontispiece map) and smaller groups along the river bank between them, but the whole forms only a trifling area. Of the 4 per cent. of the occupied land which is not devoted to paddy seven-tenths are recorded as "orchards" in which are included all house-compounds and sites not devoted to any special crop as well as true orchard sites. Under these circumstances the immense labour of selecting records kwin by kwin from the surveyor's reports to compile a statement showing the area under each crop in the settlement area has not been undertaken; a beginning was made, but in past years the records were unsatisfactory and the task promised to be quite beyond the value of the result even if not ultimately impossible. Statement 3 gives the area under each crop for the *whole district* (as shown in the annual reports); and an abstract of assessment rolls of the surveyors (which had to be compiled for the purposes of Statements 5, 6 and 7 and therefore caused little extra labour) has been added at the foot of the statement to show the area and proportions assessed in each class for the settlement area alone. The statement and the abstract taken together give a complete view of the matter. The classification by surveyors in items 32 to 36 (*a*) of the statement is of little interest as practically all gardens are really mixed and the abstract figures are of equal value. The figures for dhani are given for the settlement area in the abstract For other crops the small figures for the whole district may be regarded as maximum and generally excessive estimates for the settlement area of which they make up only 2,266 acres or 0 5 per cent altogether.

85. In the "orchards" the principal trees are mango, plantain, coconut, betelnut, marian and bamboo, with *danyin* in the west of Myaungmya Township. Limes, citrons and a few oranges, jack, guava, papaya, pine-apple are also to be seen. Sugarcane is grown only as a catch crop to prepare new ground for paddy. Black canes are generally used and in places these grow where flooding at high spring tide is so bad that stakes have to be driven deep into the ground near each clump of plants to be anchors to which the plants can be tied Groundnuts are grown only in a small patch in the *kaing* area already mentioned and are all consumed quite locally; it is probable that they would succeed in many small isolated plots all over the district, but there is no continuous and extensive suitable area Pebyugale was grown in the *kaing* area during the war when the price of this bean rose so high The principal crop of this *kaing* area is chillies which are grown whenever possible, but are only possible for one or two years in any one place The miscellaneous vegetable gardens on the high land near Myaungmya grow all kinds of vegetables for the Myaungmya market; such things as sweet potatoes, brinjals, beans and gourds predominate, but at least forty kinds were found. *Thetkè* grows on some small patches of high land along the eastern bank of the Zalètaw River; it is used locally but it is regarded by the landowner as a nuisance preventing the cultivation of paddy, and paddy cultivation is always instituted as soon as possible.* Experiments in growing jute have been instituted by the district authorities in 1917 and subsequent years, and the settlement party gave assistance in discovering volunteer cultivators and distributing seed and instructions. There were many failures but some successes, including one success by a headman a little north of Wakèma which showed a yield of 1,500 pounds of good fibre per acre. When a variety suitable to the locality has been discovered there will probably be a possibility of considerable development. The people, probably as a result of being largely colonists or the immediate descendants of colonists, are generally ready to try experiments if only they can understand exactly what is involved; they are indeed constantly experimenting with strains of paddy. The headman of Shwelaung, who is something of a genius, invented and made pumps with which he pumped water out of some low flooded land at the end of the rains and pumped water in again during the hot weather; in

* This thetkè land has accordingly been classified for assessment as third-class paddy-land under the new settlement.

this way he grew in the dry season a crop of *thônlapyu* paddy—a variety of three-and-a half months' life, well known formerly in the Prome District—on land which was univetsally regarded as unculturable. He made no profit because all the rats for miles around assembled in this particular holding when the harvest near their usual homes was complete, and in the next year he grew melons and cucumbers instead, the financial result of which is however unknown to me. There are possibly no other individuals with the same inventive quality, but there are many who have something of the same spirit of adventure; and deserving agricultural improvements will probably meet no great difficulty in finding acceptance in the Myaungmya District.

Kinds of Paddy

86 Glutinous paddy (*kaukhnyin*) is grown on a much smaller scale than in most districts and only towards the north and west. There is no general custom of eating it in the early mornings at reaping time as in more northerly distrcts; it is used for regular meals in December before the main harvest is ready and for a little indulgence now and again during harvest in an early morning repast. For the rest it is used to make sweetmeats, chiefly for presentation to the priests The kinds most generally used seem to be *paukwa* (five months' life) and *ngacheik* (five and a half).

87. The Land Records Department likes to talk about *mayin* paddy, but there is really no *mayin* grown anywhere in the settlement area. The paddy which they call *mayin* is of ordinary kinds, commonly *mokseik*, planted late upon land which is near a river and flooded until October; exactly the same kinds are grown in the middles of saucer-kwins, and these are not called *mayin* because they are away from a river, although the conditions of water-supply are identical.

88. Of ordinary kinds of paddy there is none grown with a life-period of less than five months except occasionally in the west of Myaungmya Township; but to the number of varieties with a life-period exceeding five months there appears to be no limit Probably the same variety has a different name in different localities, or appears in strains resembling each other as closely as twin brothers; but there are probably even more cases of the same name being applied to descendants from a common ancestor which have varied in quite different ways. The principal reason for the great number of varieties is the variety of conditions. Custom of course plays a part; most men believe in the kind they have frequently grown in each level of tidal, flooded and high land, and with a population drawn from various sources only a generation ago there is naturally a variety of fancies. But men are bound to adapt themselves to local conditions if they are to cultivate at a profit; and the cultivator in the Myaunymya District cannot afford to have all his crop ripening at the same time where there are no large gangs of reapers for hire; some parts getting overripe would be lost; some, ripening before the water left the fields, would get damaged There is of course a similar effect at ploughing and planting time and it happens in some places that the low fields must be planted earliest to forestall floods and cannot be reaped till last because the water recedes late; these conditions in the low land then perhaps compel the use of a shorter-lived paddy in the high lands than is used in an adjacent holding where there is a different assortment of land. In other places or holdings planting and reaping reach the fields in much the same order and one kind of paddy can be used all over.

89. Then again the manner of exit of the water is of importance. In some places water is in the fields to the end, tides enter even during and after the reaping; there a variety of paddy which keeps its head erect and does not dangle its seed in the water must be chosen, and this is perhaps the principal quality of

the long-lived *kaukgyi* varieties. The water-supply is in fact the most important consideration, and the variety of its conditions and of the devices for meeting them, from broadcasting on the dry soil in the hot weather to late planting with transplants two months old in October, demands a variety of kinds of paddy; and the labour conditions are probably in large measure a result of these natural conditions which tend usually to prevent a concentrated demand for much labour for only a short period. Price is often an important factor in selecting the variety to be grown; some varieties, as will appear later, obtain higher prices than others in some places, and the farmer naturally tries to adjust his work to facilitate the cultivation of these varieties Grain, which is soft in eating, is demanded for home consumption, and the lower lands which are generally suited to the varieties that yield such grain are commonly utilised for these *Ngakywè*, the black paddy, (called *sabanet* in some places), with a life of seven or seven and a half months (from sowing), is the favourite of these varieties and is always grown for home use where that is possible But it is a difficult and delicate crop; it is of great importance to have exactly the right amount of water in the fields of *ngakywè* when its flowers are forming seed, by its slow ripening it is very liable to harm from a shortage of rain, or (if there should be a plentiful supply of water) from the damping of its ears which are particularly liable to bend over on account of its flexible stalk Frequently other varieties of the *kaukgyi* class must be grown instead, particularly in those parts in which short-lived varieties are common. *Byansein* is a useful variety of *kaukgyi* as it is disinclined to ripen before the water leaves the field *Yosein, dalisan, yemanaing, bawyut* (*midôn* and *mishè*) with life-periods of about eight months (from sowing) are commonly favoured in low lands, *tadaungbo* is of too short life to be used in most low lands because there is still too much water in the field when it ripens. *Bawyut* is perhaps the commonest kind used for dry broadcasting *Thidat* is common in many parts in the middle levels which though not badly flooded have rather much water, and *ngakywè* often appears in these levels too *Kalagyi* and *kalagale* are largely used in flooded lands north-east of Wakèma and seem to have considerable power of adjusting themselves to the conditions, growing in quite low land or in well-drained land, but the latter has much red grain which depresses its price. In the bunded kwins the first-class lands depending on rain are commonly planted with *letywesin*, but *ngasein* (six months) and *madama* (six and half) are also used; *madama*, though of distinctly short life as paddies go in this district, has a short soft grain like the long-lived varieties In the tidal kwins the two latter are generally used for the occasonal high patches out of reach of the tide but *kaukgyi* varieties of longer life are used for first-class lands and lower lands The most useful variety perhaps is *ngasein-bilu* which appears to be a fairly new production This has a life period, according to most, of seven months but it is grown successfully in places where it only gets five and a half, no doubt because some local strain has adapted itself to local conditions The particular value of *ngaseinbilu* is that it grows in areas suited to paddies of a medium life-period but obtains the higher price of those of long life Like plain *ngasein* it is also found useful in the salt areas towards the south As is well-known there is a great deal of cross-fertilisation among different kinds of paddy, and consequently in an area where many kinds are grown still more new varieties are constantly being produced Some cultivators with a liking for novelties are always looking out for these, and any new strain with pronounced advantages is sure to be tested In 1917 near Shwelaung, a variety of *ngakywè* with a life-period of only four months was the subject of some talk. Two varieties were met a little east of Mawlamyainggyun, known as *Ne-ba-ôn* (wait a little) and *Ma-â* (not at leisure) The latter has the quality that it can wait without harm for a considerable time after it is fully ripe, so that a cultivator who is occupied with other fields is not worried by it; the former has such a long life that its reaping can safely be left until all other varieties have been finished. Both names are probably local names for varieties grown elsewhere, but they are of interest for their indication of the difficulties which have to be met.

90. When however the grain is to be marketed the many various kinds (other than *kaukhnyin*) are treated as belonging to three groups; and different members of a group are not distinguished, their sheaves being mixed at once on the threshing floor unless required for seed-grain. *Ngakywè* is always kept distinct from other kinds because on account of the smoothness of its husk it settles down in the measure into which it is poured and occupies less bulk than other rougher kinds, and owing to its lightness it is of low value if sold for the Rangoon and Bassein mills, while owing to the preference which the Burmese palate has for it, it is kept for home consumption or sold at about ten per cent. above the price of other kinds for Burmese consumption. All the remainder of the crop is regarded as either *ngasein* or as *kaukgyi*, but the essential distinguishing quality of *kaukgyi* is not its length of life but the kind of grain produced. All paddies of short thick grain which are soft in eating, except *ngakywè*, are classed by dealers as *kaukgyi* without reference to their length of life, and where there is a special price for *kaukgyi* varieties they all obtain that price. All the long-lived varieties are included in this class, but so also are some of the varieties of shorter life, such as *ngaseinbilu;* and the name *kauklat* is accordingly used now only by a few old men here and there. Paddies which are neither *ngakywè* nor *kaukgyi* are called *ngasein*, and this group of varieties includes all paddies of long thin hard grain. Occasionally *ngakyauk* is mentioned, but that also is a relic of a former custom, and as a matter of fact *ngakyauk* proper is almost unknown in the settlement area having been given up largely on account of its liability to produce red grain which causes a reduction of price.

91. Further, if, after threshing, the balance of *kaukgyi* grain in excess of that required for home consumption is small, it may not be worth while to sell it separately unless a neighbour who has only grown *ngasein* is willing to buy it; in such a case the *kaukgyi* will be mixed with the *ngasein*. Similarly, if the holding produces only a little *ngasein* in proportion to the amount of *kaukgyi* the two kinds will be mixed, and if the proportion of *ngasein* is small enough the mixture may be treated as *kaukgyi* by the dealer. With a larger proportion of *ngasein* the dealer calls it *apyu* or *bawsein*, and in those places where *kaukgyi* secures a higher price than *ngasein* he gives an intermediate price for it provided the proportion of *ngasein* is not above twenty per cent. In tracts where this difference in price is made some cultivators keep enough *ngasein* separate to settle rent and debts payable in kind, and in this way have a fairly pure *kaukgyi* for sale; but this generally applies only in the comparatively few holdings in which, after setting aside for seed and home consumption as much as is required or can be afforded for these purposes, there is not a predominating balance of either *kaukgyi* or *ngasein* in the residue. Thus apart from such provision as can be made for seed and *wunsa* and perhaps a little *kaukhnyin* the grain in the cultivator's hands on the completion of the threshing may be in two heaps, one of *ngasein* and one of *kaukgyi*, but is generally in one heap of *apyu* or of *ngasein* or *kaukgyi* in which although the one kind predominates there may be included a small portion of the other kind. *Ngakywè* paddy, as already mentioned, is always kept quite apart from other kinds, whatever the circumstances. Naturally, in small holdings, in which only one threshing floor can be worked at a time and separated kinds must be threshed successively, the sheaves are mixed or kept apart according as it is intended to mix the grain or not. But the mixing of *kaukgyi* and *ngasein* does not take place in the stacks of sheaves; it occurs only when the sheaves are actually laid down to be threshed and may be postponed until threshing is complete and the requirements of each pure kind have been measured out. In large holdings where there are sufficient men and cattle and two threshing floors can be worked economically the *kaukgyi* and *ngasein* are generally threshed on separate floors.

92. In the Pegu and Toungoo Districts it has been found that as time goes on it becomes necessary to substitute shorter-lived types for the *kaukgyi* grown in virgin land. But nothing of this has been observed in the present settlement area, perhaps because in the parts where cultivation has gone on long enough there is still so much water in the *kaukgyi* parts that these varieties must be retained.

There is no reason for supposing that any of the land now used for *ngasein* varieties was formely regularly used for *kaukgyi*. On the contrary there are parts in the south-west where the contrary change has taken place. The area around Kanbè had until two or three years ago a name for red grain and many dealers still refuse to go there to buy. But the *ngasein* varieties with red grain are no longer grown there ; all *kaukgyi* varieties are free from red grain, and these have been substituted with the result of a large increase in price.

Specific Gravity of Paddy

93. The average weight of a nine-gallon basket of paddy varies of course from season to season and with the kind of paddy as well as from one locality to another. But there is a well-recognised normal average weight in each locality for the kind most commonly sold. In the centre and west of Myaungmya Township this is as low as 49 pounds. In the central part of Mawlamyainggyun Township it is as high as 53, and the same holds of much of the narrow southern part of Wakèma Township. In the wide northern part of Wakèma Township and in the areas east of Kyaikpi the ordinary weight is a trifle below 51 pounds. Fifty to fifty-two pounds is the ordinary range of the weight in an ordinary season.

Soil and Sub-soil

94. Understanding by sub-soil the first layer found in digging which differs essentially in composition or texture or condition from the surface layer, the usual sub-soil of the paddy lands of the district is an alluvial clay, white to yellowish, always stiff towards the west of the district but sometimes more friable towards the east. It is found at a depth of one to four inches below the surface on the high lands and three to seven inches in the middle lands, but these depths vary with the amount of silt deposits annually received and also with the age of cultivation. Commonly in high lands the depth is now about three inches and in middle lands about six inches ; but throughout the southern half of the settlement area it is stated that at a period, varying with the locality but usually between five and twenty years ago in the more recently cultivated kwins, the stiff clay was not found in these middle lands within twelve, fourteen or more inches of the surface. In the lowest levels of cultivation there is sometimes no perceptible change for a distance of three or four feet from the surface, but eight to twelve or fifteen inches is the usual range of the depth at which stiff clay is found in cultivated third-class lands, there is difficulty however in obtaining detailed knowledge of these sub-soils because they are usually water-logged a short way from the surface and such a large proportion of them are almost constantly covered with water. This sub-soil, except in the higher lands, is always wet and sticky ; on the higher lands one generally finds it wet at a depth of a foot below the surface of a clay-loam soil and in the middle levels in the tidal tracts the ground is found to be water-logged on digging only as deep as fifteen or twenty inches, and the dry soil is not more than a mere skin on the surface even on a neap tide afternoon in the driest months, and often there is no dry soil at all. In the garden lands along the edges of rivers the same sub-soil is found below a deeper layer of silt formed by the usual action by which overflowing rivers raise their banks above the surrounding country. In some parts, notably near the Shwelaung and Irrawaddy Rivers in the North Kyônpauk Circle in the extreme north-east of Wakèma Township, there is a heavy layer of recently deposited sand in which it is difficult to speak of soil and sub-soil at all ; part of this is due to the action of local cultivators in conducting silt-bearing water into their lands by ditches communicating with the river. In some of the higher parts of the west, south and centre of Myaungmya Township, on ridges occupied by gardens or jungle, there is only a thin soil overlying the mother-rock of laterite or gravel with no sub-soil.

95. The soils of the district are naturally the joint product of the weathering of the upper layers of the sub-soils and the additions made to the surface by vegetation or by new alluvial deposits and the subtractions made by cultivation. In

the western and central parts of Myaungmya Township the soil in the higher paddy lands is a stiff clay changing to a sand gravel or laterite and occasionally weathered dolomite on the ridges of jungle or garden. In the gardens which fringe the rivers of Wakèma Township the soil is generally sandy and formed by the recent annual deposits of silt from the rivers. These ridges being denuded by rain quantities of the sand are carried down into the paddy fields behind them, which also get sandy silt in most cases direct from the river floods. Even in the kwins in which the higher levels are efficiently protected from river floods by bunds this action of the rain is going on now and the action of the floods was proceeding before the bunds were built.

96. Taking a broad view it appears that generally the district illustrates the ordinary theory of river deposits according to which the sand is deposited in the higher reaches and clay in the lower, the proportion of sand in the soil generally diminishing from the north-east towards the south-west except in so far as bunds have modified the flooding in recent years or the local contours cause the deposits of the earliest floods to be scoured away again each year. In the same way the higher levels are nearly everywhere more sandy than the neighbouring lower levels and soils tend to be more loamy than sub-soils. The definitely sandy deposits of the extreme north-east cease at about Shwelaung on that branch of the Irrawaddy and at about the head of the Yazudaing River on the other branch though all three rivers form banks of sand in their channels still lower down ; above these points the soil is often so sandy that the bunds of paddy fields give trouble by being washed away by the rain. The soils are loamy all through Wakèma and Mawlamyainggyun Townships down to about Kanbè and even lower in the immediate neighbourhood of the Pyanmalaw River, which carries a large bulk of the Irrawaddy water, and a loam soil over a clay sub-soil is generally the arrangement approved by the cultivators. Quite close to the west of Kanbè along the Ywe River and the Waingkana *chaung* there is no loam but only stiff clay, as will be understood by reflecting that this is nearer the Myaungmya dome and comparatively little water from the upper country gets into the Ywe River, as is indicated by its salinity in the dry weather. Similarly the universal stiff clay west of Myaungmya Town is to be understood. But even near the Ywe River, above Pyinywa, the loamy soil has led to the formation of Primary Tract 10 (Map III) in distinction from Tract 9, in which as the water of the rivers is derived from tides and quite local rainfall loam is scarce. One may indeed picture the soils of district as complementary to the water in the sense that friability decreases as the salinity of the neighbouring rivers increases. The sandiest soils are in the north-east where water is quite fresh ; the stiffest clays are in the west and south-west where the water is salt, and in between there is generally a steady gradation. The axes of steepest gradation of soil-change are the same as for salinty. In the Myaungmya Township stiffness of soil and salinity of water diminish together as the observer travels eastwards, the line of quickest change lying north-west and south-east ; in the Mawlamyainggyun Township this direction is north-east and south-west. In the centre the two systems clash, but they can still be traced in the tracting of Labutta Township if allowance is made for the disturbance in the general rule of salinity along the course of the Pyanmalaw.

97. This general conception of the soils fails of course in many local areas unless it receives considerable elaboration, but it holds with surprising fidelity in the first-class and better second-class soils. The highest lands in some cases are not more loamy but stiffer than the lower levels near by ; but this is because they ceased so long ago to receive fresh increments and their loamy cover has been washed down to lower levels ; in the central parts of the Myaungmya Township the loamy surface of the lower levels also appears to have been largely eroded and carried away by the rivers. The different jungle growing on higher soils with smaller water-supply has also led to a difference of cultivation. The earlier pioneers naturally attacked the higher jungle first because it was sparser and they wanted some immediate return, and in the more southerly tracts partly because

their previous experience of cultivation gave no suggestion that the low *kanazo* lands would be fertile, and perhaps in some cases because those low lands were perceptibly lower then than later on when brought under cultivation. These lands with a smaller original supply of organic constituents being cultivated earlier were naturally "exhausted" of their virgin fertility at an earlier date than lower lands, and they also suffer a continual loss of soil washed down from them as it is formed to the lower levels. In the lowest lands of all tracts the constitution of the soil is of practically no interest to cultivators because of its generally water-logged condition, its excessive content of decaying vegetable matter and its strong growth of weeds. Towards the south of the district, where the tidal inundations are salt in the hot weather, part of the salt deposited is washed out by the rain, but a certain amount is left to impregnate the soil for at least a part of the cultivating season and affects the crop unfavourably, reducing both the measure of the outturn and its quality.

98 In spite of the generally copious water-supply sandy soils are disliked by the cultivators much more than in some more northerly, drier, parts of the country like Prome. This is partly because these soils are on the higher levels and the heavy rain and the floods denude them so rapidly and so soon destroy field bunds made of them and partly because it is so difficult to make with them an effective dam to prevent the entry of water into the fields by the numerous water courses. Also the heavy rain of this district carries humus away through the more open sandy soils very rapidly Partly however it is probably due to the general predominance of clay soils which has led to traditions of cultivation which are suited to such soils and do not provide for the rarer sandy soils which only occur in a small patch in any one holding But there is a further reason in the tendency to surface rooting which prevails throughout and is due both to the excessive supply of water and to the stiffness of the sub-soil Nearly always the roots of the paddy are found to go only a short way down ; they hardly penetrate at all the stiff clay which so often appears as the sub-soil This holds in all except the lowest levels with their thick layer of silt washed down from the higher levels ; but the sandy soils are generally on the highest levels and consequently out of reach of the tides and liable to dry up in any interval in the rains, and especially towards the end of the monsoon. The higher clay levels would probably suffer even more from breaks in the rains because of the wide cracking to which such stiff clay is subject ; but it is the special value of the tidal irrigation that it obviates this difficulty.

Silt in Paddy Lands

99 The deposits of silt in the North Kyônpadôk Circle have already been treated in the note upon crops at the beginning of this chapter. In paddy lands, too, the silt which is commonly received by the annual floods or the tides is an important factor in the quality of the soil. Many of the lowest places are being steadily built up with the annual depositions which are sometimes due largely or entirely to the action of cultivators digging silt-conveying channels like those in the north-east of the district which have already been described, or closing exits so that flood-water drains away slowly without scouring. Unfortunately in the non-tidal and flooded area much of the silt which reaches the lower lands consists solely of the particles washed off the higher lands in the immediate neighbourhood from which it can ill be spared. It has frequently been suggested that the improvement of the lower lands by the silt affords compensation for this denudation of the higher lands. But the complacency of this view is disturbed if the owner who has lost on the swings watches some other owner making it up on the roundabouts. It is true that in the case of some lands acquired by original clearing, as well as in the most land acquired by purchase after development, the difference in the capital cost affords at least some measure of compensation ; but the compensation is not complete even for the cultivating class as a whole. For the part of the washings from the higher land, with its valuable content of vegetable plant food, which is carried down to the low water-logged fields is almost wasted there where the soil is already as rich as it need be ; while much of the balance is carried off by small tunnels into the streams,

and is not deposited in any fields at all but goes down to the coast to extend the delta. It must not be supposed that this indicates any deterioration of the soil in the denuded higher levels; the average effect of weathering and cropping upon the soil and sub-soil is constant and the soil therefore is identical year by year though its surface is infinitesimally lower each year if silt is not added. The effect is that the fertility of the higher levels is constant at a lower level than it would be without the denudation, while the fertility of the lower levels is not increased. Where the floods do not scour the lower levels as they retire there is of course an ultimate gain in the steady elevation of the surface of the low lands; but that gain is slow in maturing.

100. In the tidal kwins the conditions of silt-deposit in the low levels are similar in kind to those in the flooded kwins save that there is more silt brought by the Irrawaddy from other districts and less received locally from the higher levels. In some parts lands have been raised from the second-class of assessment, in which they stand for the current settlement, to the first-class on account of the improvement in their level by these silt-deposits. But in the best levels no perceptible change in the height of the surface seems to occur as a rule, though here and there the historic changes in the soil and water described by the cultivators seem to suggest a general elevation of their lands, which would appear however to be more probably due then to earth-movement than to silt-deposits. Silt-deposits cannot indeed have much effect upon level in the well-drained parts of the tidal area. Any slight increment of silt by raising the height of the land increases all the effects of weathering and reduces the amount of silt deposit so long as the extra height is maintained. A moment's consideration shows that the result is to establish an equilibrium about which there can only be secondary vibrations year by year with no steady tendency either towards a rise or a fall of level. Similarly the surface-soil in these lands, which are practically the lands of the first-class in every tract, must for the same reason tend to be as approximately constant in composition and texture as is the composition of the matter in suspension in the Irrawaddy, and there can consequently be no question of increase or decrease of fertility as a result of the silt-deposits. The fertility is as constant as it would be without them, but it stands at a higher level. There is however a sense in which appreciation and depreciation of the soils have taken place and are still taking place; but this is a subject which can be approached only by a discussion of the history of the soil-development which takes place when jungle is transformed to cultivated land.

Development of Paddy Land

101. In the first year of cultivation of *kanazo* land, the low jungle between the trees having been cut at the end of the previous rains and burned in the dry season, only broadcasting is possible, and the plants have to grow as best they can where the seed falls between breathers of the *kanazo* trees which cover the whole surface. Owing to the high proportion of decayed vegetable matter it contains and its constant wetting by tides on the surface and the high level of sub-soil water, the soil at this time is rather a viscus fluid like butter than a solid. It is excessively rich in plant food and the first year's crop runs to leaf and stalk and produces only a small quantity of extremely chaffy grain. The total yield is small also, because so large a part of the area will be choked with weeds or *kanazo* roots or occupied with stumps or standing, live or dead, trees and because there are always so many irregularities in the contours caused by the natural drainage channels. In the second year broadcasting is again necessary; the crop is of much the same quality but a larger proportion of the area can be sown and fewer seeds fall where they cannot germinate, because some of the breathers have rotted and broken and more weeds have been cleared, and as a result of the bunding the levels are often improved. By the third year it becomes possible to plant the land, placing the transplants as best one can between the breathers, and this still further increases the outturn because there is still less waste. The quality of the crop also improves a little and the combined result is a distinctly improved yield which continues to increase year by year. In

the third or fourth year "ploughing" becomes possible with the aid of patient oxen who will stop if the harrow meets an obstruction so as not to be continually breaking its teeth on the *kanazo* breathers, and in this way the contours begin to be smoothed out. The excessive proportion of humus in the soil continues to diminish as a result of cropping and weathering, and in about the sixth year, owing to the decay of breathers of the trees which were cut for fuel or killed by suffocation through the bunding and the removal of their decay-products, a sudden increased in quantity and quality of the crop occurs. This is repeated for one or two succeeding years and then gives way to a slow, steady continued improvement which is the result of the steady improvement of the surface by the levelling of contours and by the diminution of weeds and *kanazo* breathers and inferior patches and of the improvement of the soil itself by the reduction of its excessive vegetable content The improvement of the surface comes practically to an end in time, and the second process continues past the stage of maximum production of seed; so that the outturn begins to diminish and continues to do so until the opposed effects of soil-production and of cropping and denudation are in equilibrium, after which the soil is generally said to be "exhausted" This course of development of *kanazo* land is conveniently represented by the curve K1 in Figure 1 in which the height

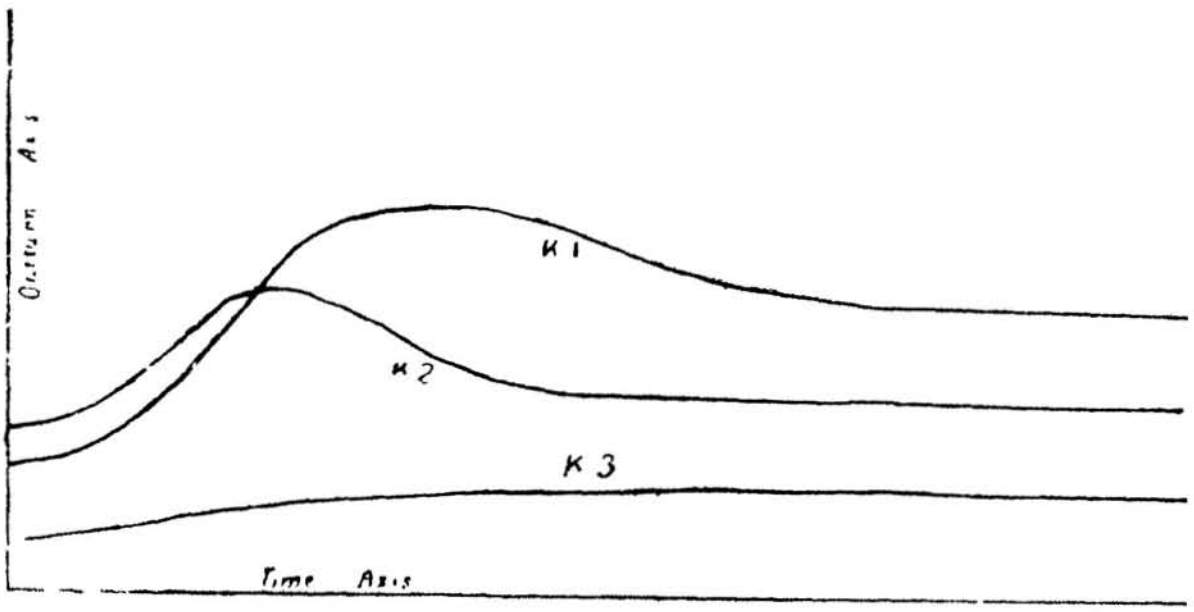


Figure 1.—Symbolising the progressive development of Kanazo land.

above the time-axis represents the normal outturn. The shape of the curve varies with local conditions of water-supply; for the higher lands the dome-shaped portion is narrower as in K2 because development is more rapid; as a descent is made to the low water-logged levels the dome is widened and flattened until in the lowest lands the descending part disappears and the curve degenerates in the lowest levels to the form K_3, for intermediate levels being intermediate between K1 and K_3. But the curves are all of one family; they all show a rise to a maximum followed by a fall to a horizontal line, which for convenience may be called the asymptote although the curve does really meet it and coincide with it. For land with other

jungle than *kanazo* the only difference is that as the difficulties due to the breathers are absent the point of inflexion in the initial part of the curve does not occur. The comparison of *kanazo* land with land bearing *bamaw* and *thayet* is the most important and is fairly represented by the curve in the margin. Initially, for five or six years, the *bamaw* land has the advantage; the sudden improvement of the *kanazo* land changes this, but the *kanazo* hare gets tired and the *bamaw* tortoise in about the twelfth or fifteenth year by steady progress catches it up and thereafter they travel on together. Deterioration generally begins in the first-class lands after about twenty-five years. Some say that *bamaw* land deteriorates sooner than *kanazo*, but it is difficult to decide upon this because other conditions always vary at the same time, and also because the curves shown here are ideal curves representing general tendencies The curve of actual outturns of any given piece of land would show oscillations about the ideal curve caused by seasonal variations of water-supply, the health and skill of the cultivator and other conditions It seems fairly certain that *bamaw* and *kanazo* land after fifteen or twenty years are of equal value if they receive similar inundation; without silt *bamaw* land is generally superior in the present settlement area because the *kanazo* land is always a stiff clay

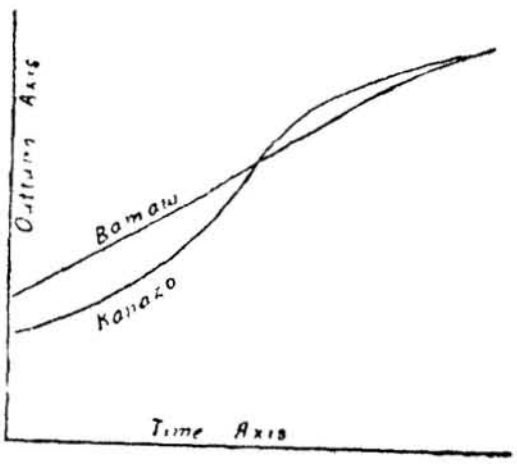


Figure 2.—Symbolising the comparison of Kanazo and Bamaw

102 Appreciation and depreciation of the soil are thus a matter of the length of time it has been cultivated; when once average equilibrium has been reached between the effects on the one hand of silt-deposit and weathering and on the other hand of cropping and denudation there is neither appreciation nor depreciation of fertility. Continuous cropping, silt and a regular system of manuring have no relation whatsoever to this fact except that they modify the level at which the fertility finally remains constant; they modify the position of the asymptote but it remains a horizontal straight line all the same.

Deterioration of Soil.

103 With the conceptions of the last section as expressed in the mental shorthand of curves borne in mind it is possible to understand the widespread complaints of diminished fertility which are met indeed almost everywhere outside the flooded areas but particularly in the Mawlamyainggyun Township, in the most fertile tract of the district (Tract 12 in Map III). The soil was formerly friable and now is hard and stiff; formerly transplants were set at a cubit or even two feet apart, now they must be a foot or less apart; formerly there was no need to plough, it was sufficient for buffaloes to trample in the mud; all sorts of evidence indeed is produced to support the view that the soil is deteriorating and with it is frequently offered an expression of fear lest the process should continue. Deputy Commissioners have on several occasions reported deterioration of soil owing to various causes, but if they had looked a little farther afield they could always have found improvement of soil going on too. By travelling from the south to the north of Tract 12 one passes through land which, taking the average in each locality, is steadily increasing in the age of its cultivation, and illustrates every part of the curves of development. Each locality is a picture of its northern neighbour a few years ago and of its southern neighbour a few years hence. Allowance being made for the salinity of the water to the south-west by observing the change as one travels east and west through cultivation of approximately the same age but with water of different salinity, the future of each locality can be

foreseen. It becomes clear that the horizontal asymptote is the proper representation of the fertility, and the earlier curved portion is only a temporary aberration. The older holdings, *e.g.*, in the localities of Kyônmangè, Thayettaw and Dipalè, have reached the asymptote of their development-curve; the newer tracts towards the south, such as the lands round Pyaleik, Kazaung and Hlaingbôn, have much land near the crest of the curve or on the ascending portion. A discussion of increase or decrease of fertility in a locality of moderate extent generally becomes in fact only a discussion of the date of colonisation.

104. There has however been real deterioration of land already under cultivation at last settlement caused by increased flooding in parts of Tracts 17, 18, 20 and 21 (Map III), especially near Zôkkani, Duntabè and Kyaikpi, which the cultivators ascribe to changes in the embanking near Yandoon and certainly are due to changes in the behaviour of the Irrawaddy and Yazudaing in the neighbourhood of these tracts In the area just to the north-west of Kyaikpi (Tract 20) the flooding is said to have become really serious only since 1917; at Duntabè it was said that the water was specially bad in 1915 to 1917, at Zôkkani 1913 is given as the date of the increase, the differences may be due to the land at Zôkkani being generally lower and therefore more liable to suffer from an increase of water in the river than the Kyaikpi neighbourhood.

105 If the question of the average rate of production per acre of the whole settlement area since last settlement is raised it is difficult to give an answer In all the tracts north-east of the *kanazo* area nearly all extensions of cultivation since last settlement have been made in severely flooded land, but there has been improvement in much of the old land on account of the silt-deposits raising its level and by improvements in the arrangements of cultivators to restrain the floods. Large areas in the southern tracts which have reached or are approaching their asymptote are yielding less than at last settlement, other parts though on the downward grade are still quite new Probably if the land which was under cultivation at the time of the last settlements is considered the balance is rather towards a fall in the total productivity But at that time the best land in many parts had not yet been cleared Mention has already been made of the fact that the earliest settlers attacked the higher land first because its sparser jungle was so much more easily cleared than that of the low lands. Moreover it was not at first believed by many that the level of the *kanazo* land would prove more fertile than the higher land, it appeared to be too badly flooded and there was little temptation to undertake the heavy task of clearing *kanazo* jungle if only inferior land could be obtained thereby The comparatively slow improvement of *kanazo* land in its first few years did nothing to discourage this view and many hesitated long before entering upon it When a few adventurers had profited by their boldness the others followed their example and thus a superior grade of land was brought into use. In this way the average fertility in the more southerly parts has probably been raised since last settlement, and it is likely that this rise is enough to counterbalance the fall due to the extensions into flooded land in the north. But in the greater part of the portion of the settlement area which produced *kanazo* jungle little of the best *kanazo* land now remains; extensions of cultivation must generally be into inferior land. In the more north-easterly parts where *kanazo* never flourished all extensions in the future will be made into inferior levels. Of the new area in the south many fields are in or approaching the humps of their development curves; but they are inferior all long to the lands further north, and pass also in their turn to the descending portion of the curve on their way to its asymptote, and the new extensions constantly become smaller in comparison with the continually increasing developed area. In the future, therefore, the average fertility may be expected to fall.

Character of Seasons.

106. The character of the seasons since 1902-03 is shown in the table below, the terms *good, bad, fair,* describing the ordinary nett outturn in the settlement area as a whole without reference to the price obtained for it. (Some notes on price are given in the last

Years.	Rain.			General character of Season.	Remarks.
	Early.	Middle.	Late.		
1902-03 ...	Capricious; cyclones.	...	Failed ...	Bad ...	High prices in Rangoon due to famine in China and Japan, but cultivators in Myaungmya failed to benefit.
1903-04 ...	Poor ...	Good ...	Good ...	Fair.	
1904-05 ...	Good ..	Irregular ...	Good ...	Fair.	
1905-06 ...	Good ...	Good ...	Break in October.	Fair ...	While high lands suffered from break in rains, low lands sufier by river floods.
1906-07 ...	Fair ...	Scanty ...	Good ...	Fair ...	Late rains largely redeemed failure of middle rains. Good prices.
1907-08 ...	Excess ...	Excess ...	Excess harvest damaged.	Fair ...	Low lands generally water-logged. Rain 3·59 inches in December. Prices high.
1908-09 ...	Good ...	Good ...	Good till harvest, then excess.	Bad ..	Harvest suffered from rain. Chetties restricted loans on land.
1909-10 ...	Good ...	Good ...	Excess rain added to river floods.	Fair ...	Bumper crop promised till ten inches rain come in November. Combination of millers kept prices down in Bassein.
1910-11 ...	Scanty ..	Good ...	Excess ...	Bad ...	Rats and insects, particularly bad foot and mouth disease.
1911-12 ...	Good ...	...	Scanty; storm in January.	Bad ...	Serious floods from Irrawaddy in middle rains; late rains too scantyfor replanting or for ripening. Sprouting on threshing floors. Much cattle disease. Prices abnormally high.
1912-13 ...	Good ...	Good at first; later scanty.	Good ...	Good ...	Much damage by rats. Prices good.
1913-14 ...	Scanty ...	Scanty ...	Excess ...	Bad ...	Deficient sunshine for ripening.
1914-15 ...	Fair ...	Good ...	Failed, then excess.	Bad ...	Price low.
1915-16 ...	Good ...	Good ...	Failed ...	Fair ...	Cattle disease.
1916-17 ..	Good ...	Good ...	Good ..	Good ...	Heavy cattle mortality.
1917-18 ...	Began well but then a long break.	Good ...	Excess ...	Bad ...	Good crop promised but floods in rivers and heavy rain at harvest unfavourable to standing crop and damaged much after reaping. Price low.
1918-19 ...	Good ...	Good ...	Poor ...	Fair ...	Bad floods in the north giving quarter crops. Good crops in some southern parts, but chaffy and light everywhere.

column.) The terms *good, fair,* and *bad* depend partly of course upon the standard chosen by the commentator; in this case after the two outstandingly good years and four particularly bad years had been marked off the remainder were assigned to the group which they seemed most to resemble according to the accounts of them given in the provincial Season and Crop Report, and, since 1909, in the detailed records in the district office.

107. The effects of rain and of river-floods are not of course independent, and the latter being due to heavy rain in other parts of the province are often associated with heavy local rain and enhance the effect of this by causing a failure of the drainage. The area depending upon rain for water is comparatively small, and the greater part is not troubled by fear of deficiency of rain in the middle or towards the end of the season. It is true that tidal water is not so good as the cooler oxygenated rain-water, but it is better than drought. There is a difficulty if the early rains are scanty, because if sowing and planting are delayed on this account the plants do not get tall early enough to withstand the deep water of the middle season. If sowing is not delayed till the monsoon has properly developed, breaks of dry weather just after sowing or transplanting weaken the plants. The principal difficulty however is excess of water. The table shows a proportion of seven bad, eight fair and two good years, and there was excess of rain at some time in nearly every bad year. In the process of soil-classification the people made quite clear that their difficulty was rather excess than defect of water. The greater part of the second-class land of this settlement is water-logged, and outside Myaungmya Township there is hardly any land which was placed in the third-class on account of lack of water. Excess of water at harvest time is the worst experience because it reduces the quality as well as the quantity of the crop. Rain during the ripening season prevents proper maturing of the crop and leads to chaffy light grain. Rain just before reaping breaks off the dry ripe grains But deep water in the fields is even worse because the grain either on the stalk before reaping or after reaping is apt then to get wetted. Such wetting causes the paddy to "heat" and the rice then turns yellow and breaks in milling; sometimes the paddy even mildews and it has been known to sprout on the threshing-floor.

Weeds

108. The larger tree-growths have been noticed already in Chapter I. The weeds in the paddy fields differ from place to place as well as from level to level. The *shwelanbu* which flourishes in the high levels of Myaungmya Township is a sure indicator of a stiff and sterile clay. The elephant grass and *daungsaba* of the northern parts of Wakèma Township indicate flooding, as also do the strong growths of *kyu* and *kasmè* which arise from seeds carried by the water. Owing to the continually damp state of the sub-soil, and often of the soil too, nearly all the fields produce a heavy growth of weeds between successive crops. *Myetchein, myesa, myetthindôn* grow in the best fields on middle levels, and though they do not look very important in the dry season add a great deal to the cultivators' expenses on account of their rapid growth at the beginning of the rains. These and other kinds of grasses, too numerous to mention, were found to indicate soil-qualities, and assistance in soil-classification was derived by making enquiries concerning them from the cultivators. Particularly it was often possible to discover by the weeds the level of a piece of land in relation to the tides or floods. While all cannot be discussed special nôte must be made of a few. The long stems of the water-convolvulus (the *kazun*) twine around the paddy and weigh it down into the water which drowns it The beauty of the flowers of the waterlily disguises a villainous enemy of the cultivator which attacks his plants in three separate ways. Its roots prevent the roots of the paddy from entering the soil, so that they merely dangle in the water instead; its long stems twist around the clumps of paddy and strangle them or drag them down or bend them over into the water so that they are drowned; when the water falls it drops its broad leaves on to the paddy and smothers or drowns it. The *paganbin* plays much the same part; it grows to keep pace with the water, but when the water falls its fine feathery leaves, which are kept open

and light while buoyed up, fall heavily on the paddy and drown it. The *padawmyet* grows as fast as the water rises and strangles the paddy. *Daungsaba* is objectionable not so much in itself but because the soil on which it grows gets hard. All the weeds add to the expense of cultivation by requiring men to cut them before paddy can be planted or even before the land can be ploughed, and complaints on this score are often loud. In some cases men are able to soothe themselves with the reflection that the same flood which brings the seeds of weeds bring also silt to enrich the soil or represents the tidal irrigation to which their best fields owe much of their crops; but not all have this satisfaction Very rarely is any effort made to deal with weeds after the fields have been planted. It would not indeed be possible as a rule on account of the water and mud; and the custom of neglecting weeds at that time being thus established for the majority of the fields, the few in which weeding might be practised with advantage are neglected too.

109 Some mention must be made of the water-hyacinth which infests many of the lower patches of the fields and is carried up and down by the tide in large patches in many of the rivers In several parts earnest endeavours to eradicate it are being made, but in many cases there seems to be a feeling that in the low places of the fields it helps to hold back silt and so to improve the land by filling up these hollows

Damage by Animals and Pests

110 Of the larger fauna mentioned in the first chapter the elephant, the pig and the *sat* affect the crops only near the edge of the forests in the south and west Monkeys extend also into smaller clumps of jungle and damage the paddy crop by tearing open the sheaths of the flower-buds. Of fish the *nga-pe-aung* bites the green stalks of the paddy, the *nga-ku* bites ears which lean over towards the water, while the *nga-bye-ma* bites both ears and stalk and assists the crabs in devouring seed sown in submerged nurseries Crabs, besides eating this seed and attacking the young plants, burrow in the field-bunds and cause them to break down Where nurseries are kept dry instead of being submerged the seed is attacked by the birds and rats With the exceptions of the mosquito and sand-fly which attack the cultivator himself and affect the crop by reducing his efficiency, the rat is the principal enemy of the crop, attacking it at all stages of its growth and often attacking so vigorously that it becomes the deciding factor in the quality of the harvest Parrots swarm in the newer parts, and sparrows as need hardly be mentioned are in numbers everywhere. When the paddy is nearly ripe stages about ten feet high must be erected at short intervals all over the paddy fields to support boys or men who do their best to frighten the sparrows from the crop by shouting and by casting at them with a sling (*laukhlwè*) mud pellets into which tails of grass have been stuck *Gwabo* and other blights often cause severe damage to paddy and perhaps rank next to rats in this respect Most of the coconut plantations entertain numbers of the rhinoceros beetle

Field-snails

111 There is reason for thinking that the snails which are so numerous in some parts and appear in some number almost everywhere are of greater importance than has hitherto been generally supposed. The commonest species is the *kayu-myet-pyè* (*Ampularia globosa* ?) and the less instructed cultivators describe nearly all by this name; but there are several other common species. Commonly found in the paddy fields besides *kayu-myet-pyè* are *kayu pin-lein*, *kayu pin-she* or *myi-she*, *kayu-si-sin* and two kinds both known as the *kayu-ya*. Another kind with fine black ridges on its shell parallel to the coiling could not be named and appears to be rare. The *kanazo-kayu* which is found chiefly on the foreshores and is distinguished by the rich black and gold colouring of its shell is eaten by a considerable number of the people when they can collect enough; but that rarely happens, and the *kayu-myet-pyè* which is found everywhere is eaten more commonly The cultivators say that the snails eat the young shoots in the paddy nurseries, and some say they eat the seed too and produce eye-witnesses when others deny this. More important than this however is the fact that they afford food for rats and thus damage the

crop indirectly by assisting to support a larger rat population. Around the mouths of rat-holes in the dry season are always to be found numbers of empty shells cleaned out by the rats who are thus probably enabled to live in larger numbers through that season. But there is possibly still another aspect involved in the 82 per cent. of lime contained in the shells of the snails. It is known that quite a small quantity of lime has a considerable effect upon a stiff clay soil and it is possible that the snails arrest lime particles contained in the river-floods and save them in their shells for the benefit of the land. Eight pounds weight of shells all belonging to one season were collected by village children from one-tenth of an acre ploughed four inches deep; the equivalent of two to ten pounds an acre was found several times lying on the surface of fields and was of course only a fraction of all contained in the upper layers of soil. These are small quantities; but if, as is possible, they are derived entirely from the river, they may, being annual contributions, be enough to have an influence in preventing the sourness to which wet soils are so liable The *kayu-ya* or stinging snails have a special importance for the transplanters of paddy. There are two kinds, both small, one whorled in a rather lopsided cone, the other in neat coplanar cylindrical whorls. They do not bite but they infect the water all round them for three or four yards with some substance which causes severe irritation if it touches the skin Usually a number of such circles of influence overlap so that a whole field is infected. Transplanters smear their legs and arms with kerosene before going into such a field, and afterwards apply to the vesicles which appear on the skin of the hands and legs the juice of a lime which relieves by transforming the sharp itch to a general slight pain. A transplanter can only work for a short time at a stretch in such a field and must go off to work elsewhere for the rest of the day and perhaps for the next day too. About one field in ten is so infected in the worst places, the infection moving from one field to another year by year. The cost of cultivation of these fields is sometimes materially increased in this way.

Methods of Cultivation of Paddy

112 Both the broadcasting and the transplanting methods of cultivation are in regular use by growers of paddy. In the west of Myaungmya Township scarcity of labour is given as the reason for broadcasting all except the best fields, but many broadcast the whole holding because the increase of return does not pay for transplanting; the soil is so poor that the critical point of diminishing returns for the application of capital and labour is reached in fact by broadcasting. In other places the reason almost universally given for broadcasting relates to the water-supply. In a large proportion of the fields assigned in the present settlement to the third-class the water accumulates so rapidly at the beginning of the rains that it would be impossible to plant them; one could not get so early transplants tall enough to esape drowning. With irrigation or other facilities for supplying water to a very early nursery such transplants could be had, and in many places where for one reason or another the flow of water gives suitable conditions they are obtained; but even then the transplants must be one and a half or two months old to be tall enough to keep their heads above water. Such transplants standing in so much water do not tiller, and the crop is reduced by the fewness of the culms as well as by the poorness of the ears; expenses too are largely increased by the heaviness of the labour of transplanting under such conditions. In some other cases deeply flooded land is left until the floods begin to subside in October and then planted; but the yield in such cases is always poor, and frequently this method is only used to patch bad places in the broadcasted fields. Another factor which affects the choice of broadcasting and transplanting in many cases is the greater damage done by rats in broadcasted fields in which the tangle of plants gives so much better cover than the orderly rows of a transplanted field; the rats often determine in this way whether transplanting will pay for itself or not. Broadcasting is also practised on new land in the first two or three years when the tangle of jungle roots, and especially the breathers of the *kanazo*, make transplanting practically impossible even if the labour could not be applied more profitably in other ways. But generally in this matter of the choice of broadcasting and transplanting are concerned not only the intrinsic character of the particular field and

the local labour market, but also the distribution in the holding of different kinds of land. With much land which repays early ploughing with a certain crop the cultivator cannot afford to waste time on the worst portions where deep water makes the cultivation a gamble in which even success brings only a small prize. He may also have high land which cannot be ploughed till comparatively late, but requires all other land to be finished before that if it is to be used profitably, and the low land must therefore be hurried over to let the most be made of the middle levels from which the main crop is to be derived The question of tiring the plough cattle before they come to the fields which give the best return for their work also comes into consideration. If there is little or no area at the middle levels in the adjacent holding the cultivator of that may find it more profitable to transplant in fields similar to those his neighbour has broadcasted. There may be several choices left open by the physical conditions for the method of cultivating a particular field, but their number may be reduced by the labour supply or in accordance with the law of diminishing returns to Hobson's choice. The latter, however, is not commonly the case; generally one can at least choose either to cultivate very early or very late, and the final choice is governed by the cultivator's opinion of the most profitable way of distributing his time and attention amongst the different levels of his holding and the need to adjust the life-period of the paddy to soil-conditions and to the conditions of harvest labour Towards the south where the flooding is tidal and much of the water commonly drains away at neap tide broadcasting gets rarer; tall plants put in just after one spring tide subsides can get established before the next comes, and early and late planting are both practised, though the latter is more general. In the greater part of the third-class land of the north and north-east of Wakèma (new Assessment Tracts 16 and 17) there appears, however, to be only the one choice of cultivating early, because the floods come so early—within a fortnight or so of the first rain—and when they subside they drain clean away and dry up too quickly for anything to be grown. One method then adopted is to sow as a nursery one of the lowest fields as soon as the first showers come, conducting water from other fields to it After three weeks or so the plants are thinned so that the field is left in much the same condition as if transplanted, but its plants are firmly rooted and established and able to withstand the water which comes at that time—unless it has come before and washed out the whole venture. Meanwhile the fields on the next higher level have been ploughed also with the aid of water conducted from still higher fields and are planted with the thinnings from the early sowing; these fields being a little higher the transplants get a little more time to become established. After completing these fields the cultivator proceeds to begin his nurseries for the milder parts of his holding. This method is only possible in certain places and the more common method is "dry-broadcasting" In this the cultivator does not wait for the rains. He cuts the grass and ploughs (with a share) before any showers come. The work is laborious in the extreme, but in such low lands there is commonly a damp sub-soil and the ploughing is not so heavy as it would be at higher levels and is often performed about the middle of April. (I saw an Indian cultivator ploughing in Tract 16 on the 23rd March in 1917). The field is then harrowed two or three times, the bad parts being treated with a spade; the seed is broadcasted and covered by harrowing again two or three times; a little weeding is then done before the rain comes. In some places, particularly where the *daungsaba* weed grows, the ploughing is deferred till after the first few showers so that the weeds will be destroyed in ploughing; the seed is then sown immediately afterwards, being soaked in water in this case for one night before sowing.

113. In the normal method of broadcasting the weeds are cut and the fields are ploughed and harrowed as early as they are soft enough for this to be done with ordinary strain on the cattle; seed which has been soaked in water till it has just begun to sprout is scattered at the rate of about a basket an acre and left to grow. Sometimes the field is merely muddy at sowing, sometimes it has an inch or two of water. Later on thick places may be thinned by hand and the uprooted plants used to fill in empty patches if conditions permit, but usually nothing else is done. The work is lighter than in cultivation with transplanting, but the reward

is less and it is quite erroneous to suppose that laziness is the motive for broadcasting. That is practically never the case. Broadcasting is adopted when it seems to lead to the best net result on the whole holding in spite of the relative loss on particular fields. Occasionally an accident or sickness which prevents the transplanting method being followed in time for good results is partially met by broadcasting all kinds of land; but this is exceptional and is avoided when possible because it leads to excessive weeds. The method of cultivation by transplanting will be described in the succeeding paragraphs.

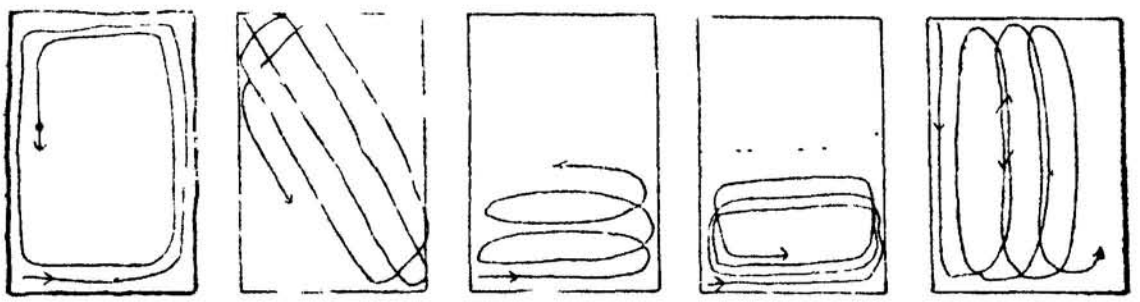
Tillage

114. The operation commonly described in English as ploughing or cultivating may consist only of harrowing or may include true ploughing with a share as well as harrowing. The plough consists essentially of a curved wooden share with an iron point by which a groove is cut and the clods are turned aside but not generally overturned. In a small area, chiefly near Sagamya, disc-harrows are used by a few in preference to the plough, but their price is too high for most, as they cost Rs. 125 (before the war) if imported and copies made by Myaungmya blacksmiths cost Rs. 85. They can be hired at one basket of paddy (paid at harvest) per morning in which 1.3 acres can be treated; and a number of cultivators hire them because, as one cultivation with a disc-harrow replaces not only a ploughing but also part of the harrowing, they enable a larger area to be cultivated without increasing the cost of cattle and ploughmen. The harrow consists essentially of a stout beam of *pyinkado* into which are set five to eight stout teeth about a foot apart. The number of teeth is adjusted to the strength of the cattle and the texture of the ground, six or seven is commonest. The teeth are 2 75 inches wide, flat behind and bevelled on both sides in front, and have a blunt point; a length of 8.5 inches protrudes from the beam in the end teeth, while the middle teeth are commonly half an inch longer. The teeth are generally made at home of the wood of the *kanazo, thitpyu* or *sitpin*, the men who bring fuel usually seek a piece of suitable wood and bring it with them unless it can be obtained locally

115 In the first year after clearing jungle on low land there are generally too many roots in the soil for it to be ploughed otherwise than by turning out the cattle to trample it when it has been softened by rain. Next year a very light ploughing is commonly given unless the jungle was *kanazo*, in which case the breathing shoots will still make ploughing impossible; but such land will still be very soft because of tidal inundation and will not have needed any ploughing yet. As time goes on and the organic matter of the new soil is reduced ploughing becomes both easier and more necessary, but there is no use in excessive labour and consequently only two or three light harrowings are given for eight or nine years. It has accordingly been customary to say either that the cultivator of the delta has an easy time or that he is lazy according to the thesis the speaker wishes to support. That laziness is not the true explanation is shown clearly by the practice in vogue amongst the poorer people in some parts by which the harrows are pulled by the cultivator or his family instead of cattle so long as the ground is soft enough for the expense of buying cattle to be avoided in this way. But this is only a passing phase and the higher lands get fairly efficient harrowing quite early in their history. The true plough, however, does not generally come into use until the soil is older and has passed its summit of fertility and is falling towards its asymptote. It is interesting here to turn to the Season and Crop Reports of the district for 1914-15 and 1915-16. In the former year it was recorded that an increase of ploughs had taken place in the district on account of the greater use of these implements in the "Mawlamyainggyun Township where the soil, owing to dampness, is continually covered with grass." In the next year it was reported that ploughs were being abandoned in Mawlamyainggyun Township as they were thought to cause deterioration of the soil. It is obvious that that could not be the reason for abandonment after one season. The truth probably was that the observations were made in lands in different stages of development. Land near the asymptote generally profits by ploughing and is treated accordingly; land in the dome of its development curve would probably not profit by ploughing, and cultivators of such land, who, having seen the benefit derived from the plough in adjoining holdings of

greater age, tried the same method, would give it up again because they found they had used it prematurely. The instance serves to illustrate the difficulty in giving a just general description of the conditions in the area of this settlement, as the incompatible reports quoted might both be true, and relate not to different continuous stretches of land but to assortments of holdings intermingled everywhere

116 Apart from newly-cultivated lands the amount of labour required varies largely from the high stiff lands of the west of Myaungmya Township to the friable soils and the low water-logged areas of Wakèma and Mawlamyainggyun; but a fair medium sample may be taken at Pyinywa. Here the first operation is to plough four or five inches deep to break up the tangle of weeds both above and below the surface, the path followed is the *kayubat*, a rectangular spiral beginning with the outside edge of the field and working towards the centre with each successive circuit. The harrow is then taken successively on the paths known as



Kayubat. *Daungdaik or daungde.* *Anansaung* *Alyapala.* *Myetpyaung.*

daungde (in other places called *daungdaik*), *alya pala*, and *daungde* again. The *pala* are curious paths somewhat resembling the *kayubat* but with the first whorl of the spiral enclosing only half the area and successive whorls of equal size but shifted a plough's width to one side so as to work across to the opposite side of the field, unless the field is small it is divided into two halves treated separately; *alya* and *anan* differ only in having the axis parallel to the long or short side of the field *Daungde* counts as two harrowings because each spot is covered twice; the *palas* count as one each, making a total of six The next step is to comb all the weeds straight to make them easy to cut, and this is done by harrowing lightly without stabbing the soil along the *myet-pyaung* path which resembles the *pala* but makes the area enclosed by each whorl only as wide as the plough is long instead of being half the field; thus every part is traversed twice in opposite directions in the same order and the weeds are all combed to lie one way. In other places a common sequence is *alya saung*, *anan saung*, *daungdaik* and repetitions of these as required A little later on an additional harrowing or two may be given just before transplanting. In average circumstances each harrowing occupies a morning for an area forty fathoms square. Usually the harrowing goes to a depth of about four inches, but in the wetter places where the weeds are particularly heavy this means little more in the first one or two ploughings than dragging the grass to the embankments of the fields so that it shall not rot in the fields and suffocate the paddy seeds or plants with the products of its decomposition. The weeds are cut by a long dah fixed to a long handle which is lifted well round behind and above the head so as to give the clean swing down which is needed to cut the tough stalks under the water. This work is highly laborious and women never engage in it; it is confined in fact to the stronger men. Pay is usually at the rate of Rs. 5 or Rs. 6 (no food provided) per 40 fathoms square if labourers are specially hired for the work, but the work is largely done by the ploughmen and their assistants hired for the season. In the low third-class lands, particularly those of Tracts 16, 17 and 18 (Map III), the strong growth of *Kaing* grass has to be cut before any ploughing is done, and this is paid at Rs. 6 (no food provided) per forty fathoms square; half the cultivators hire this labour, each for about one-third of his holding, all the rest being done by the cultivators themselves, often with the aid of fire in the hot weather. In many parts irrigated by tides the

weeds are cut first over the whole holding; then in the morning, while one or two men plough, a third clears the grass before and behind them, and in the afternoon all pull up seedlings; next morning the third plants in an earlier field while the others continue the ploughing and in the afternoon all work at planting. These arrangements vary with circumstances from holding to holding, but this is a fair sample and illustrates the necessity of hiring labour in the present state of knowledge of cultivation.

117. The relative expenditure in lands of different soil classes is of importance in relation to assessments. Sometimes the lowest third-class lands receive less and the highest, if time permits, a little more harrowing than the remainder, but roughly speaking the first and second classes of soil get nearly the same treatment. The higher second-class lands are laborious in dragging the plough or harrow because the soil is hard, and they may also get an extra harrowing or two; but the lower second-class lands are more extensive in all tracts and are laborious to both man and beast because the feet sink so deeply into the mud and the tangle of weeds obstructs the harrow as much as harder soil, while instead of the extra ploughing there is the extra grass-cutting. The principal consideration in the matter is that the cost of cultivating most holdings would not be changed except by the cost of seed if the third class land were omitted, because this is usually treated either before or after the season suitable for treating other classes of land and does not usually involve the employment of additional cattle or labourers.

Nurseries

118. Two kinds of nurseries are used, the wet and the dry. The latter is the commoner, but the wet kind is used in several parts, notably near Duntabe in Tract 19 (Map III) The field is ploughed and harrowed to a fine tilth and then smoothed with the stem of a plantain tree transfixed on the teeth of the harrow; the seed is scattered in anything from four to twelve inches of water. At Tisakan, towards the south-east corner of the district, it is usual to make two sowings in wet nurseries and two in dry. They complain that rats and birds eat the seed in the dry nurseries, but fish (*ngabyema*) and crabs eat it still more in the wet. The wet nurseries appear to have the advantage of protection from pests in some places, and of surface rooting and ease in transplanting as a rule; but the products of decomposition of grass and other weeds rotting in the water and poisoning or suffocating the seed and young plants make them impossible in some places at all times and in other places at some parts of the season. The principal reason for using wet nurseries appears, however, to be that drier ones are not available; in some places wet nurseries with about six inches of water really are preferred and dry nurseries are only used until a copious water-supply has washed away the rotting vegetation, but in others the later sowings are dry and early sowings are wet only because the only fields which can be ploughed early get a depth of water so quickly. The dry nursery is much the commoner and is only dry relatively. After a fine tilth has been obtained by ploughing and harrowing the water is let out and the seed is scattered by hand and covered by the harrow. When the plants are an inch or so high water is let in then to a depth of two or three inches, being let out and changed if there is a tendency to stagnation, and is kept about one finger-width below the tops of the plants while they are small. The site has to be chosen to enable the water to be regulated and is accordingly on low land for early sowings and on higher land for later. Before sowing the seed is first put into an earthen pot or oil-tin of fresh water to float off the light infertile grains The heavier seeds are then left to soak, or are put in a bag or earthen jar and suspended in the water from the river-bank, for three nights. *Kaukgyi* takes longer soaking than *ngasein* to make it sprout, owing to its thicker husk, and is said to require six days at times. After sprouting the seed is spread out for two days in the shade on the verandah, or it is spread on the ground and covered with grass in an enclosure made with logs to prevent it being washed away; if it does not receive rain where it is spread it is watered at intervals. By this time the seeds have shoots half an inch long; all become matted together in a tangle of rootlets and in this condition are scattered

in the nursery. In some places the seed is soaked only two days, and in others it is placed after soaking in ordinary paddy-baskets and kept moist for three days. Such variations are due partly to fancy or tradition and partly to differences in the soil and water of the nursery which require slight differences in the condition of the seed to give the best result.

119 In order to have suitable transplants available as the ploughing operations progress several successive nurseries are made even when only one kind of paddy is grown; three is probably the minimum and three or four the usual number of sowings but there may be six or more, and according to the issue of the earlier sowings the usual number or extent may have to be varied. As an example a holding a few miles south of Mawlamyainggyun and entirely devoted to *kaukgyi* may be taken, its area being twenty acres. At first two baskets of seed are sown in one-third of an acre; after fifteen days this is repeated in another field if it has been successful, and if it has not the amount is increased by the proportion that failed. After another fifteen days a third sowing is made to bring up to six baskets the successful amount, and if any part of this fails a further sowing of the deficiency must be made.

120. Usually sowing takes place in the afternoon (or in the evening if the afternoon is not cloudy), so as to give the seed the best chance of having no hot sun for at least a few hours. The date is necessarily controlled by considerations of the almanac and lucky and unlucky days, but as the original authorities made the rules for determining these conveniently so as to give three lucky days every week at this particular season there is no great difficulty on this score. Some, too, have begun to hold that it is more unlucky to have hot sunshine on the newly-sown seeds than to sow on a *pyatthada* day. Subject to these considerations the day of sowing depends in the greater part of the settlement area upon the spring tides, and the effects of these are various. In one *kwin* sowing is done on the seventh or eighth day of the moon (either waxing or waning) because then the neap tides begin and the plants can get rooted to withstand the next spring tide; it is also believed that there is less rain from the seventh to the tenth days of the moon than in the next few days and that thus further relief from flooding is obtained by sowing at this time. In a neighbouring *kwin* with slightly higher levels the eleventh day was considered the best day, because for the next four or five days, while still free from tidal influx, the seeds generally get the advantage of rain and cloud and have not the same risk of scorching sun as seeds sown on the seventh day. In a few higher places the spring tides are desired to water the nurseries and in this way all days of the moon have their votaries in suitable localities, but successive sowings in each place are separated by multiples of fifteen days. The variations in the date of sowing were found in some parts to give useful indications as to the relative agricultural conditions in kwins when the primary tracts for the revised settlement were being built up. The soaking of the seed must be commenced in due time before the date of sowing; and occasionally difficulties result when the seed is unexpectedly long in sprouting, and sowings may even fail as a result of this.

121. The usual seed-rate for nurseries is five to seven baskets of dry seed per acre, and one acre of successful nursery supplies twelve to twenty, usually sixteen, acres of plantation. Sparse and dense sowings are recognised and usually the later nurseries are sown more densely than the earlier. After the seedlings have been taken up nurseries are universally ploughed again and planted, but they are always inferior to other fields on the same level planted earlier.

Seed Selection.

122. In most parts of the district there are rudimentary ideas of seed selection amongst the paddy growers, but nearly always the selection is directed only to obtaining seed which will produce plants of uniform life-period so that ripening will take place uniformly in each field. The usual method is to pack the sheaves of varous kinds of paddy in separate stacks when they are brought from the field to the threshing-floor;

from each stack are taken a sufficient number of sheaves to give the required amount of seed of the particular variety, and from these sheaves all the included ears of other varieties are then pulled out by hand The more intelligent cultivators naturally select from each stack sheaves which appear to include few foreign ears, but there is no conscious selection for quality as distinct from variety. After this purification the seed sheaves are threshed separately from the bulk of the grain in the manner described later in this chapter. A method of selection used in the Ludaw and Kanbè neighbourhood of the Labutta township is to thresh all the sheaves of one variety at once without reserving any for seed, but to stop the threshing for a few minutes a short time after it begins and, raising the lowest sheaves of the pack, to sweep out for use as seed the grain which has been detached and fallen through to the ground first. This is supposed to give automatically a supply of equally ripe seed which will therefore be approximately of uniform variety or at any rate of uniform life-period. This method recalls that used in some parts of Prome of throwing the sheaves violently to the ground when they arrive at the threshing-floor and gathering up for seed the grains which are detached by this. It should be observed that this neighbourhood is noted for the chaffy character of its produce and its high content of red grain paddy. At Dipale on the Kathahmyin *chaung*, near Mawlamyainggyun, are some Karens who select their seed with more than usual care. They select a field or patch of the desired variety in which the plants appear to be strong, healthy and productive, and pay special care when reaping it. From each handful as it is reaped they select the ears of any foreign variety or of very inferior quality and collect those in sheaves apart from the remaining ears which are reserved for seed and are sheaved separately, and these seed-sheaves are again examined for foreign varieties just before threshing. This reservation of a particular patch of plants for seed is rare, and apart from the slight approach to it made in this particular neighbourhood there is little or no selection of quality. In some places the cultivator merely puts aside for seed so many baskets from the general bulk of the threshed grain, and some simply take the requisite quantity, when it is needed, from the stock of paddy kept for the family's consumption. The poorer tenants who rely upon the landlord for all their capital often get from him only impure seed, the more enlightened landlords keep sufficient of the purest consignments of their rent paddy for seed advances in the following season or buy suitable seed-grain from others; but all idea of using grain of special quality is excluded in either case and there are several forces in action which tend to make the paddy received for rent in payment of debts the least suitable for use as seed The practice of soaking the seed in water to germinate it before sowing is sometimes supposed to effect selection; it fails entirely in this because the grain which floats off in fresh water and is rejected is only that which would not germinate at all even if sown. A salt solution would select more efficiently, and in those tracts in which salt water is not available in the river could be used by treating a small portion of the seed at a time and pouring the salt water off each time into a second container without wasting it; but few to whom the method was suggested were willing to risk exposing their seed to salt water even for a minute or two. The selection each year for quality as well as for variety of the one basket or so of seed-grain which is needed to produce the next year's seed is a method which would give good results; it can be understood by any cultivator to whom it is carefully explained and it generally commands ready approval; the revenue officers of the district should endeavour to teach the practice when on tour in the hot weather. But the improvement of seed selection is one of the many matters in which the weak economic condition of many of the tenant cultivators is a powerful obstruction to progress. A proposal was on foot in 1919 to get seed from the Agricultural Department's farm at Hmawbi sown by a few cultivators experimentally, but the result is not yet known.

Transplanting.

123. Seedlings are always uprooted from the nurseries by men and are made into bundles of five hundred to a thousand and taken on the shoulder or by boat or on a small wooden sledge to the transplanting field. The planting is done both by men and by