CHAPTER IV.
AGRICULTURE AND FORESTS.


Crops grown

The staple food crop of the district is rice which in 1902-03 covered 66 per cent. of the total cropped area. Other important crops are tea (5 per cent.), and orchard and garden crops (8 per cent.), but a large part of the area shown under this head, is occupied by the homestead, and it is doubtful whether as much as one half is actually under cultivation. Mustard occupied 19 per cent. of the total cropped area and til (Sesamum indicum), which is grown much more extensively in Nowgong than in the other districts of Assam Proper, nearly one per cent. Miscellaneous food grains, nearly all of which are different forms of pulse, formed 6 per cent., and sugarcane 0.7 per cent. of the total. Wheat, barley, and gram, the food grains of Upper India, are grown in small patches by immigrants from those parts, but the total area under
these three crops in 1902-03 was only 37 acres. Cotton is grown by the Mikirs in the hills, and covers an estimated area of about 2,000 acres. The area under this and other crops since 1901 is shown in Table VI. The general system of cultivation and the manner in which the staple crops are raised is described in the following paragraphs.

Rice falls under three main heads sali, ahu, and bao. The proportion of the total rice area normally occupied by each of these three classes, being sali 51 per cent., ahu 30 per cent., and bao 19 per cent. Sali dhan or transplanted paddy, is first sown in little beds or nurseries (palang) near the homestead. The land is broken up in April or May, and is ploughed five or six times. The size of the nursery varies with the area to be planted out, but generally stands to the rice fields in the proportion of about 1 to 15 or 20. The seed, which has been selected from the largest ears of the previous year's crop, is sown broadcast over the bed in May and June, and during the time that this operation is going on, water is sprinkled over the bed from a bamboo scoop (lahoni). It comes up a rich emerald green, and at the beginning of summer these patches of the brightest green herbage are a striking feature in the rural landscape. In the meanwhile the fields are being got ready for the reception of the seedlings. The husbandman starts ploughing as soon as the soil is softened by the spring rain, and repeats the process from four to eight times till he has reduced the land to a rich puddle of mud. After the third ploughing the field is harrowed, the little embankments, a few inches high, intended to retain the water,
are repaired, and if the fields adjoin the road or the village site they are fenced in with split bamboo. When the seedlings are about seven or eight weeks old, they are taken from the nursery bed and carried in large bundles (gosa) to the field. Here they are planted out in handfuls, each of which contains four or five plants. The distance at which these are planted from one another depends upon the fertility of the soil, and the time of year at which the work is done. If the plants are transplanted early in the season, they can be placed at intervals of two feet, but later on the distance is reduced to nine inches. It is not unfrequently the practice to steep the young plants in water before they are planted out, and if they seem too luxuriant, the tops are cut off when they are removed from the nursery.

Transplanting goes on from the beginning of July to the middle of September, and is generally carried out by women. The work is of a most arduous description, and involves stooping for hours in a field of liquid mud, under the rays of a burning tropical sun. Before the end of the rains the crop is fully grown, though the ears are still empty, but about the beginning of October they begin to fill, and the field to turn to a rich yellow. From the middle of November to the middle of January, harvesting is going on. The women grasp a handful of the ears and cut them off about 8 inches below the head. These handfuls (muthi) are tied up with a piece of straw and left in the field for a few days to dry. When the grain is ready to be transported to the granary the muthis are made into larger sheaves. Six to eight muthis
form a thor or jhap, and five or six thors a dangari. A dangari is then affixed to either end of a sharp pointed bamboo called biriya, and the load, which is called a bhar and carried across the shoulder, is taken to the homestead by the men.

The different kinds of sali dhan fall under two main divisions sali proper, which is generally known as bar in other districts, and lahi. Lahit ripens earlier than sali and, though the grain is of a finer quality, the yield is appreciably smaller. It is planted on the higher fields which dry up first at the conclusion of the rains, and are thus not fit for sali. Very little sali dhan is grown in the chapari near the Brahmaputra, i.e., in the mauzas of Mayang, Gerua Bokani, Ghugua, and Juria, though in Dhing and Barbhagia there is a considerable area under this variety of rice.

Bao dhan is sown broadcast about the end of March, the field having been previously prepared by four or five ploughings. It is grown in flooded tracts and the embankments made between the fields are smaller than in the case of sali, and are sometimes dispensed with altogether. It ripens about the beginning of November and is harvested in the same way as sali. Bao dhan is generally sown in the intermediate tract which lies too low for the growth of sali, but is not so much exposed to flood as the riparian flats. Mikir-bheta and Hatichong are the two mauzas in which most bao is grown, but it is also sown in the higher parts of the chapari near the Brahmaputra. East and south of the Kalang there is very little bao.
Ahu dhan is usually sown broadcast, and is grown under two different sets of conditions. The greater part of the ahu raised is sown on the chaparis which fringe the Brahmaputra, and in the Gerua Bokani mauza, there are over 7,000 acres under this kind of rice. The usual procedure is as follows. In May the jungle is cut down and burnt, and the land left till towards the end of the rains. The jungle, that has sprung up in the interval is cleared in the same way, the process being known as gojola kata, and ploughing begins in January. The field is ploughed three times and harrowed, and the clods are broken up by a mallet. Another ploughing and harrowing follow, the seed is sown and the land again ploughed and harrowed to ensure that the grain becomes thoroughly mixed with the soil. When the plants are about six inches high, and catch the wind (botah boloah,) they are harrowed again and weeded, and finally harvested about the middle of July. The crop is, however, a precarious one and is liable to be destroyed by a sudden rise of the river. The plants can live under water for as much as a week, but if after this time the floods do not retire they are permanently destroyed. Ahu is generally grown on the chaparis in conjunction with mustard, and no jungle cutting is of course required when the soil has been already cleared for the oil seed crop. The same field is seldom cropped for more than three years in succession. The weeds which were unable to find a lodging under the dense growth of ikra (saccharum arundinaceum), khagari (saccharum spontaneum)
and *nal* (*phragmites roxburghii*), with which the land in its natural state is covered, soon spring up when once the jungle has been cleared and after the third year, it is less trouble to burn fresh jungle than to clear the old fields of weeds, while by a change of site, the peasant gets the further advantage of the manure of ashes for his next year's crop. *Ahu* is sometimes sown in conjunction with *bao*, in the hope that if the earlier crop is destroyed, the longer stemmed and sturdier *bao* may at any rate survive. It is also sown on high land near the village site, again in conjunction with mustard. The soil is poor, but is manured with the sweepings of the courtyard and the cowshed.

*Ahu* is also occasionally transplanted, the system of cultivation employed being substantially the same as that in force for *sali*. It is sown about the middle of May, transplanted some six weeks later and reaped about the end of October. Transplanted *ahu* is generally grown on irrigated land, and is most commonly found in mauzas Bamuni, Kandali, Kathiatali and Kampur. The crop ripens earlier than *sali* and thus gives a quicker return on the labour expended in its production.

Mustard, as has already been said, is usually grown in conjunction with *ahu* on the riparian flats. The jungle is cut down in February and March, and if the land cannot be prepared in time for summer rice, is allowed to rot upon the ground. What remains is burned in October, the stumps dug out, and the land is ploughed over four or five times. The seed is sewn about the end of October and the plant is ready to be
pulled from the field about the middle of January. It is generally left to dry for a few days and is then tied in bundles, and carried to the homestead, where it is threshed out by the cattle.

Nearly one-third of the total mustard crop of the district is raised in the three mauzas of Mayang, Gerua Bokani, and Dhing, but the whole of the country lying between the Kalang and the Brahmaputra is a mustard growing tract. South and east of the Kalang, the area under this plant is inconsiderable.

Pulse is usually grown on the alluvial flats that fringe the Brahmaputra in conjunction with summer rice and mustard, but a crop is often taken from the land on which rice seedlings, early rice, and sugarcane have been grown, as it is generally and rightly thought to improve the quality of the soil. In the *chaparis* if new land is taken up the first proceeding is to cut and burn the reeds and grass. Only two ploughings are required, and those are of the very lightest character, and, if the ground is naturally clear of jungle, the seed is sometimes simply sown on the river flats as soon as the floods subside. Pulse is also scattered broadcast amongst the rice stubble, or between the *sali* plants, if the land is still soft, but this method is not generally in use. The seed is sown in September and the crop is ripe about four months later. The plants are pulled up by the roots, left for a few days in the field to dry, and are then collected at the convenience of the cultivators. The seeds are threshed out by cattle, but as the grains do not separate readily from the pods, their
efforts are supplemented by a man armed with a bamboo staff. Several different kinds of pulse are grown but nine-tenths of the crop belong to the variety known as *mati-mah* (*phaseolus mungo radiatus*). Other kinds are *magu-mah* (*phaseolus mungo linn*), a species which has a smaller yield and requires more careful cultivation, but commands a higher price and possesses a more delicate flavour. It is seldom grown except on the river *chaparis*. *Kala-mah* (*lathyrus sativus*) is grown but not in any considerable quantities. It has a large yield but does not fetch a high price. Another variety is the lentil *masur-mah* (*lens esculenta*), which is also grown on *chapari* land.

Jute is grown in small patches as a garden crop. The plants are cut in August and September, stripped of their leaves, tied in bundles and left to rot in pools of water for from seven to twelve days. When they are ready a handful of stems is taken up, broken in the middle, and beaten to and fro in the water, till the inner part drops out and only the fibre remains. The bundles of fibre are then dried and are ready for use. Small patches of *rhea* (*bechmeria nivea*) are grown in the gardens of the fishing castes, where they are heavily manured. The skin is stripped off from the stem and the fibre separated from the outer covering. The thread obtained is exceptionally strong and durable but the difficulty of decortication has hitherto prevented the growth of *rhea* on a commercial scale.

Cotton is grown by the Mikirs in the hills and is of two varieties. The large boll'd high growing cotton is
known as *bor kapah* (*gossypium neglectum*) while the smaller round boll'd species is termed *horu kapah* (*gossypium herbaceum*). The former is sown on level ground, has a comparatively small number of seeds, can be ginned more easily than the second variety, can be plucked twice a year, and bears for three seasons.

The *horu kapah* on the other hand yields only one crop in the year. Cotton is generally grown on hill sides covered with young saplings, which are cut during the cold weather, allowed to dry on the ground, and burnt in March or April. The ground is then hoed up, and the seed sown broadcast, generally in conjunction with that of other crops such as rice, *til*, maize chillies, mustard, or melons. The field is weeded, once or twice, and the crop ripens in November. Cotton requires rain when it is put into the ground to enable the seed to germinate, but afterwards it thrives best if it gets a good deal of sun, and heavy rain is liable to rot the stems. The average yield is about 150 lbs. per acre, and the produce is generally sold unginned, as the cost of labour is heavy in Nowgong and there is little demand locally for the seed. Most of the cotton grown in the district is raised in the Mikir Hills where it is estimated that there are about 3,000 acres under this plant.

The grain is usually stored as it is brought from the field in an out-house called *bhoral*. When it is required for use the sheaves are untied and spread over the courtyard. Cattle are then driven round and round over the heap of grain and straw, till the ears have been
finally separated from the stalk.* The grain is next passed through a sieve, and placed in a flat bamboo tray called *kula*. It is then jerked into the air and allowed to fall back into the tray, or held aloft and allowed to fall slowly to the ground, till gradually the chaff is carried off. After threshing the paddy is stored in huge drums, called *duli* or *mar*. They are made of split bamboo, and the outer surface is plastered over with clay and cowdung.

The agricultural implements in use are of a very simple character. The plough is usually made of the jack fruit tree or some other hard wood, and consists of three parts—the handle and body which are usually all in one piece, the pole which joins the plough at the junction of the handle and the body, and the yoke which is merely a piece of wood, fastened by rope at right angles to the pole, with pegs affixed to it to keep it from sliding from the necks of the bullocks. The front portion of the body is sharpened to a point which is shod with iron, and in soft soil a piece of bamboo is sometimes substituted for the iron. This piece of iron is the only portion of the plough which the farmer has to purchase. The rest he makes for himself. The whole instrument is suited to the wretched class of animal required to draw it. It weighs as a rule about 20 lbs and, when cattle are used, the yoke seldom stands as much as 36 inches from the ground. When buffaloes are employed, the whole plough is constructed on a

* An experiment made by Mr. Darrah, D. L. R. and A. showed that nine bullocks took 2 hours and 8 minutes only to thresh out 7½ maunds of paddy.
larger scale. It is obvious that such an implement can only penetrate from three to four inches into the soil, but the wretched quality of the plough cattle prohibits the use of a more effective instrument.

The harrow (moi) is generally a bamboo ladder, about eight feet in length, on which a man stands as it is drawn across the field. It is used to crush the clods turned up by the plough before mustard or summer rice is sown, and to reduce the fields required for wet rice to puddle. Its place is sometimes taken by a plain log of wood. It is prepared by the cultivator himself from the bamboos growing in his garden. Clods are broken by a mallet (dheli mari) which is also made at home. Hoes (kodalis) are used to trim the embankments (alis) which help to retain the water. The head is bought in the bazar, and costs from Re. 1 to Re. 1-4, and is fitted with a shaft by the farmer himself. Sickles, with which the rice is reaped, have also to be purchased and cost from two to four annas. In aku cultivation, a large wooden rake (bindha) with teeth nearly one foot in length, is dragged over the crop by a bullock when the plants are about six inches high. The nirani, a kind of trowel with a long handle, is used for weeding aku rice. The sugarcane mill is described in the paragraph dealing with the preparation of molasses. The ordinary implement used for husking grain is the dheki, a long beam with a pestle affixed at the end, which is supported by two posts at about two-thirds of the length from the head. The shorter end is depressed by the foot, and the pestle is thus raised into the air; the weight is then
removed, and the pestle falls into a small hole, in a piece of wood which has been sunk level with the ground, in which the grain is placed. The dheki is the implement ordinarily employed by the Assamese to husk their rice or pulse but the animistic tribes generally use a large wooden mortar (ural) and a pestle (muri). All of these implements are made at home.

Sugarcane (saccharum officinarum) is usually grown on high land near the village site, and as the soil is poor, it has to be well manured with cowdung. The crop is propagated from the tops of the best canes, which are cut off at harvest time and kept in a shady place. One of these tops yields on the average about five canes, and as they contain but little juice, the cultivator does not sacrifice much of the gross product of his fields in the cause of reproduction. Four principal varieties of the plant are recognised. The bagi or white stands about seven feet high and has yellow canes of a soft juicy texture. The telī is shorter, harder, and thinner, and the canes are of a deep red or even purple colour. The Bangali, a foreign variety, is larger and more juicy than the indigenous kinds, but yields a smaller proportion of sugar. The malaha is a hard and thin variety of the mugi, and, where grown, is planted round the edge of the field. The land is hoed up till it is reduced to a fine tilth, and the tops planted in trenches between April and June. The patch is fenced with split bamboo, and there is usually a stout hedge of arhar dal (cajanus indicus), but constant watching is required to scare away jackals and other animals,
and an empty oil tin with a clapper is generally to be seen suspended over each field. While the crop is growing it is continually hoed and weeded, and about August the leaves should be tied up round each cluster of canes, which is a troublesome proceeding. The earth from the ridges is heaped about the roots to strengthen their hold upon the soil, and this process is continued until the relative positions of ridge and trench are reversed, and the canes stand upon ridges with the trenches in between. Harvesting goes on from January to April, and during the winter nights and in the foggy mornings the drone of the sugarcane mill is heard coming across the fields in nearly every part of the Assam Valley where the "works of men" are to be seen.

The native form of mill is still generally used for the extraction of the juice. It consists of two wooden rollers, fixed side by side in a trough hollowed out of a heavy block of wood. The tops of the two rollers pass through a hollow beam, supported by uprights let through the lower block of wood into the ground, and are cut into the form of screws which fit into one another. To the larger of the two (mota bhim as distinguished from maiki bhim) is affixed a pole, which is driven round in a circle, and thus causes the rollers to revolve. The motive power is usually supplied by the villagers themselves, but buffaloes are occasionally used for the work. The mill requires rather more knowledge of carpentry for its production than the other implements of agriculture, and can only be made by the more skillful of the villagers. The cane is placed between the
rollers and crushed as it is slowly forced through. Each handful is passed through the mill three or four times, till nothing but foam appears. The juice trickles from the trough into an earthen vessel, and is then transferred to a small boat scooped out of a log. When twelve or fifteen gallons have been collected, boiling begins. The furnace is hollowed out of the ground, and has four circular openings to receive the cauldrons, which are made of the most durable kinds of potters' clay. Two of these vessels are placed about 9 feet from the furnace's mouth, and only serve to heat the juice before it is transferred into the other vessels to be boiled. When the juice has been reduced to the proper condition, it is ladled into a wooden vessel (gholani) shaped like a small dug-out, and is stirred for half an hour. As the stirring continues, the liquid loses its dark brown colour, and assumes the consistency and hue of yellow mud. It is then stored in earthen pots and the process is complete.

The fertility of the rice fields mainly depends upon the following five causes: the water supply, the quality of the soil, and the liability to injury from flood, wild animals, or shade. But the first named factor is probably of most importance. The soil of the district varies from pure sand near the Brahmaputra to clay so stiff as to be utterly unfit for cultivation. The land best suited for the growth of rice is a clay loam alatia, the most fertile variety of which is called bherbheria, and is particularly deep and soft. Bherbheria land is found at the lowest part of the rice basins, and is enriched by the drainage
from the village site. The animals which do most injury to the crop are pigs, elephants, and monkeys. Elephants leave disastrous traces of their presence, but luckily do not remain long in any one locality, and are generally only found in the *chapari*, and in the Bangkhang, Duar Salana, Jorabahi, Garubat and Jamunamukh manzas. Serious damage is sometimes done by insects which are called *keonkata, tupaliya, gandhi* (*leptocoris acuta*) and *chara* (*hispa acusecens*). The *gandhi* is a small bug, which injures the rice plant by feeding on the stems and sucking all the sap from the young grains. It is most prevalent in July and August, and is particularly in evidence during a spell of hot dry weather. High wind and rain drive it back into the jungle, and good results are obtained by lighting fires of vegetable refuse to windward. The best remedy of all is to collect the insects by smearing a winnowing fan with some glutinous substance and pushing it over the ears of grain, when many of the bugs will be found adhering to the fan. This remedy should be tried in the morning or late afternoon, as the insects do not feed in the heat of the day. The *chara* is a tiny beetle, which eats away the outer surface of the leaves and stalks and thus affects the outturn of the crops. It attacks the young plants in the nursery and can most easily be destroyed there by spraying*. Smoking the fields also produces good results, but must be continued for some days or the beetles will return. Rain is wanted when *sali* rice

*The best solution is 1 lb. Paris Green, 1 lb. freshly slaked lime or flour and 150 gallons water. The solution should be kept constantly stirred and should be sprayed on with a fine sprayer.
is sown and is transplanted but is not needed for the sowing of *ahu* and *bao*. Sir W. Hunter† reports that about 1822 there was a wholesale destruction of the harvest by locusts, and that the price of paddy rose to the enormous height of Rs. 8 per maund. Locusts re-appeared in 1840 and sent up the price to Rs. 3-5-0 per maund, and in 1858 the visitations of other insects as well as locusts sent paddy up to Rs. 2-10-0 a maund. The authority for these statements is not quoted, and at the present day, Nowgong does not appear to be in any way specially liable to blight. The troubled condition of the country in 1822 would in itself be sufficient to account for the high price of grain. During every stage of its growth the plant is benefitted by moderate showers, but rain is absolutely essential at the time when the ears are first appearing. Hail storms in December sometimes lay the crop and add materially to the cost of reaping, but fortunately are very local in their action.

One of the most valuable of garden crops is the *plantain* (*musa sapientum*). As many as ten main varieties of this tree are recognized, but the most important are those known as *athia*, *monohar*, *cheni champa*, and *malbhog*. The first two groups are again subdivided into a considerable number of different species. The commonest form of *athia* is called *bhim*, a large tree which is found growing in the garden of nearly every house. The fruit is considered cool and wholesome, and is very generally used as food for infants. The *monohar* is a somewhat

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smaller tree; the pulp of the fruit is white and slightly acid in taste, and is largely used in combination with soft rice and milk at village feasts. The *malbhog* and *cheni champa* are small trees, whose fruit is much appreciated by Europeans. The *athia* plantain is generally grown near the homestead where it can obtain a plentiful supply of manure; but the finer varieties are planted at a little distance to protect them from the earthworms, whose attacks they are hardly strong enough to resist. Sandy soil and heavy clay check the growth of the plant, and anything in the shape of waterlogging is most injurious. The trees are planted in holes about a foot wide and eighteen inches deep and are manured with cowdung, ashes and sweepings. Young saplings take from eighteen months to two years to flower, and the flowers take from three to six months to turn into fruit. The plantain tree plays many parts in addition to that of fruit purveyor. The flower is much esteemed as a vegetable, the leaves serve as plates, and the trunks are used for decorative purposes on occasions of ceremony, and as food for elephants. An alkaline solution, distilled from the sheaths and the corm, is often used in place of salt. These portions of the tree are sliced, dried, and reduced to ashes. The ashes are placed in an earthen pot, in which there are several holes lightly plugged with straw. Water is then poured over them, which dissolves the alkali and trickles through the holes into the receiver below. The resulting product, which is known as *kharpansi*, is used as a relish, as a hair wash, and as a mordant with certain dyes.
The betel nut (areca catechu) is grown almost as universally as the plantain, and, with the bamboo, forms the great trinity of trees in which the houses of the Assamese are usually embedded. The plantation is hoed up, and kept clear of weeds, and the trees are most liberally manured with cowdung. The pan vine (*piper betle*) is frequently trained up their stems, and the leaf and nut, which are invariably eaten in conjunction, are thus grown side by side. Tobacco is a plant which is to be seen growing in the majority of gardens. The seedlings are raised in carefully manured beds in August and September. At the beginning of November they are transplanted into ground which has been reduced to a fine tilth, watered for a few days, and protected from the sun by little sections of the plantain trunk. The bed is lightly hoed up two or three times and not more than ten or twelve leaves are allowed to grow on each plant, the remainder being picked off as they appear. The leaves are first gathered in February and March, and there is a second, but much inferior crop about two months later. If required for chewing, they are either dried under a shed, or else pressed into a hollow bamboo (*chunga*) and allowed to ferment. When the tobacco is destined for the pipe, though this is not the use to which it is generally put, the leaves are piled up in heaps till they ferment, cut up and mixed with molasses, and then are ready for the hookah. The commonest forms of vegetable grown are, spinach *puj* (*basella alba*), *laki*, a species of *brassica*, different kinds of arums (*kachu*), different kinds of yams (*dioscorea*) and gourds, the country bean *urahi* (*dolichos*
lablab), the common mallow *lafu* (*malva verticillata*), the radish *mula* (*raphanus sativus*), the sorrel *chuka say* (*rumex vesicarius*) and the brinjal (*solanum melongena*).

The outturn of different crops varies according to the character of the season, and also to a great extent according to the character and level of the soil on which they are grown.

The statement in the margin shows the normal yield per acre laid down by the Agricultural Department after a long series of experiments. These figures only represent a general mean and even in a normal year, there are many fields whose outturn varies largely from the average. The yield of rice, it may be premised, is expressed in terms of husked grain. Like the outturn, the cash value of the crop can only be approximately ascertained. The prices obtained by the raiyats vary to some extent in different parts of the district, but probably average about Rs. 1-4 to 1-8 per maund of unhusked grain. Assuming that unhusked paddy yields 62 per cent. of clean rice, it would appear that the value of the harvest from an acre of *sali* is between 25 and 30 rupees, from one of *bao* between Rs. 17 and Rs. 21, and from one of *ahu* between Rs. 20 and Rs. 24. For mustard the villagers generally get from Rs. 2-8 to Rs. 3 a maund, so that the yield from one acre is worth from 17 to 20 rupees. The price of molasses varies considerably from time to time and from place to place and ranges from Rs. 5 to Rs. 7-8-0 per maund.

<table>
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<tr>
<th>Crop</th>
<th>Yield (lbs)</th>
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<tbody>
<tr>
<td>Sali</td>
<td>1,000</td>
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<tr>
<td>Ahu</td>
<td>800</td>
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<td>Bao</td>
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<td>550</td>
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<tr>
<td>Molasses</td>
<td>1,500</td>
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The value of the yield of an acre of cane ranges accordingly from Rs. 110 to Rs. 165.

In many parts of Nowgong floods are a serious obstacle to agriculture. The mauzas near the Brahmaputra are inundated in the rains, but this is merely one of the ordinary incidents of life, and the villagers overcome this difficulty by growing summer rice, which, if they are lucky, will be reaped before the floods are at their highest, and mustard which is sown after the waters fall. Further south the Kalang often overflows its banks after heavy rain and does some damage, while the Kapili and its tributaries are especially troublesome as they are liable to come down in strong and sudden freshets from the hills. It would be a difficult matter to regulate these rivers by protective works, and the population of the district is so sparse that no attempt has yet been made to reclaim any of the inundated tracts for permanent cultivation. The remains of embankments constructed in the days of native rule, are to be found in the Barphagia and Juria mauzas and the Dhing road is said to afford some protection to the land lying on the west, but the time is not yet ripe for the construction of embankments on an extensive scale.

There are no great irrigation works in Nowgong, for the matter of that in any other part of the Province, and no attempt is made to water the crops from wells, but near the hills the people grow rice on high land above the reach of flood and bring the water of the hill streams through little channels on to their fields. These channels are constructed and
repair by the villagers themselves, and are to be seen in the Kandali, Kathiatali, Duar Bagari, Bhatialgaon, Barbhagia, Bholeguri, Chalchali, Namati, Jamunamukh, Rangkhang, Sahari, Uttarkhola, and Garubat mauzas. But they are not very numerous or very elaborate feats of engineering, and over the greater part of the district the aim of the cultivator is rather to protect his fields from flood than to attract the water to them. Manure is very seldom used, except for sugarcane and vegetables for which cowdung and sweepings are employed, but land covered with jungle is of course fertilized by the ashes of the reeds standing on it. Little attempt has been made to introduce new crops, or to improve the existing staples except in so far as this is done by reserving the largest ears to act as seed, but in Kampur the cultivation of peas, wheat, and jute is said to be extending in the neighbourhood of the railway.

The buffaloes of the district belong to two distinct breeds, the Assamese and the Bengali.* The Assamese are the larger of the two and are fine upstanding animals with widely spreading horns. During the cold weather, they are generally grazed in jungly tracts and a wild bull often attaches himself to the herd, and becomes the sire of many of the calves. This continual infusion of a good strain of blood does much to maintain the excellence of the breed. The Bengali buffalo is a smaller and less imposing animal, and does not command so high a price, a bull

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* The information given in these paragraphs is taken from a note compiled by Mr. Darrah, Director of Land Records and Agriculture in 1887 and from reports received from the tahsildars and mauzadars in Nowgong.
costing from Rs. 25 to Rs. 30 and a cow from Rs. 30 to Rs. 40. The price of the Assamese buffalo varies considerably in different portions of the district. Near the Brahmaputra, where large herds of these animals are kept by professional graziers, the bull fetches from Rs. 30 to Rs. 40, the cow from Rs. 40 to Rs. 60, but in the Kapili valley the price rises to Rs. 40 to Rs. 60 for a bull and to Rs. 60 to Rs. 85 for a cow. Buffaloes rarely get anything but grass and a little salt to eat. In the cultivated portions of the district they are usually placed in charge of a small half naked boy whose legs can hardly stretch across the massive back of the animal he bestrides, and who guides it with a nose-rope. In the chaparis the herd is driven out to graze in the jungle, and follows the lead of the older cows, whose whereabouts is indicated by the metal or wooden bells that are dangling from their necks. They are often trusted to return in the evening of their own accord, and a long line of animals is sometimes to be seen swimming across a channel of the Brahmaputra, which separates them from the huts in which the graziers live. Often too, as the sun is setting, a herdsman is to be seen climbing a simul tree, which raises its head above the surrounding wastes of grass, to call his buffaloes home. At night each animal is fastened by a nose-rope to a post, and sleeps on the bare ground. A cow generally remains in milk for about ten months, and yields at the beginning from two to four seers every day. The amount gradually decreases till a month or so before the next calf comes when it ceases altogether.
The milk is very white and rich in fatty materials, and consequently yields a large proportion of \( ghi \). The cows are said to begin breeding when three years old, and to continue doing so for fifteen years; during which time they give birth, on the average, to about ten calves. The normal life of a buffalo is from 25 to 30 years.

Half starved, undersized, ill-bred, and not unfrequently diseased, the Assamese cattle are but sorry creatures. The bullocks find it a difficult task to drag even the light native plough, and the cows yield but a minimum of milk. The causes of this degeneracy are not entirely clear, but are probably to be found in a total indifference to laws of breeding, in absolute neglect, and partly perhaps in the want of suitable fodder in the rains. No bulls are set aside to be the sires of the herd, and the cows are generally covered by a young and immature animal, who secures the object of his desires by his superior lightness and agility. The sire is often closely related to the dam and she, in her turn, has had her strength exhausted by being covered, when herself little more than a calf, and by subsequent breeding without the smallest intermission. The cattle are never groomed, and, when an epidemic breaks out no attempt is made to isolate the sick. “Everything,” as Mr. Darrah says, “is left to nature, from the moment when the most active, and therefore probably the youngest bull of the herd has succeeded in covering a cow, until the progeny, after years of work and semi-starvation, dies neglected in some unfrequented jungle.” If nasty, they have, at any rate, the merit
of being cheap and cows cost from Rs. 7 to Rs. 12, and bullocks, which are usually castrated when three years old, from Rs. 15 to Rs. 30.

In the cold weather there is generally plenty of grazing ground, and the animals are turned loose in the rice fields, or are driven away to swamps which are often covered with the most luxuriant grass. In the rains, when most of the country goes under water, fodder is not so easily obtained, and the cattle have to pick up a living as best they can on the high ground between the rice fields, and are stall fed on grass, and, in the more densely populated portions of the district, on straw. The difficulty becomes particularly acute in the chapari mahals, and in Gerua mauza they are said to be kept on artificial mounds of earth, which are thrown up near the homestead. On the other hand in the cold weather there is abundance of excellent grazing on the chapari, and in the six mauzas that fringe the Brahmaputra from Pubtharia to Mayang there were in 1903 no less than 42 separate mokhutis, or herds of buffaloes kept by professional graziers, the great majority of whom are Nepalese. Graziers are also fairly numerous in the tahsils, and there were 14 mokhutis both in the Raha and the sadr tahsil, and 9 in Samaguri. On the other hand in the Kapili valley, above its junction with the Jamuna, the professional grazier is unknown. This no doubt is due to the fact that the population is so sparse that there could be but little sale for milk, as in this portion of the district there is an abundance of good grazing ground, and the
cattle of the Kapili valley are said to be some of the finest in Assam.

The goats are almost as degenerate as the cattle. They yield but little milk, the whole of which is taken by the kids, and are only kept for food or sacrifice. At night they are usually shut up in a small out-house with a raised floor, which is approached by a slanting board or sloping bamboo platform. There is no indigenous breed of sheep, and the animals imported do not thrive. The total number in the district is extremely small. The country ponies are, if anything, even more miserable specimens than the cattle. Few of them are as much as twelve hands in height, and they possess neither pace, endurance nor stamina. A census of the live stock in the district was taken in 1904, and disclosed the following results. Bull buffaloes 8,100; cow buffaloes 8,200; bulls and bullocks 69,900; cows 56,000; young stock 72,200; goats 31,000; sheep 213; horses and ponies 516. A fine breed of black swine are also kept by the animistic tribes.

The most common forms of cattle disease prevalent in Nowgong are foot and mouth disease, rinderpest (*guti*), a disease called *kachua*, the principal symptoms of which are flatulence and diarrhoea (*marki*), cholera, *matikkoa* the first symptom of which is, as the name implies, the eating of earth followed by dysentery, and *sukuna* when the animal refuses to eat and dies after ten days or a fortnight.
The indigenous tea of Assam was first brought to the notice of Government in 1826 by Mr. C. A. Bruce, a gentleman who had traded in the Province in the time of the Ahom Rajas, and who had been sent up the Brahmaputra in command of a division of gun boats in 1824. In 1834, a committee was appointed by Government to enquire into the possibility of cultivating tea on a commercial scale, who deputed three of their members—Drs. Wallich, McClelland, and Griffiths to visit Upper Assam. Nurseries were opened for the plant, a small establishment was entertained, under the general management of Mr. Bruce, to search the jungles for plots of indigenous tea and cultivate them when discovered, and plants and seed were brought to Assam from China. Tea makers and trained Chinese were imported in 1837, and, in the following year, some of the manufactured product was sent to England, where it met with a most favourable reception. Assam tea was regarded as a curiosity, and the first eight chests which were put up to auction fetched sums which, at the present day, seem little short of fabulous, the prices paid ranging from 16 s. to £1-14-0 a pound. These were, however, only fancy prices, and a short time afterwards a merchant offered to purchase tea in considerable quantities at prices ranging from 1s. 10½d. to 2s. a lb.

* Information with regard to the early history of the tea industry has been derived from

Nowgong was, however, one of the last districts of the Assam Valley to attract the attention of the planter. In 1859, no tea was manufactured west of the Mikir Hills, and even the area planted out was not recorded. In 1872, the total area under mature plant was said to be 1,278 acres which yielded 363,000 lbs. of manufactured tea. Then ensued a period of some expansion and by 1882 the total area under plant both mature and immature had risen to 9,945 acres and the yield to 3,253,000 lbs. of manufactured tea. But the district continued to be unpopular in planting circles. During the last twenty years of the nineteenth century the tea industry in Tezpur, Sibsagar, and Lakhimpur advanced by leaps and bounds, but in Nowgong it made little progress. In 1900, there were only 12,673 acres under plant which yielded 4,330,000 lbs. of the manufactured article or a little more than one-seventh of the total outturn of the Sibsagar district. Statistics for later years will be found in Table VI. Most of the gardens are situated near the western slopes of the Mikir Hills, stretching from a point east of Nowgong town towards the Brahmaputra. Details for each garden will be found in statement A in the Appendix.

The industry is for the most part worked with imported labour, and in the ten years ending with 1890, 18,837 coolies were brought up to the plantations. The importations in the next decade were 25,610 the largest number (5,320) arriving in 1897, when famine was raging in the recruiting districts. Details for later years will be found in Table VI.
The abstract in the margin shows the areas from which the labour force in 1901 had been recruited. Assam itself is largely represented but a considerable proportion of those born in Assam are the children of immigrant coolies.

The journey from the recruiting districts is troublesome and expensive, the class of persons capable of working successfully in the damp climate of Assam is limited, and of recent years the supply of labour available has not been sufficient to satisfy the requirements of the planters. Special Acts have been passed to regulate the relations between the employers and their labour force. Careful provision is made for the welfare of the coolie. He is housed in neat and comfortable lines, usually far superior to the dwellings occupied by persons of that class outside the gardens, he is provided with an excellent water supply, generally drawn from masonry wells, and when sick he is cared for in a comfortable hospital by a native doctor working under the supervision of a European medical man. The provision of all these comforts and the importation of the labourers themselves cost large sums of money, which no one would be willing to expend without some guarantee that the coolies, when imported, would consent to remain on the plantation. This protection is afforded by the law, (Act VI of 1901) which lays down that a labourer, provided that he is
well-treated, must not leave the garden to which he is indentured before the expiry of his contract, unless he chooses to redeem it by a money payment.

A friable red loam is the soil that proves most suitable for tea. The plant requires a heavy rainfall, but anything in the shape of water-logging is most prejudicial to its growth, and gardens should only be planted out on land which can be well drained. Land which, in its natural state, is covered with tree forest is usually considered the most suitable, as the absence of timber generally shows, either that the place is liable to flood, or that the soil is sandy, or that the rainfall is deficient.

Four distinct varieties of wild tea are recognised: Assam indigenous, which has a leaf from 6 to $7\frac{1}{2}$ inches in length by $2\frac{1}{2}$ to $2\frac{3}{4}$ inches in width; the Manipur or Burma indigenous with a larger, darker, and coarser leaf than the preceding variety; Lushai or Cachar indigenous, whose mature leaf is from 12 to 14 inches long, and from 6 to $7\frac{1}{2}$ inches wide; and the Naga indigenous which has a long and narrow leaf. In addition to these four varieties there is the China plant, and different kinds of hybrids. The China tea is a squat and bushy shrub with small leaves, which gives a lower yield per acre than the other kinds. It is many years since China seed was planted out in new clearances, and considerable areas covered by this plant have been abandoned. In its natural state the indigenous plant attains to the dimensions of a tree, varying from 20 to 50 feet in height, though its girth seldom
exceeds two feet. It has a vigorous growth and yields a large outturn of fine flavoured tea, but is delicate when young. Of the hybrid variety there are many qualities ranging from nearly pure indigenous to nearly pure China. A plant with a very small admixture of China is usually preferred, as this imparts the hardiness, the want of which is the one defect in the indigenous variety.

The seed is planted in nursery beds in December and January and kept under shade till the young plants are three or four inches above the ground. Transplanting goes on between April and July, whenever there is rain, the plants being usually placed from four to five feet apart. During the first two years of their life little more is required than to keep the plantation cleared of weeds. By this time the plants are from two to four feet high, and at the end of the rains, they are pruned down to fifteen inches or a foot to encourage lateral growth. In the third year the plant can be lightly plucked over, but the yield of leaf is small. Pruning is continued every year, only about two inches are left of the wood formed since the previous pruning, and any unhealthy or stunted branches removed. As an extreme remedy old plants, in which there is a large proportion of gnarled and twisted wood, are sawn off level with the ground, and fresh shoots are allowed to spring from the root itself. During the rains the garden is hoed over several times, in order to render the soil permeable both to rain water and the roots of the bush. At the end of the rains the ground is
hoed up to the depth of 8 or 9 inches. The object of this is to protect the land from drought, the hoed-up soil prevents the evaporation of water from the lower strata. It also adds to the fertility of the land by exposing it to air, light, and changes of temperature. Manure has hitherto been little used. Oil cake and cowdung are occasionally spread about the plants, and exhausted land is sometimes top dressed with rich soil from a neighbouring marsh. The cost of these operations is considerable, and they are not invariably successful from the pecuniary point of view.

Plucking begins in April, and is continued till the beginning of December. The bud and the two top leaves are taken from each shoot, but fresh leaves soon appear, and in about five weeks time the shoot is ready to be plucked again. This throwing out of new leaves is termed a "flush," and there are usually five or six full "flushes" in a season, though each bush is picked over every ten days or so, as the twigs develop at different times. The plucking is usually done by women and children, while the men are engaged in hoeing up the ground around the plants. The plant is liable to be attacked by a large number of pests, the best known being the tea mosquito or blight, the green fly, and the red spider. A full account of these pests will be found in "The pests and blights of the tea plant" by Watt and Mann, Calcutta, 1903.

When the leaf has been taken to the factory, it is spread out in thin layers on trays and allowed to wither. In fine weather the process takes about twenty hours,
but if it is cold and wet from thirty to forty hours may elapse before the leaf is ready. When the leaf has been properly withered it is placed in the rolling machines. The object of rolling is to break up the cellular matter and liberate the juices, and to give a twist to the leaf. Rolling takes about forty minutes, and after this the leaf is placed in a cool room for about three and a half hours to ferment. It is then placed on trays in the firing machines, through which hot air is driven, until the last trace of moisture has been expelled, and the tea is crisp to the touch. The leaf is then passed through sieves of varying degrees of fineness, and the tea sorted into different grades. The best and most expensive quality is called broken orange pekoe, and is made from the bud or tip, which contains all the good qualities of tea in a more concentrated form than any of the other leaves, is stronger, and has a more delicate flavour. The other grades, which are differentiated by the size of the mesh through which they pass are, orange pekoe, broken pekoe, pekoe, souchong and fannings. After the tea has been sorted it is fired once more to remove any moisture it may have absorbed from the surrounding atmosphere and is packed in lead lined boxes while it is still warm. Tea loses largely in weight during the process of manufacture, and about four pounds of green leaf are required to produce one pound of the finished article.

The character of the outturn depends largely upon the season, but still more upon the garden and the

prices.
system of manufacture followed. In 1868 the Commissioners estimated that the average outturn was about 240 lbs. per acre; but this estimate was probably too low, as the average yield in Nowgong during the five years ending with 1903 was 350 lbs. per acre. The introduction of machinery, and the improvement of the general system of cultivation and management, have rendered it possible to effect a large reduction, in the cost of the tea when placed upon the market. In 1868 it was calculated that tea must be sold at two shillings a lb. to yield a profit. Twenty years later the average price obtained by tea from the Brahmaputra Valley was 8 annas 2 pies, and, though in 1894 it rose to 10 annas 5 pies, in 1898 it dropped to 6 annas 9 pies, and has since remained below that figure.

The forests of Nowgong fall into two main classes, the reserved forests, which in 1902-03 covered an area of 142 square miles, and the unclassed state forests, which in the same year occupied the enormous area of 3,418 square miles. Unclassed state forest is however, simply Government waste land, and does not necessarily possess any of the characteristics which are usually associated with the expression forest. It may be a sandy chur, or a huge expanse of low-lying land covered with high grass and reeds and almost totally destitute of trees. It may be a small piece of arable land, which has been resigned by its former holder, and has not yet been settled with any other
person; or it may be, what its name would naturally suggest, i.e., actual tree forest. It is impossible to give even the roughest estimate of the proportion of un-classed state forest, which is actually under timber, but where the total area is so enormous it is obvious that, in a country with a heavy rainfall like Assam, the area covered with trees must be considerable.

The management of the Government reserves is usually entrusted to an extra Assistant Conservator of Forests, who has a sanctioned staff of two deputy rangers, one forester, and twenty-one head guards, and guards. Settlement holders are allowed to take from unclassed state forests, any forest produce required for home consumption other than live reserved trees, free of royalty.

Sonaru (*cassia fistula*), ajhar (*lagerstroemia reginae*), titasapa (*michelia champaca*), gunserai (*cinnamomum glanduliferum*) and gomari (*gmelina arborea*) are the most valuable trees found in unclassed state forests, the first four being used for the construction of dug-out canoes which are floated down the Kapili, Jamuna, and Barpani to Chaparmukh where they are purchased by traders from Goalpara and Gauhati.

From Table VIII it will be seen that the bulk of the timber sold in Nowgong is obtained from un-classed state forests, and that the reserves are hardly touched. The Diju valley forest, which lies a few miles south-east of Kaliabar, is in fact, the only one from which any appreciable revenue is at present raised, and the remaining 134 square miles of reserved forest
only yielded a revenue of Rs. 883 in 1903. These forests are too remote to attract the Bengal trader, but now that the railway has been completed through the North Cachar Hills, it is possible that purchasers may come from the Surma Valley, where there is a brisk demand for timber. In addition to the trees already mentioned they contain sal (\textit{shorea robusta}), sam (\textit{artocarpus chaplasha}) poma (\textit{cedrela toona}) nahor (\textit{mesua ferrea}) and koroi (\textit{albizzia procera}). Details for each reserve will be found in Table VII. Minor articles of forest produce from which revenue is raised are bamboos, canes, rubber, lac, and agar (\textit{aquilaria agallocha}), but the most important item of all are the fees levied on the professional graziers who herd their buffaloes in the jungles.

The expenditure incurred on forests in Nowgong is certainly not high, but as will be seen in Table VIII, it not unfrequently exceeds the revenue obtained.