THE CULTIVATION OF NATIVE FOOD CROPS.

(Continued.)

By E. C. Green, A.I.C.T.A. (Trin.), H.D.A.
Demonstration Plantation, Keravat.

4. Cassava.

Cassava, or tapioca, is a root crop which is grown throughout the tropics, it being grown for food and sale to other countries. Cassava tubers contain poison which is rendered inert by cooking, drying in the sun or peeling and scraping the tubers and washing them many times in water.

Cassava has many uses; the tuber can be removed from the ground, peeled and boiled or roasted for food, or it can be dried and made into flour, or the starch can be removed and used in washing clothes. The tubers of cassava also produce raw material for the manufacture of power alcohol.

There are many varieties of cassava in cultivation and, for food purposes, those containing the least amount of poison are best.

Climate.—A warm, moist, tropical climate is ideal for cassava.

Soil.—Cassava will grow in most types of soil, but wet soils are no good as the tubers rot in the ground before they have matured or grown to any size. The best soil for cassava is one that is not too heavy, well drained, and contains a lot of organic matter.

Preparation of Land.—Land that is to be planted with cassava must be hoed to a depth of at least 9 inches in order that the tubers will have loose soil in which to develop.

There are four methods of planting—

1. Hills.
2. Ridges.
3. Furrows.
4. Erect in ground.

1. When planting in hills it is customary to make the hills about 4 feet apart, 1 foot to 1 ft. 6 in. high and flat on top. Two cuttings are planted in each hill.

2. When planting in ridges, the land is prepared in a similar manner to yam ridges, only the ridges are spaced 4 feet apart and each cutting is planted at 4 feet intervals along the top of the ridge, which has been previously flattened in the same manner as the hills.

3. The furrow method is used a great deal—furrows, resembling shallow drains, are made 4–6 inches wide, 4–6 inches deep, 4 feet apart, and each cutting is put in the bottom of the furrow at a spacing of 3 to 5 feet depending on the richness of the soil.

4. The method of planting erect in the ground without hills or ridges is commonly used by native cultivators in this Territory, and should only be used in very loose, well-drained soils. For this method two holes about 4–6 inches deep are made side by side and one cutting placed in each at an angle of about 45°.

The holes are lined 4 feet apart in rows and spaced 3–5 feet apart in the lines.

Planting Material.—Short lengths of stem known as cuttings are used as planting material. Native cultivators generally make their cuttings about 18 inches long, but such long cuttings are not necessary and are a waste of good planting material. The bottom sections of the stem make the best cuttings, but the middle sections of the stem, i.e., from about 3 ft. 6 in. to 5 feet from the ground are quite suitable. The extreme ends of the stems should not be used. The cuttings are made about 6 inches long, and when planting it is essential that they are not planted upside down in the soil, and also that the end of the cutting for a distance of 1–2 inches is out of the ground.

After Cultivation.—Weeds must be controlled until the crop has grown enough to shade the ground and keep the grass from growing.

If methods 3 or 4 have been used, a commencement must be made to hill the crop when the plants are about 3 ft. 6 in. to 4 feet high. Hilling is carried out gradually during the first few months, after which time it should not be necessary to hill up any more. Where ridges or hills have been used these must be reformed from time to time if flattened by heavy rain. Once the tubers have commenced to form, the soil around the base of the plants should be disturbed as little as possible, otherwise the tubers may be damaged.

Harvesting.—Cassava matures in about nine to twelve months after planting but in well-drained soil, or if the weather is not too wet, the crop can remain for a long time in the ground without much damage.

The period of maturity is usually shown when the plants have flowered and formed seed, but as this is not always a sure indication, it is advisable carefully to remove the soil from a number of plants and inspect the tubers to see if they are fully developed.

Cassava is harvested by hand, the soil is removed from the base of the plant and the tubers are cut off from the stem and carefully taken out of the ground. Cassava will not keep very long once it is harvested, and for this reason, it is advisable that only sufficient for one day should be removed each time.

Treatment of Land after Harvest.—Cassava takes a lot of food out of the soil, therefore, two crops in succession should not be grown in the same piece of land. After harvesting, remove and destroy the stems, after any planting material that is needed has been obtained, then hoe up the land and plant cowpea or some other legume.

Preparation for Food.—Cassava can be boiled or roasted when freshly harvested or dried and made into flour or meal.

To make flour, first wash the tubers, peel them and then grate them (a suitable home grater can be made by punching nail holes in a piece of galvanized iron). After grating the material is washed with water and then dried, or it

can be squeezed through a piece of cloth into a tin, allowed to sink to the bottom of the tin after which the water is poured off and the white material left is placed in the sun to dry. In this second method the flour is very fine and looks like powder as all the fibre has been removed and only the starch remains. In the first method, a coarse flour is obtained. To make cassava meal, first wash and peel the tubers, then cut them into small circles like pennies or in thin strips like wood shavings, and dry in the sun. When thoroughly dry these cassava "chips", as they are called, can be pounded up finely, mixed with water to make a "dough" as in breadmaking and then cooked. The fine flour which is made when the cassava is scraped and squeezed through a cloth can be used for starching clothes.

5. Maize or Corn.

Maize is one of the best grain crops that can be grown for food. In the immature state the cob can be boiled or roasted and the grain eaten, whilst when mature and dry the grain is removed from the cob, finely ground in a machine, and made into cakes or porridge. Maize requires a well-drained soil fairly rich in plant food, and it does not like too much rain especially when the cobs are ripening.

Maize is planted in rows spaced 3 feet apart, and the seed is sown 2 feet apart in the rows, about 2–3 inches deep with two or three seeds at each place. The correct time of the year to plant will depend on the period when the most rain occurs. Always try to plant so that the crop will not mature during the wet months, also, if the seed is planted at this time, the crop might fail due to the seed becoming rotten in the ground before it germinates.

Germination occurs very quickly after planting and in 4–5 days the young shoot should be seen above ground. Once germination takes place the plants grow quickly and reach a height of up to 8 feet or more in about six to seven weeks. Tasseling or flowering occurs six to seven weeks after planting and in ten to eleven weeks the cobs should be ready for boiling or roasting. The crop matures in thirteen to fourteen weeks, and the cobs are removed from the stalk and hung in a barn or shed until thoroughly dry.

Whilst the crop is growing all grass and weed growth must be kept under control, and this is best done by means of a hoe.

When selecting seed maize for planting, always discard the seeds from both ends of the cob, and only use the central grains. Select large cobs with straight even rows containing grain that is well filled. Seed planted from cobs that are undersized, or not properly filled with grain, or where the grain is uneven in shape, or where the rows are not straight, will produce a large percentage of cobs which resemble the unsuitable cob from which the grain was taken.

6. Rice.

In the tropics rice is the most important grain food for native races. There are two types of rice cultivated—

1. Swamp or wet rice.
2. Upland or dry rice.

Swamp Rice.

Soil, &c.—Swamp rice needs a soil rich in humus and fairly heavy, the ideal soil being one containing a fair amount of sand and humus with a heavy type of sub-soil. In a soil of this sort, the roots of the rice can easily grow through the fairly light upper soil and the heavy lower soil stops the water from draining away.

The climate for swamp rice must be hot and rice likes plenty of sunlight.

Preparation of land.—In most parts where swamp rice is grown irrigation is practised. The land is levelled into small plots and surrounded by banks 1 ft. 6 in. to 2 feet high, and at intervals along the banks openings are made so that water can be run on to the land or run off it, whichever is necessary. On sloping land terraces are made, divided into compartments by means of earth walls, and openings made in the lower walls so that the water may run from the top compartments to the lower ones.

Once the land has been levelled it is dug up, flooded with water and "puddled" i.e., trampled until the surface is thick mud.

Planting.—After the land has been prepared the ripe seed is soaked in water for 24–48 hours then planted in one corner of the field or in a specially prepared nursery a short distance away.

When the young rice plants are about 6 inches high they are taken out and planted in the field about 6-9 inches apart, either singly or two or three plants together.

Some rice cultivators plant the seed thickly direct into the field and thin out the plants later, the plants taken out being planted in the patches where the seed has not properly germinated.

It is generally considered, however, that the nursery method is best and more rice is produced.

After cultivation.—The fields must be kept clean of weeds, and as the rice is so closely planted these must be removed by hand which is a tedious job, all the weeds after removal being buried in the mud to enrich the soil. The fields are kept flooded with water to a depth of 4-6 inches until the rice commences to flower, when the depth of water is gradually reduced until the land is only just moist at harvest time.

Harvesting.—The period of maturity depends on the variety that is grown and is from five to nine months. When the heads containing the grain are a golden yellow, it is time to harvest and the heads, with about 6-9 inches of stalk attached, are cut off.

The heads are now made into small bundles and dried in the sun or hung up in an open, well-aired shed.

After drying, the grain is removed by beating the heads on a piece of timber about 1 foot in diameter, or on a pole fastened about 1 ft. 6 in. to 2 feet above the ground. Trampling over the rice on a hard floor will also remove the grain from the heads. The grain after its removal from the head is known as "Padi".

Upland Rice or Dry Rice Cultivation.

Soil.—Upland rice needs a good well-drained soil containing a fairly large amount of humus. The climate best suited to its cultivation is one in which not much rain falls during the ripening period.

Preparation of the Land.—The land should be dug up or hoed as deeply as possible and all green material turned into the soil.

Planting.—Two or three seeds are planted in rows 1 foot to 1 ft. 6 in. apart and at intervals of 1 foot apart in the rows. It is important that too many seeds are not planted at each place, otherwise the rice "clumps" become too thick and not a great deal of grain is formed.

After Cultivation.—The rice seeds germinate quickly and shorty after planting are 4-6 inches high. Weed and grass growth must be controlled until the plants have made so much growth that it is hard to work in the crop without damaging it.

Harvesting.—The period of maturity varies from about four and a half months to seven months, according to the variety; the one at Keravat known as "Santap pangkur", matures in about five to five and a half months.

Upland rice is harvested, bundled, dried and the grain removed from the heads in the same manner as for swamp rice.

Treatment of "Padi" for eating.—The rice grains after threshing have a covering called the "husk" and before cooking it is necessary to remove this husk, which is accomplished by means of a machine or a pestle and mortar.

The native method of removing the husk is with a pestle and mortar. The pestle consists of a round hardwood stick about 5-6 feet long and 3 inches in diameter, with one end slightly sharpened.

The mortar consists of a hole that has been made in a block of hardwood, the hole is about 1 foot in diameter at the top, 9 inches deep and slopes down to about 3 inches diameter at the bottom. The "padi" is placed in the mortar and pounded with the pestle until the husk is removed after which it is winnowed by pouring from some container placed about 10–15 feet high on to a bag or mat on the ground. As the husked "padi" passes through the air the heavy rice grains fall on to the bag and the light husks and flour are blown away by the wind.

7. Groundnuts or Peanuts.

The groundnut or peanut is a valuable food and contains a high percentage of oil; it is also a legume, and improves the fertility of the soil.

It is a small, annual plant which grows to a height of 1-2 feet, some varieties are bunch types, that is, they grow erect whilst others are the "runner type", that is, the stems trail along the ground.

Peanuts require a loose open type of soil containing a fair amount of lime, warm weather conditions, and not too much rain.

There are two methods of planting peanuts—

1. In ridges.
2. On the flat.

Where there is a possibility of a heavy rainfall it is advisable to plant in ridges, the ridges being made about 1 foot high and spaced 2 feet to 2 ft. 6 in. apart.

Where the rainfall is not too heavy peanuts are planted on the flat, the rows being spaced 2 feet to 2 ft. 6 in. apart according to the variety. "Runner types" are planted further apart than "bunch" types.

Before planting, the seed is removed from the shell, and one or two seeds are planted at intervals of 1 foot to 1 ft. 6 in. apart along the tops of the ridges or in the rows.

The seed germinates quickly and should be showing above the ground in less than a week.

As the crop grows, it must be continually "hilled", that is, the ground is pulled up around the plant by means of a hoe or some other suitable implement. The reason for hilling is that from each "node" along the stem a long "spike" grows downwards towards the soil, and some of the nuts are formed on the end of it.

The crop is ready to harvest about 3-4 months after planting, and the period of maturity is when the old leaves have fallen off and the younger leaves are covered with brown spots.

At harvest the whole plant is pulled out of the ground. If the weather is dry and sunny then the nuts can be cured as follows:—Erect stakes in the ground and build the plants around them so that the bottom part of the plant is facing the stake. Build up until the heaps are about 3 feet high, then cover the top and allow the heaps to remain until some nuts that were not quite ripe at the time of harvest have ripened thoroughly. When curing is finished remove the nuts from the stems and dry them in the sun.

Should the weather be unsuitable at harvest time, then pull out the plant, turn it bottom upwards and allow it to remain for 2-3 days until it has wilted, then remove the nuts and dry them.

It is important to remember in growing peanuts that—

1. The seed must be removed from the shell before planting.
2. The plants must be continually hilled up during growth.
3. Where there is much rain, plant in ridges.

8. Lima Beans.

The lima bean grown at Keravat is a small bushy plant having small yellow flowers and producing pods containing three flat white seeds in each pod. The lima bean is a legume so that, wherever it is cultivated, it improves the soil.

When planting, the seed is sown in rows 1 ft. 6 in. or 2 feet apart and 1 foot to 1 ft. 6 in. apart in the rows, and about 1-1½ inches deep. Germination takes place quickly and the plant grows quickly. Approximately 5-6 weeks after planting, the first flowers begin to appear and the first ripe seeds are ready for harvest in about 10 weeks from planting.

Lima bean will not grow in wet soils and if when they are nearing maturity, there is very much rain, then many of the plants die. Lima beans are very good food and the seed is prepared by soaking in water for twelve hours and then boiling.

9. Winged Beans.

The variety of winged bean grown at Keravat is a climber, which has purple flowers and produces a long, three-cornered pod containing a number of round black seeds. Like the lima bean, the winged bean is a legume and improves the soil.

The seed is sown in rows 3 feet apart, 2 feet apart in the rows and about 1-1½ inches deep.

When the plants are about one month old they must be staked.

Staking is carried out in the same manner as for yams. Flowering begins about six weeks to seven weeks after planting and the dry pods are ready for harvest in ten to twelve weeks.

The young green pods when about 6 inches long may be boiled and eaten, *or the mature seed may be soaked in water for about twelve hours and then* boiled.

10. Velvet Bean.

There are two types of velvet bean in cultivation at Keravat. One type is a climber, the other a non-climber. Both types produce short, hard, dark-coloured, fat pods containing several seeds. The seeds may be black, white, buff-coloured or mottled.

The seeds are sown in rows 2 feet apart, and in the case of the climber 2 feet apart in the rows whilst non-climbers are planted 1 ft. 6 in. apart in the rows. Plant the seed 1–1½ inches deep. Germination takes place quickly, and the growth of the plants, especially the climbing varieties, is very rapid.

About four to five weeks after planting the climbing type should be staked, in a similar manner to that used with winged beans. The bush type is not staked. The first ripe pods are ready to harvest in about three months from the time of planting.

When the ripe pods have been collected they are placed in the sun and allowed to get very dry, so that they can be opened easily, and the seed extracted. The dry seeds should be soaked in water for twelve hours before boiling for food.

11. Mungo Beans.

Mungo beans are grown in many parts of the tropics, mainly for food, but being a legume and quick growing, can be used to advantage as a green manure crop. This crop which is one of the most important legume crops grown in India and China is unknown in New Guinea and the adjacent Territories and is a crop which can be recommended for cultivation in this country.

Soil and Climate.—The soil must be well drained, and the climate moist and hot.

Preparation of Land and Planting.—The land should be hoed well before planting and cultivation between the rows maintained during growth. The seed is planted in rows 2 feet apart and spaced 2 feet apart in the rows and about ½–1 inch deep.

The mungo bean plant grows to a height of about 2 feet and contains many branches on which the seed pods are produced in clusters. The pods are short, about 2 inches long, are dark in colour when mature and covered with fine hairs. The seed is small and may be green, yellow or black in colour; at Keravat the green seeded type is grown.

The seeds germinate soon after planting and the plants grow so quickly that the crop is mature in about ten weeks.

For food the green pods may be boiled and eaten, or the dry grain boiled. It is customary in some countries to germinate the seed in boxes containing sand and when the sprouts are 1–1½ inches long the sprouted seeds are cooked and eaten.

As a green manure crop mungo bean is dug in when in full flower.

12. Pigeon Pea.

Pigeon pea is grown in all parts of the tropical world, and may be used as food for man or animals, for improving the soil and as a temporary shade for coffee or cacao. Pigeon pea is a shrub which grows to a height of 6–8 feet.

There are a number of varieties of pigeon pea in cultivation, and the varieties may be divided into two types, namely—

1. Annual.
2. Perennial.

The annual varieties grow and produce crops in 1–1½ years, after which they die out, whilst the perennial types produce crops in the first year and for some years following.

The pigeon pea is a legume, hence the soil is improved wherever the crop is grown and for this reason, plus its food value, the pigeon pea is quite a valuable crop to grow in rotation with other crops.

Soil and Climate.—Pigeon pea will grow in almost any type of soil, providing that it is not wet, badly drained or badly aerated. A tropical climate with a moderately long dry season is ideal.

Cultivation.—Where pigeon pea is to be planted for food purposes the land should be dug before planting. The planting material used is seed and this is sown in rows 5–6 feet apart, 3–4 feet apart in the rows and about 1½ inches deep; two or three seeds are planted in each hole.

The seeds germinate quickly and in a short while the plants are 6–9 inches high. Once they have reached this height and there is no danger of them being disturbed, weeding can commence. The control of weed and grass growth is kept up until the plants have made sufficient growth to shade the ground and keep down the weeds. This is generally about six to ten weeks.

Harvesting.—Some six to eight months after planting the first crop commences and the plants will bear for some time; when this first crop has been harvested, the perennial types are cut back and allowed to grow again to produce further crops. Ripe pods should not be allowed to remain on the plants as they are quickly attacked by insect pests and frequent pickings are necessary during the harvesting period.

After the plants have finished their first crop they should not be cut back if the season is dry.

After harvest the pods are dried in the sun, and the seed removed either by opening each pod by hand or placing a number of pods in a bag and beating the bag with a stick. If the latter method is adopted then the pod husks and the grain must be winnowed.

Pigeon pea is prepared for food by soaking the seed in water for about twelve hours and then boiling it.

13. Cowpea.

There are many varieties of cowpea which is a quick-growing legume. The cowpea improves the soil, the leaves and stems being good food for cattle, horses, goats and pigs. The pods when green can be boiled for food and when dry the seeds which are found inside the pods are used for food or for planting again. The cowpea seeds when cooked and eaten are very nourishing.

Cultivation.—Cowpea will not grow in wet soil, and in wet weather it will grow but will not produce seed.

Soil.—The soil for cowpeas must not be wet and heavy, although practically any sort of soil is suitable.

Preparation of the Land.—In light soil, such as pumice, the land need not be hoed, but heavier soil should be dug up before planting. Where it is necessary to grow cowpea in wet districts long ridges similar to those for sweet potatoes must be made. The ridges, however, are not made as high as sweet potato ridges.

Planting.—The seeds are planted in rows 3 feet apart and two or three seeds are planted about 2 inches deep, at intervals of 2 feet to 2 ft. 6 in. in the rows. Where ridges are made they are spaced 2 feet apart and two or three seeds are planted about 2 inches deep at intervals of 2 feet along the tops of the ridges. The seeds germinate quickly and should be showing above ground in four to six days.

The land between the rows must be kept clean until the cowpeas have grown and are covering the soil. When about eight weeks old the crops will commence to flower and first pods should be ripe and ready to pick in about ten to eleven weeks. Cowpeas are used for green manure, the crop being dug into the ground when it is flowering and allowed to rot in the soil for about one month before any other crop is planted in the ground.

Harvesting.—Cowpeas are ready to harvest when the pods have changed colour from green to light brown and are dry. When harvesting, the pods are picked by hand and spread in the sun until properly dry. When dry the pods can be opened by hand and the seeds removed, or pods can be placed in a bag and the bag beaten with a stick. This beating removes the seeds from the pods. The pod shells or husk can then be separated from the seed by standing on a platform about 10–15 feet high and pouring the mixed seed and pods out of a bag or some other container towards the ground into some suitable receptacle so that the wind separates them and blows away the light pods. The clean seed is now ready for planting or cooking.

Before cooking cowpeas, wash them with water and boil them until they are soft, then throw away the water in which they have been boiled, replace with fresh water and boil again.