DEPARTMENTAL NOTES

NOTES ON THE CULTIVATION OF FOOD CROPS

THE campaign for increasing food production in Ceylon has led, in many areas, to the planting or the preparation of land for the planting of crops which are strange to the growers. The Department of Agriculture is publishing a series of simple leaflets giving a brief outline of the methods of cultivation of crops, the growth of which is recommended by the Director of Food Production. To give wider publicity to this information, the notes on the cultivation of eight of these crops are reproduced below.

KURAKKAN (*ELEUSINE CORACANA*)

Kurakkan is an important millet grown chiefly in chenas in the dry zone areas of Ceylon. It is rich in calcium, iron, and vitamin A in comparison with other cereals and could profitably replace rice in three or four meals a week.

Climate and elevation.—Although best grown in the dry zone areas of the Island, kurakkan does well elsewhere up to an elevation of about 4,000 feet under moderate rainfall conditions.

Type of land.—The crop is usually grown in chenas in the first and second years after clearing and burning the jungle. It can, however, be grown in any type of highland, including the upland hill slopes, provided the soil is a well-drained loam, fairly rich in organic matter. It will not be successful on eroded patnas, *kekilla* lands, gravelly or sandy soils, unless heavily manured with cattle manure at the rate of 15 to 20 cartloads per acre.

Season and method of cultivation.—The north-east monsoon is the more favourable season in all parts of the Island, except the Jaffna Peninsula, where this crop is planted at different times during the dry season from February to September, and grown under irrigation.

The seed is sown broadcast at the rate of 4 measures (8 lb.) per acre and, after sowing, it should be lightly covered over with soil by means of mammoties or the tooth harrow.

When the crop is grown under irrigation, the seed should be raised in nurseries, about 6 lb. of seed being sown on $\frac{1}{6}$th acre which will provide sufficient seedlings for transplanting an acre. When the seedlings are about 25 to 30 days old, they

should be transplanted at 3 in. to 4 in. apart, one seedling per hill. Irrigation should be withheld or restricted for about 10 to 14 days until the seedlings have established themselves. Thereafter, the crop should be irrigated at about four-day intervals. The crop will benefit by weeding at least twice.

Age and yields.—It takes about 3 to 4 months for the crop to be ready for harvesting, the broadcast seed ripening about 3 to 4 weeks earlier than the transplanted seed. Ripening is uneven and harvesting of earheads should therefore be done on two occasions, the second after an interval of about 10 days. There are several varieties, some being early maturing (3 months) and others late maturing (4 months).

The average yield is about 15 bushels per acre under chena conditions, though as much as 25 bushels per acre may be obtained under favourable conditions. Under irrigation in Jaffna the average yield is about 40 bushels per acre.

Storage and use.—The earheads should be dried in the sun for two or three hours each day until they are thoroughly dry. They should then be stacked in a dry shed with a free circulation of air. The storage of kurakkan does not offer much difficulty as it is not very subject to attack by insects or moulds.

The earheads should be threshed as grain is required. Threshing is easily carried out by means of the village mortar and pestle. Milling is done by means of the kurakkan hand mill, and the percentage of grain after milling is about 95.

Seed.—A pure-line strain of kurakkan, known as E 43, has been evolved by the Department of Agriculture. The age of this strain is $3\frac{1}{2}$ months and its use is recommended.

Bushel weight.—60 lb.

ADLAY (*COIX LACHRYMA—JOBI*)

Adlay or Job's tears, sometimes erroneously referred to as barley by the villager in Ceylon, is a cereal which is a good substitute for rice in the various preparations which can be made from it and which closely resemble those made from rice.

Climate and elevation.—The crop can be grown in the wet zone, provided a dry period prevails when the ears set, and in certain parts of the dry zone such as North Matale. It will grow at all elevations up to about 4,000 feet.

Type of land.—Adlay can be cultivated in chenas, abandoned *owita* lands and all high lands. It requires a well-drained soil. It will not be successful on eroded patnas, *kekilla* lands or gravelly soils, unless these are manured with compost or organic manure at the rate of 15 cartloads per acre.

Season and method of planting.—Planting may be done during the north-east monsoon in the dry zone and during both monsoons in the wet zone.

The seed should be sown in rows 2 feet apart and 2 feet apart within the rows, 3 to 4 seeds being placed in each hill. The seed rate is 8 lb. per acre. When the seedlings are about 6 inches high, they are thinned out leaving two per hill. Adlay can also be transplanted in the wet zone areas and any seedlings removed during thinning out can be transplanted on new land or used for filling vacancies. The crop should be weeded on two or three occasions until tillering commences.

Adlay responds well to liberal applications of organic manure. In the dry zone areas, irrigation should result in increased yields.

Age and yields.—The period of ripening varies from four months in the dry zone to about five in the wet zone. A second or ratoon crop can be obtained if there is wet weather following the harvest, but this is not generally profitable unless the plants have tillered well. In harvesting, the whole plant should be cut down as low as possible but, owing to uneven ripening, the crop should be harvested on two occasions.

Threshing is done by beating the sheaves against a post or log or by trampling.

Yields vary from 40 to 50 bushels of unhusked grain, but as the milling outturn is only about 30 per cent., the outturn of edible grain will not be more than about 10 to 15 bushels. Under favourable conditions, however, yields of about 75 bushels of unhusked grain have been obtained.

Storage and use.—If the seed is to be kept successfully, it must be well dried. The seed should be dried in the sun for two or three hours a day, not more, until thoroughly dry. The exposure of seed to the sun for long periods at a time is not recommended.

Adlay kept for seed should not be husked and, as it is liable to be attacked by weevil, it should be kept in the roof of a house where it will be exposed to smoke from the fire. Alternatively, it should be stored in air-tight bins and should be examined periodically. If weevils are seen the seed should be dried again and, if possible, fumigated.

If it is desired to store large quantities of adlay for consumption, the seed should be husked, the grain dried in the sun and stored in air-tight bins or in large clay pots. A few dried margosa leaves and a sprinkling of ashes on the top of the grain will help to keep away insects.

The local village mortar and pestle as used for hulling paddy can be used for extracting the grain.

Bushel weight.—35 lb.

MAIZE OR INDIAN CORN (*ZEA MAYS*); **S.** *BADA-IRINGU.*

Although the second most important cereal crop in the world, maize is only casually grown in Ceylon, being confined chiefly to chenas as a mixed crop and to small plots in peasant holdings. To those who are accustomed to rice, maize is somewhat difficult to digest at first but, if taken in gradually increasing quantities, it will be found to be a valuable substitute for rice. From the nutritive point of view, its protein and mineral value is as high as country rice, while it has a higher fat content. Many useful preparations can be made from maize but they require twice as long to cook as rice.

Climate and elevation.—Maize is suited to localities where a certain amount of dry weather can be depended upon at the time of harvest, as the cobs should be thoroughly dry for storage purposes. It grows best in the cooler regions of the dry zone in Ceylon, but it can be successfully raised elsewhere up to an elevation of about 4,000 feet provided the rainfall is not too heavy during its cropping period.

Type of land.—Maize is, generally, grown in chenas as a mixed broadcast crop with kurakkan. It is also cultivated on any type of high land including the upland hill slopes. The best soil is a sandy loam, clay or ill-drained soils being unsuitable. Maize will grow on soils which are not rich enough in organic matter for kurakkan. Maize does not do well in the Jaffna Peninsula and Pata Hewaheta Division of the Kandy District.

Season and method of planting.—The crop should be grown during the north-east monsoon, so that the crops reach maturity during the dry months of January and February.

The seed should be sown, 1 to 2 inches deep in rows, 3 feet apart, and 1 foot apart within the rows. The seed rate is about 12 lb. per acre, about four seeds being placed in each hill. Cowpeas may be interplanted between the rows of maize and will prove a useful leguminous mixture. When the seedlings are about 8 inches high, they should be thinned out to two plants per hill. About two weedings should be done before the cobs begin to develop. The suckers should be nipped off.

Age and yields.—The crop ripens in about 100 to 120 days. In harvesting, the cobs should be snapped off the stems. Yields vary from 4,000 to 8,000 cobs per acre depending on the conditions of soil and climate, and when dried, will weigh from 1,250 to 2,500 lb. On shelling, a yield of 1,000 to 2,000 lb. of grain per acre should be obtained.

Storage.—Maize, when stored, is very subject to weevil attack and great care is necessary if wastage is to be avoided. After harvesting, the sheaths surrounding the cobs should all be

removed except the innermost ones. The cobs must be thoroughly dried by exposure to the sun for two or three hours a day for a number of days.

The best way to store the cobs is to tie them together in pairs and to hang them over reapers in a barn. If they can be exposed to smoke once or twice a week insect attack will be avoided. In villagers' houses the cobs reserved for seed should therefore be hung in the roof where they will receive some of the smoke from the fire.

The storage for consumption of large quantities of maize is difficult if damage is to be avoided. The grains should be removed from the cobs and dried again. The secret of successful storage is to ensure that the grains are thoroughly dry. The grains should then be stored in bins with close-fitting lids or in earthenware pots. The stock should be inspected periodically and, if weevil injury is seen, the grain should be fumigated or, if that is not practicable, spread out in the sun and picked over to remove infested grains before storing again.

Bushel weight.—60 lb. dry corn in the cob up to 70 lb. (30 lb. to a cubic foot).

CUMBU (*PENNISETUM TYPHOIDEUM*)—THE BULLRUSH OR PEARL MILLET

This cereal which is known as *bajri* in North India, and *cumbu* in South India, is one of the most important millets grown in India and Tropical Africa. There are millions of acres under this crop in India. It is of high nutritive value, being richer in protein and fats than any other tropical cereal and in mineral salts than rice and maize.

Climate and elevation.—*Cumbu* is essentially a dry zone crop and can be raised in areas of low rainfall where all other cereals are unlikely to succeed. Once the seed has germinated, it will grow with very little rain. It can, however, be grown successfully in the mid-country zones during the north-east monsoon. It will not do well at elevations above 3,000 feet.

Type of land.—The crop can be grown on chenas in the dry zone and in highland on all but the heavier types of soil. It can also be cultivated during the *yala* season on certain paddy lands under village tanks where the soil is light-textured and well-drained, when there is insufficient water for growing paddy.

Season and method of planting.—In the dry zone, *cumbu* is an ideal cereal for the south-west monsoon season and should be grown in rotation with other crops.

In the moderately wet mid-country zones, it may be grown during the north-east monsoon, so that the crop may ripen during the drier months of January and February.

The seed is sown about 1 inch deep in rows 1½ feet apart and 1 foot within the row at the rate of 6 lb. per acre, and after sowing, it should be lightly covered over with soil by means of mammoties or the spiked harrow.

The crop may be weeded once followed by an earthing up.

Age and yields.—The crop ripens in about 3½ to 4 months, but as ripening is uneven, as in the case of kurakkan, harvesting should be done on two occasions at an interval of about 10 days. There is an acclimatized variety from India called Jamnagar, which is being successfully grown at the Experiment Station, Peradeniya, and takes about 4 months to mature. The ripening seed is subject to attack by paddy birds and care should be taken to scare these away. The earheads should be cut and, after heaping indoors covered with straw for 2 to 3 days, the grain may be threshed as in the case of kurakkan.

The average yield is about 15 bushels per acre, although under good conditions about 25 bushels per acre may be obtained.

Storage and use.—The seed, if well dried, will keep for long periods. It can either be stacked in the ear in a dry barn or it can be threshed and stored in earthenware pots or bins. A layer of margosa leaves and a sprinkling of wood ash on top of grain stored in pots or bins will assist in keeping away insect pests.

Milling of *cumbu* can be done on the kurakkan hand-grinding stone.

Bushel weight.—50 lb.

SORGHUM (*ANDROPOGON SORGHUM*), S. *KARAL IRINGU*

This cereal is the staple food of a quarter of the world's population and, although not usually grown in Ceylon, it has considerable value as a grain crop.

Climate and elevation.—Sorghum is generally suitable for a dry area where maize will not grow and it is capable of standing severe droughts. At harvest time it is susceptible to damp weather.

Type of land.—The plant will grow and produce a crop in nearly every soil, but the one best suited to it is a rich light sandy, well-drained and not too moist soil. It may be grown up to an elevation of about 4,000 feet.

Season and method of planting.—The seed rate is about 10 lb. per acre. The seed should be sown about 1 inch deep in rows 1½ feet wide and 1 foot within the rows. When the seedlings are about 8 inches high, they should be thinned out to two plants per hill. The crop may be weeded once followed by an earthing up.

Age and yields.—The grain sorghums vary in age from 3½ to 7 months, depending on the variety. There is an acclimatized variety from India called Budhperio, which has grown successfully at the Experiment Station, Peradeniya, and takes about 4 months to mature. It is a white-seeded variety with a compact drooping head. The ripening seed is subject to bird attack and care should be taken to scare birds away.

Harvesting is done by cutting off the ears, which are kept in heaps for a few days. A ratoon crop should not be allowed as the sprouting plants after the first harvest are likely to contain prussic acid which is poisonous.

The average yield is about 20 bushels per acre (1,500 lb. per acre), though with irrigation and good manuring, about 30 to 40 bushels may be expected.

Storage and use.—The earheads should be threshed and the grain dried by exposing it to the sun for two or three hours a day for several days until it is perfectly dry. If the seed is not dried thoroughly it develops moulds and is very subject to insect attack.

The dry grain may be stored in earthenware pots or bins with tight-fitting lids. A layer of margosa leaves and a sprinkling of wood ashes on the top of the grain will help to keep insects away.

Sorghum can be ground and cooked to a rough meal or it can be cooked as whole grains like rice.

Bushel weight.—56 lb.

THE SOYBEAN

The soybean or soya is a valuable food crop because the seed, which can be cooked in a variety of ways, contains the vitamins A, B, and D and sprouted seedlings contain vitamin C in addition. It is very rich in protein (40 per cent.) and in fat (17 per cent.) and is particularly rich in calcium.

Climate and elevation.—The crop will grow well in the dry zone and in moderately wet regions provided there is sufficient dry weather for the pods to mature and dry. At high elevations of about 5,000 feet and over, growth and production of seed may not be satisfactory.

Type of land.—A medium loam on any high land including the upland hill slopes is most suitable. It will not grow well on eroded patnas or gravelly soils, unless heavily manured.

Season and method of planting.—It should be grown during the north-east monsoon, although in the Jaffna Peninsula it can be successfully raised under irrigation during the dry season from March to September.

The seed should be inoculated with the nodule-forming bacteria, if it is being grown for the first time on the land, and

the soil is also not well manured with compost, cattle manure or other nitrogenous fertilizer.

The system of growing soya for two or three successive seasons on the same land will result in increasing crop yields, year by year.

As lime stimulates growth, especially if the soil is acid, an application of about 5 cwt. to 1 ton per acre of air-slaked lime, depending on the acidity, about 2 to 3 weeks before sowing will be useful. An application of basic slag at the rate of 1 cwt. per acre (in the rows) a few days before planting is also of advantage. The slag should be mixed with 2 or 3 times its weight of dry soil and then spread in the rows.

There are three types of seed—large, medium, and small—and the seed rates and spacings should be as follows, the seed being planted not more than 1 inch deep one seed per hill in drills :—

	Spacing.	Seed rate lb.
Large seed	1 ft. by 3 in.	90
Medium seed	2 ft. by 3 in. (good soil)	20
	1½ ft. by 3 in. (poor soil)	25
Small seed	as for medium	20

In the dry zone, when the crop is grown during the months of March to September, irrigation is of great benefit.

Age and yields.—The age of the crop is about 3 to 5 months depending on the type. The large seed varieties generally mature in 3 to 3½ months and the smaller seed varieties in 4 to 5½ months. When the pods turn brown, they should be harvested and dried in the sun, before extracting the seed.

The large seed varieties are most palatable, though less prolific than the medium and small seed varieties. The small seed varieties are twining plants and are best grown as green manures.

Storage.—The seed should be well dried by exposure to the sun for two or three hours a day (not more) for several days until it is thoroughly dry.

The storing of soybeans in air-tight bins is not recommended as it is reported that, after a time, the oil in them becomes rancid and this spoils them for consumption or for seed purposes. They should therefore be *thoroughly* well dried and stored in sacks or open bins covered with sacks.

Bushel weight.—40 to 60 lb.

DHAL (*CAJANUS CAJAN.*)

Dhal (red gram) or *parippu* is the chief pulse crop imported into Ceylon. It contains about 22 per cent. protein and is fairly rich in vitamin A and vitamin C. One of the best varieties is that grown in Gujerat.

Climate and elevation.—The crop produces seed most prolifically in the dry zone. It is remarkably drought-resistant. It grows well up to an elevation of about 2,000 feet, but above this up to 3,500 feet its growth is slow and maturity delayed.

Type of land.—Dhal thrives in almost all types of soil varying from sand to heavy clay loams but it is best cultivated in a medium heavy loam that is well drained.

Season and method of planting.—It may be sown as a mixture with crops of shorter duration such as kurakkan, maize, cumbu, &c., which are harvested later. In this form of mixture, the dhal may be sown in widely spaced rows varying from 4 to 8 feet apart depending on the type of its associated crop and the spacing given to it. The seed rate with this type of mixture varies from 1½ to 3 lb. per acre.

As a pure crop, dhal should be planted in rows 3 feet apart and 2 feet apart within the row, about 3 to 4 seeds being placed in each hill. The seed rate is 8 lb. per acre. When the seedlings are about 8 inches high, they may be thinned out to 2 plants per hill.

The seed should be sown as early as possible in October, with the commencement of the north-east monsoon rains.

Age and yields.—If planted in October, the annual varieties such as Gujerat which is recommended for cultivation in Ceylon would flower in January and yield a first crop in March. The second flowering starts early in June and the second which is also the final crop can be removed in August or early in September.

About two weedings should suffice. As a mixture, the yields vary from about 300 to 600 lb. per acre depending on the type of mixture. As a pure crop, yields from 800 to 1,000 lb. per acre may be obtained.

Harvesting.—In harvesting the first crop, it is necessary to pick the beans by hand. For the second crop, the plants should be cut down to ground level and threshed at convenient centres.

Storage and use.—For consumption the seed coat is removed and the seed split into halves and dried. The method of manufacture to obtain the best results has been described elsewhere. Further information on this can be obtained from the local Agricultural Officer. In the manufactured form the storage of dhal offers no difficulties.

Seed which is reserved for sowing needs careful attention as it is subject to weevil injury. First, it should be thoroughly dried by exposure to the sun for two or three hours a day for several days until it is quite dry. It may then be stored in a sack which is placed in the roof of a house where it is exposed to smoke from the fire. Alternatively, the dried seed may be

stored in an earthenware pot. On top of the seed should be placed a layer of margosa leaves and a sprinkling of ashes. Another method is to cover the seed in the pot with a layer 1 to 2 inches deep of dry sand. Weevils present in the seeds will make their way to the surface through the sand and will be unable to return through the sand.

Bushel weight (of seeds).—56 lb.

DRY CHILLIES

There are about 180,000 cwt. of dry chillies, valued at about Rs. 26,000, annually imported into Ceylon. The most important commercial types are those known as Tuticorin, Calcutta and Singapore, named after the ports from which they are shipped. Of these the long Tuticorin variety, grown in the Tinnevelly district of South India, commands the highest value owing to its bright red colour, a smooth glossy skin, a firm stalk which does not easily become separated during storage, and a high degree of pungency as well as a good flavour. This is the variety which is recommended for cultivation in Ceylon.

Climate and elevation.—Dry chillies can be best produced in the dry zone areas, but in moderately wet regions they may be grown provided there is sufficient dry weather for the pods to ripen and be dried in the sun.

Type of land.—Chillies can be grown on chenas and any type of high land. A medium loam soil is best.

Season and method of planting.—The crop should be grown during the north-east monsoon season. In the Wiraketiya area of the Southern Province, dry chillies can also be cultivated during the south-west monsoon season.

(*a*) *Preparation of the nurseries.*—The seed is best sown in nurseries at the rate of ½ lb. per 360 sq. ft., which will provide sufficient seedlings for transplating one acre, provided the seed is of good germination. Four beds each 30 feet by 3 feet wide should be made and a dressing of compost or finely-powdered cattle manure at the rate of 2 lb. per sq. ft., should be added. On each bed 2 oz. of seed should be sown broadcast or in rows 1 inch apart. The edges of the beds should be raised slightly to prevent soil wash. The seed should be sown about ¼ inch deep. The beds should then be watered and covered over with straw or cadjan. After about a week, the covering should be removed.

When the seedlings are about a fortnight old, they will benefit considerably by being watered with a solution of sulphate of ammonia at the rate of 1 oz.

per gallon of water used over 50 sq. ft. of nursery. The dose should be repeated a week later. The seedlings should be transplanted when they are about 4 weeks old, the first flowers appearing at this time.

(*b*) *Planting out.*—This is best done in the cool of the evening. The seedlings should be topped and then planted out with a pointed stick, 2 seedlings being placed in each hill. The spacing should be 3 feet between rows and 3 feet within the rows. After planting each pair of seedlings, the soil should be pressed around but not too closely against the collars of the seedlings and over the surface a little dry soil should be sprinkled. If the season is very wet during the active growing period of the crop, planting should be done on ridges about 9 inches high.

(*c*) *Intercultivation.*—The first weeding should be fairly deep and should be given about 7 to 10 days after planting out. The second, about a fortnight later, at the same time that the fertilizers are applied and this should be followed by an earthing up. The third weeding should be about 3 weeks later and should be fairly shallow.

(*d*) *Manuring.*—The field should receive an application of compost at the rate of 3 tons per acre, and an application of sulphate of ammonia at 1 cwt. per acre, 3 weeks after planting out.

Age and yields.—Tuticorin chillies generally come into flower about one month after planting out and picking of green but well-developed fruits commences about 2½ to 3 months after planting out, and of ripe fruits about a fortnight later. The first picking, however, should be of mature green fruits and the subsequent pickings of red ripe fruits.

In drying the red ripe fruits, they should first be heaped indoors for about 2 days, so that a deep red colour may be developed. The heaps should then be sorted for discoloured or diseased fruits, and the clean fruits then be spread on a drying floor and exposed to the sun for about 4 to 6 days depending on the intensity of the sun. On the morning of the second and third days the pods should be trampled on or rolled over so that they become flattened, a desirable condition for marketing.

The average yield of dry chillies is about 800 lb. per acre although with good cultivation and manuring yields up to 2,000 lb. per acre have been obtained.

Storage and use.—The well-dried pods should be stored in gunny bags. Owing to the higher pungency of Tuticorin chillies a smaller quantity of pods should be used for flavouring purposes in comparison with other varieties of dry chillies, with the exception of the Bird pepper.