

Roving Agriculture and the Problem of Dry Farming

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AGRICULTURE in Ceylon is mainly based on a plantation economy in which tea, rubber and coconuts form about 90 per cent. of the total export trade and occupy about 60 per cent. of the cultivated land. Paddy is the staple food crop which is grown on about 912,000 acres amounting to about 25 per cent. of the cultivated area. It is produced throughout the Island in the valleys of the wet zone mainly under rain-fed conditions and in the dry lowlands under irrigation from channels leading from storage reservoirs or tanks. Local production is however inadequate to meet the requirements of the population which has now reached a total of nearly 7 millions and large-scale imports of rice had to be resorted to in the past from Burma, Indo-China, Siam and India. At the present time imports from surplus producing countries are allowed on allocations provided by the International Emergency Food Committee of the Council of the Food and Agricultural Organization at Washington. Other food crops—dry grains, pulses and roots—are grown to a limited extent to supplement the production of paddy. In the wet zone, roots such as sweet potatoes, manioc, *Dioscorea yams* and the large-leaved yams (*Colocasia antiquorum* Schott. and *Xanthosoma sagittaeifolium* (Linn.) Schott.) are grown in the small holdings or mixed gardens. The cereals and pulses are produced mainly under a system of roving agriculture or shifting cultivation as it is more commonly called, except in the Jaffna peninsula where small-scale farming is practised with lift irrigation from underground sources of water.

The two main climatic divisions are the wet zone covering an area of about 4 million acres situated in the centre and south-west part, and the dry zone comprising the northern and eastern portion of the Island with about 12 million acres. The wet zone is subject to the influence of two monsoonal periods of rain, the north-east which reaches its peak in November and the south-west in May. The total rainfall is zonally distributed and varies from 75–160 in. The land rises in 3 peneplains, the first from sea level to about 500 feet, the second from 1,500 to 2,000 feet, and the third from 3,000 to 5,000 feet. The soils are typical laterite or lateritic loams derived from archean rocks. About 50 per cent. of the total cultivated land of about 3½ million acres occurs in this zone. The permanent economic crops—tea, rubber, coconuts, cacao, citronella and cinnamon—are almost entirely grown in this zone except for coconuts which extend along the coastal sandy belts of the north-western and eastern sides of the island. These crops, with paddy in the valleys and numerous small holdings of the mixed garden type, leave little

land for further cultivation, except on the steep slopes. Some hill slopes were cleared for shifting cultivation in which *kurakkan* (*Eleusine indica* Gaertn.) and kodo millet (*Paspalum scrobiculatum* Linn.) were the chief crops, but with the increasing scarcity of land in this zone the practice has almost ceased. The forests that now clothe the hills are on slopes which are too steep for clearing and indeed from the point of view of the prevention of flooding and erosion should no more be alienated, especially in the catchment areas of rivers and streams. Further deforestation in the wet zone except in prescribed areas should also be prevented from considerations of climate and the maintenance of the agri-forest balance.

In the dry lowlands which extend over the greater part of the Island, the annual rainfall is about 40–75 in. most of which is precipitated with the north-east monsoon, the total rainfall for the south-west monsoon (May to September) being less than 20 in. This zone where the natural vegetation is different lies mainly within the first peneplain. The soil is lateritic or a non-lateritic loam of fair depth, rich in humus and mineral nutrients. The northern end, however, is characterized by sedimentary miocene limestone and the north-west portion by pleistocene sands. The natural vegetation is medium and high jungle, present in abundance due to a low density of population (81 persons per square mile as compared with 596 persons per square mile in the wet zone). With the exception of the limestone area in the north there are no underground sources of water and therefore surface irrigation from intermittent supplies carried by the main rivers and conserved in an extensive network of tanks was resorted to. Paddy was given first consideration and all irrigation schemes were designed for this crop. In order to augment the supply of paddy which was limited by the number and extent of the available irrigation schemes and was insufficient for the average peasant's requirements, other food crops were raised on a system of roving agriculture or shifting cultivation. This is a wide-spread practice in parts of tropical America, Africa and South-East Asia where it is known by various local names such as *canues* in South America, *chena* in Ceylon, *kumri* in southern and western India, *jhum* in central and north-east India, *khoria* in Nepal, *taungya* in Burma, *tam rai* in Siam, *ray* in Indo-China, and *caingin* in the Philippines. The practice in essence is the same in these countries and in brief relates to the cutting down and burning of virgin and secondary forest, and to a lesser extent burning grass, for the cultivation mainly of food crops—dry grains, pulses and vegetables—for a few seasons; and as soon as the land shows signs of exhaustion the cultivator abandons it and clears a fresh patch of forest or grass.

In order to control the rate of destruction of the forests in Ceylon, areas for *chenas* were zoned and permits were issued by Revenue Officers on the basis of an acre per family for raising food crops. When cotton was introduced as a commercial crop for the dry zone, separate permits were also issued for clearing land for growing this crop. The period of cropping extends over 2 to 3 seasons or 1 to 1½ years. The clearing is done by felling and burning the jungle during July and August. The land is planted in October and November with the north-east monsoon rains, with a mixture of *kurakkan*, maize, green gram (*Phaseolus aureus* Roxb.) mustard, amaranthus and chilli (*Capsicum annuum* Linn.) with some Italian millet (*Setaria italica* Beauv.)

and *Panicum* millet (*Panicum miliaceum* Linn.), the chief crop in the mixture being kurakkan. After the harvest of these crops in January cattle are allowed to enter the *chena* for a brief spell to eat down the stubble, and the land is tilled with hoes in preparation for sowing quick-maturing crops such as green gram and gingelly (*Sesamum orientale* Linn.) for the restricted south-west monsoon rains in April and May. The chilli plants which were eaten down by the cattle produce fresh growth and after the harvest of the green gram and gingelly the ripe fruits are picked on 2 or 3 occasions and dried. Clearing is done once more with hoes in September and October and kurakkan and other grains are sown for the 3rd season with the north-east monsoon rains after which the land is abandoned. In other countries, e.g., French Indo-China where high forest is cleared, cropping over a period of 4 to 5 years continues. The reasons for the abandonment, of the land subject to this system are (1) weeds which increase in intensity with each successive season's crops, (2) loss of fertility through soil erosion, (3) stump re-growth.

Where the population is sparse and the forests extensive, the practice can generally be continued without any serious ill effects to the land, though in countries like Indo-China where there are vast areas of land available for roving agriculture the long period of cultivation (4 to 5 years) is reported to kill the roots of trees and then weeds such as *Imperata cylindrica* Beauv. and *Eupatorium* sp. invade the area. With a rising population and an increasing demand for forest land, the intervals of rest become necessarily shorter and the regeneration of the forest slower. As the fertility declines competition from pernicious weeds which invade the land becomes more serious. The period between successive clearings is generally 15 to 20 years depending on the height and density of the re-growth, but in many areas it is reduced to 8 to 10 years as jungle, not too remote from villages, becomes scarce and the demand increases. Where repeated clearings after insufficient rest periods have taken place as in parts of the Eastern Province, the climatic climax (forest) has receded to scrub and grass associations in which *Lantana aculeata* Linn., and *Imperata cylindrica* Beauv. (*Illuk*) are dominant species.

In certain countries such as Siam and Indo-China, where roving agriculture is practised, there are two forms (1) on the hills by primitive and nomadic tribes (2) on the lowlands by a settled peasant population. In the case of the former, the tribes are entirely dependent on the crops raised by them while on the lowlands the system is used by the peasants to supplement their crops of irrigated paddy. The *chena* cultivator of Ceylon belongs to the second category. When land which is cleared on the hills is abandoned, the tribes do not later return to it but penetrate further and further into the forests which they progressively destroy.

Shifting cultivation in both its forms is a type of subsistence agriculture and its pernicious effects can hardly be exaggerated. From a forest point of view it is wasteful destruction; from an agricultural point of view a dissipation of misguided effort; and from a wider national point of view it leads to a class of land-starved peasantry. The question then arises, as was posed at the last Forestry and Timber Utilization Conference for Asia and the Pacific, organized by the Food and Agriculture Organization of the United Nations and held at Mysore in March-April, 1949, as to why such a destructive system of land use should persist in the face of clear evidence that the end must ultimately be disastrous to the peoples that depend on the land for life.

It has been described as wasteful because of the indiscriminate destruction of the forest without proper exploitation of its resources and the lack of effort to reforest the land with commercially valuable species. As already stated, the land tends to decline in fertility if the period of cropping is unduly prolonged or the intervals of rest between successive periods of cropping are shortened. With the invasion of pernicious weeds, areas are reduced to wastes and become liable to serious erosion. With the recession of the climatic climax from forest to scrub or grass there is a consequent adverse effect on the average climate of the area.

Agriculturally, the system is primitive because the yields are poor, the unit cropped too small, the labour expended too high, and the fertility of the soil neglected. The yields are poor because (a) broadcast sowing is practised as against drilling or dibbling, (b) after cultivations are often delayed as they are performed by hand labour during a short growing season, (c) space is lost by the roots of unstumped trees that are inevitably left in clearing, (d) absence of manuring especially of the quick-acting soluble fertilizers after the first season's cropping. The unit cropped (1-2 acres in Ceylon) is too small to provide the peasant with a reasonable standard of living even though it is a supplement to his paddy which itself is limited to a few acres at the most. With his resources and also the tools at his disposal—the axe and the hoe (mamoty)—he is not able to clear, plant and maintain more land. Much labour is involved in felling, burning and clearing the forest, and in erecting a stockade along the boundaries, as well as in the hand-tilling operations. This work has necessarily to be undertaken by co-operative effort. Considerable energy is required in watching the crops at night and in protecting them against the depredations of wild animals from the surrounding forest. All this requires a greater expenditure of effort and energy by the peasant than in settled agriculture. The practice cannot therefore be regarded as due to any indolence on his part.

There is unfortunately no traditional class of peasant farmers in Ceylon—those who live on their holdings and practise a system of mixed farming by raising both arable crops in rotation and livestock. The dry zone peasants have been accustomed to live in small settlements (Singh. *gangoda*) which form the units of villages situated away from his paddy field and *chena*, until colonization schemes under major irrigation works were introduced when a peasant was provided with an allotment of 3 acres and in proximity to it 5 acres of irrigable land for paddy. Such schemes are, however, limited on account of the scarcity of irrigable land and they cannot be expected to provide for the requirements of all dry zone peasants. The system of roving agriculture then persists partly due to the inertia of traditional land use practices which are difficult to break, but essentially because it is dictated by economic necessity. From time immemorial, the peasant has been familiar with two systems of agriculture—the *chena* for dry grains and vegetables, and irrigated paddy fields for his staple food. His limited resources, the comparatively inhospitable nature of his environment, the absence of an assured water supply, are some of the factors which have retarded or prevented the transition to other forms of agriculture.

Roving agriculture, therefore, is born of necessity, and as such it cannot be outlawed overnight by fiat. The only permanent solution is the provision of more attractive forms of settled agriculture, by large-scale colonization under irrigation works—major and minor; and the introduction of dry

farming of arable crops in rotation under a system of alternate husbandry with pasture and fodder—or in other words “a rotation of crops instead of a rotation of land”. These are long-term measures, where progress will necessarily be slow—particularly since large-scale colonization involves a heavy outlay of capital expenditure. What is more urgent is the provision of immediate measures that will minimize or counteract the adverse results of this practice.

This subject was considered by the Forestry and Timber Utilization Conference to which reference has already been made, and the following facts were established (7):—

- (1) “The prevalence of the widespread practice of roving agriculture by both nomadic and settled populations in the countries of this region results in very low standards of living.
- (2) The effects of this practice are pernicious and result in the economic loss of forests, the destruction of soil, and the silting up of water courses situated below the cleared areas.
- (3) The increasing demand for fresh forest land for roving agriculture as the result of a growing population necessitates some form of restriction to prevent destruction of forests.
- (4) The ultimate solution of the problem depends on a broad-based policy which embraces the fields of forestry, agriculture, and social welfare.

The recommendations then made were that the menace of roving agriculture be brought to the notice of Governments concerned, and that the practice be urgently and carefully regulated by the gradual introduction of:

- (a) “a planned system of reforestation by agri-silvicultural methods;
- (b) systems of permanent agriculture, involving the cultivation of paddy in irrigable areas or dry farming of arable crops in rotation with pasture and fodder under a system of alternate husbandry; and
- (c) the planting of permanent economic crops.

Provided that in all cases steps are taken to adopt the necessary soil conservation measures.”

In the case more especially of the nomadic tribes who in some of the south-east Asian countries practise roving agriculture on the hills and are entirely dependent on this system for their sustenance, the *taungya* or the Burmese form of roving agriculture may be adopted. Briefly, under the *taungya*, the land is planted up, principally in teak, by the peasant, *pari passu* with the cultivation of food crops—and with help and assistance from, and under the supervision of the Forest Department. Indeed the Forest Department relies on this system for the replanting of its teak forests (1). The chief merits of this system are that it not only neutralizes the wasteful aspects of the practice but actually converts it to a practical and useful means whereby to reforest the land with commercially valuable species.

It is a question for the consideration of each country where roving agriculture exists even on the plains as to what extent a similar form can be adopted or adapted to suit local conditions. Reforestation in more valuable timber species is particularly desirable where high forest is being destroyed and

regeneration of poor species takes place after the land has been cropped and abandoned.

In Ceylon, there is an excess of forest in the dry lowlands largely because the component species are of little economic value—they can be computed at about 2 trees per acre of the more valuable species. There are also areas where *Lantana aculeata* Linn. and particularly *Imperata cylindrica* Beauv. (*Illuk*) come in quickly after the forest is cleared. The reforestation of economic species in some of the areas where roving agriculture is practised and especially those which are liable to be invaded by pernicious weeds is desirable. The Forest Department has recently introduced a scheme of co-operative reforestation with teak and *halmilla* (*Berrya cordifolia* Burret.). These are to be planted by the peasant along with their *chena* crops. The financial assistance given is as follows:—Provided the stocking of teak and *halmilla* is over 75 per cent. and the average height of the trees over 4 feet at the end of the first growing season, a sum of Rs. 5 is paid. At the end of the second year a further payment of Rs. 5 is made, and after the 3rd year if the stocking is still over 75 per cent. a sum of Rs. 7.50 is given, making a total of Rs. 17.50 over a period of 3 years. Furthermore, in order to induce the peasant to extend his interest on the land he is permitted to grow plantains on his *chena* at a distance of 40 feet apart and in this way protection is afforded the young teak and *halmilla* plants for a longer period. In the Philippines, *Leucaena glauca* Benth. has been found useful as a nurse crop for planting economically valuable forest trees, the *Leucaena* being periodically lopped until the desired trees rise above it and in this way it has been found to choke out completely all weeds, to double the nitrogen content of the soil, and to improve its physical condition (6). It is sown on a *caingin* (*chena*) after the harvest of an annual crop.

Where the available forest area is restricted and the pressure for land for roving agriculture increasing, resulting in shorter intervals of rest between successive clearings, the planting of quick-growing species in place of natural regeneration may be considered. The factor which determines the rest interval is the rate of growth of the canopy of vegetation. It has been found (3) in Ceylon that 8–10 years is an adequate rest interval in most parts from the standpoint of weed control and the supply of a sufficiency of mineral nutrients from the vegetation. In Indo-China the normal rest interval is 10 years, but it was stated by the French delegate representing Indo-China at the Forestry Conference already referred to that this could be reduced to 5 or 6 years by the introduction of such quick-growing legumes as *Indigofera teysmanii* Miq. and *Leucaena glauca* Benth. (2). These species should be sown at the same time as the last crop and when they reach the height of the crop they should be lopped. This step would help to increase the girth of the legumes before the land is abandoned. It was stated that the planting of such legumes so improved the fertility of the soil that higher yields of annual crops sown could be obtained. *Indigofera teysmanii* Miq. has not been tried before in Ceylon, but *Leucaena glauca* Benth. grows well and is drought-resistant though it is slow at the start. Some years ago trials were made in Ceylon with quick-growing trees such as *Gliricidia sepium* (Jacq.) Steud. and the cashew with the object of reducing the interval between successive clearings on *chenas*, and more recently by R. H. de Mel in the Kurunegala District with *Gliricidia sepium* planted 10 feet by 10 feet the purpose being

to lop the *Gliricidia* every 4 years and then to take a crop of *kurakkan*. Good results are reported by him on 150 acres by this method, which does not involve any burning, weed growth being checked by the close stand of the *Gliricidia* and fertility being restored by the periodic leaf fall, the loppings and the nodules on the roots as well as the shade. Investigations on quick-growing species which would help to restore the fertility of lands subject to roving agriculture in a shorter time both by this method as well as the burning of quick-growing species should also be undertaken along with trials with stock proof live hedges and wind belts.

From the standpoint of the peasant, the most satisfactory method would be the introduction of a system of permanent agriculture, though preference would always be claimed by him for irrigable land for growing paddy. For this purpose, there are two schemes :

- (a) Colonization under major irrigation works on allotments each consisting of a unit of 5 acres paddy and 3 acres high land.
- (b) Development of the maximum irrigable extents under village irrigation works.

But as already stated sufficient irrigable areas are not available for providing the requirements of all dry zone peasants and systems of dry farming would appear to be the main method of developing the extensive areas in the dry zone as suggested several years ago by Stockdale (5). There are however, some complex problems on the agronomy of the dry zone that require solution before dry farming can be confidently recommended to the peasant as a more efficient substitute for his system of roving agriculture, the chief of which are (1) erosion and water-logging of the soil in the wet season, (2) erosion and loss of moisture during the dry season, (3) maintenance of structure and the nutrient status of the soil.

The north-east monsoon rains which commence about mid-October give little time for the preparation of the soil, and in November the rainfall is so heavy that the soil soon becomes water-logged especially in the areas between contour bunds. Excess moisture must be drained away quickly but without the removal of soil particles. After the harvest of the north-east monsoon crops in January and February, the land has to be prepared again as quickly as possible for the early maturing south-west monsoon crops (2-3 months). When these crops are over in June, by which time the rains have ceased, there is a prolonged period of dry weather until the advent of the north-east monsoon rains again in October. The soil becomes too hard to be worked after June but even if cultivation is possible with a disc harrow it is undesirable, for it will cause destruction of crumb structure. Again, if all vegetation is removed by cultivation methods and the soil exposed, organic matter tends to get lost and, with the strong winds that prevail during this period, wind erosion takes place. But if the soil is not worked, weeds flourish and set seed and when the north-east monsoon rains arrive weed growth becomes so prolific that their control presents one of the most difficult problems to the peasant. What is required therefore is a crop which will cover the soil uniformly and completely during the dry season so as to protect it from (a) wind erosion, (b) loss of organic matter, (c) loss of crumb structure. The establishment of a short-term grass ley planted towards the end of March

or early April with the rains would appear to be most desirable from this point of view, and if it could be under-sown with a nurse crop of the usual short-term south-west monsoon crops such as gingelly or green gram, the general rotational scheme of cropping for dry zone farming could be maintained. The search for suitable grass and legume components of a pasture is necessary, but it may be difficult to find grasses which could grow and withstand grazing during the prolonged dry spell from June to October. There is however the possibility that if grazing is withheld altogether during this period that the grasses may cover the soil but show no active growth. As regards pasture legumes, *Stylosanthes gracilis* H. B. and K. can be recommended as it has so far proved to be the most drought-resistant of pasture legumes tested in Ceylon. Another alternative is to establish a cover of a drought-resistant legume only, such as *Stylosanthes* referred to above or *Tephrosia purpurea* Pers. though the latter lacks forage value. This legume has been found to be valuable as an alternative crop to paddy in the dry season (4). It has the great advantage of being self-sown once it is introduced into an area. The seed remains dormant while the paddy is growing and after the harvest of the paddy, germinates and covers the ground during the dry season. The plants are turned in when preparatory tillage commences for the next season's paddy crop by which time the seed is shed in the soil. This legume may be tried on unirrigated arable land with and without the sowing of the usual south-west monsoon crops. *Tephrosia* is a deep-rooted crop and it will help in the opening up of the lower layers of the soil. If a good cover either of pasture or a quick growing drought-resistant legume can be maintained during the months of June to September then the cultivation of arable crops in rotation should not present much difficulty. The tillage operations for the north-east monsoon planting should be delayed as long as possible until the strong south-west monsoon winds experienced during July to September have ceased but if, on account of the time factor, ploughing has to commence with the inter-monsoonal rains in September then the soil should be left in the rough and when the blowing has dropped harrowing may be undertaken to pulverise the clods.

From the point of view of soil conservation the establishment of broad-based terraces with a graded channel above the ridge to remove excess water and to prevent water-logging is necessary together with contour strip cropping. Strips of pasture or of legumes such as *Stylosanthes gracilis* H. B. & K. or *Tephrosia purpurea* Pers. should be left at intervals on the slope so that they will check and spread the surface run-off and thus reduce erosion. These will also serve as guide lines for ploughing and planting the cultivated areas on the contour. Wind belts are essential and they should be established with different species so planted that they will show an increasing gradation in height from either side towards the middle. Suitable species are *Leucaena glauca* Benth. *Pongamia pinnata* Merr. (= *Pongamia glabra* Vent.), *Melia azedarach* Linn. leading to *Casuarina equisetifolia* Linn. in the middle.

As regards crops in the rotation the following are the most suitable :—

	North-east monsoon	South-west monsoon
Cereals	.. maize, kurakkan	.. —
Legumes	.. green gram and cowpea	.. green gram and cowpea
Cash crops	.. cotton, chillies	.. gingelly
Fodder	.. sorghum	

Different rotations incorporating some or all of the above crops can be adopted but it is necessary that a sufficient dressing of compost should be given together with a dose of fertilizers to at least some of the crops. A suitable rotation utilizing all the crops above can be drawn up as follows :—

Plots	North-east monsoon	South-west monsoon
1	.. sorghum (for fodder)	.. cowpeas and/or green gram
2	.. kurakkan and/or maize	.. gingelly
3	.. chillies	.. chillies (contd.)
4	.. cotton	.. cotton (contd.)

In the case of the widely spaced crops such as maize, kurakkan, chillies and cotton, polyculture should be practised by growing a legume such as cowpeas or green gram in association with the non-legume. The mixed crops may be grown in alternate rows.

Each plot may be $1\frac{1}{2}$ acres to 2 acres in extent, and in addition, 3 acres should be brought under pasture and fodder.

Finally, there is the question of the establishment of permanent economic crops other than those which are important from the forest point of view. The climatic and other factors which have been referred to above strictly limit the choice of suitable crops in Ceylon. The suggestion was made by the delegate for Siam at the Forestry Conference previously referred to in this paper, that cinchona and tung oil should be planted on terraced hill slopes, but these crops require a cooler climate and a heavier rainfall than prevails in the dry zone areas of Ceylon. Some of the fibre- and gum-producing crops such as *Agave* sp. and *Acacia senegal* have possibilities but export markets with prices should be assured. There is, however, a good market and an increasing demand for kapok and the Java variety can be recommended as a suitable permanent crop. Amongst orchard crops the mango is the most satisfactory especially if grafted varieties such as *karutha colomban*, *neelam* and *willard* are grown. Finally, there is the palmyrah palm which has considerable economic value and should be grown more extensively in the dry zone.

SUMMARY

Roving agriculture is confined in Ceylon to the dry lowlands where the natural vegetation is jungle. It is practised by peasants who adopt this system to supplement their cultivation of irrigated paddy on small extents. The system has been condemned on many grounds, but it is dictated by economic necessity and cannot be outlawed overnight by fiat. It cannot be regarded as in the past as due to any indolence of the peasant for it involves on his part a considerable degree of energy and effort which is not commensurate with the results.

This subject was considered by the recent Forestry and Timber Utilization Conference for Asia and the Pacific, under the organization of the F.A.O. The following three recommendations were made for the gradual replacement of roving agriculture in all countries where it is practised :—

- (a) A planned system of reforestation by agri-silvicultural methods.
- (b) Systems of permanent agriculture, involving the cultivation of paddy in irrigable areas or dry farming of arable crops in rotation with pasture and fodder under a system of alternate husbandry.

(c) The planting of permanent economic crops.

Provided that in all cases appropriate soil conservation measures are adopted.

It is suggested that where the available forest area is restricted and the pressure for land for roving agriculture increasing, with the result that the intervals of the rest between successive clearings becomes shorter, the planting of suitable quick-growing species should be undertaken in place of natural regeneration. These can be used both for cutting and burning as in the case of the ordinary forest or by periodically lopping the trees and sowing a crop between them. The possibilities of such species as *Indigofera teysmanii* Miq. as used in French Indo-China, *Leucaena glauca* Benth. and *Gliricidia sepium* (Jacq.) Steud. which grow well in Ceylon need investigation along suitable stock proof live hedges and wind belts.

Reforestation in the lines of the *taungya* system in Burma with economically valuable species has now been introduced using teak and *halmilla* (*Berrya cordifolia* Burret.) for the purpose.

Land for irrigated paddy is always in most demand and whenever available such land is given to peasants, but large-scale settlements involve a heavy outlay of capital and as such dry farming as an immediate measure is more to be favoured. There are, however, many complex problems on the agronomy of the dry zone which need solution before dry farming can be introduced on a large scale. The most important of these problems is the establishment of a vegetal cover during the period June to September when protection of the soil against direct sunlight, strong winds and weeds is necessary. What is needed is the selection of a suitable drought-resistant pasture grass and legume which will also help to restore soil fertility.

The establishment of permanent economic crops other than forest species is limited by the climatic and other conditions which prevail in the dry lowlands. Where no irrigation facilities are available, the mango, palmyrah and kapok are the most suitable, but there are possibilities with other fibre and gum-producing crops, provided suitable markets can be obtained.

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