Land Use, Soil Erosion, and Livestock Problems in Ceylon

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ON a map Ceylon is observed as a minute pear-shaped island dangling near the southern tip of India and many persons therefore conclude that its problems must have much in common with those of the larger neighbour. Ceylon is of course much influenced by events in India but the smaller land is strangely different in many ways and has a decided individuality of its own. Instead of the vast stretches of country of an endless sameness, as seen from a rail or air journey across India, the Ceylon scene changes quite appreciably over short distances, largely due to the sudden variations in climate and topography.

The main feature is a central mass of mountains running up to 8000 feet, and with a fringe of plains all around, but occupying a much larger space to the north. Against this mountain mass the two monsoons coming alternately from northeast in the winter and from southwest in the summer, are combed out and made to drop their load of rain. The resultant rainfall distribution makes one third of the island (the high hills and the southwest sector) very wet, with heavy falls during both monsoons. The remaining two thirds, including the whole of the northern lowlands gets only one monsoon. Although the rainfall quantity is still useful (45 to 80 inches of rain annually) its distribution is so bad that little or no cultivation has been attempted in the past apart from irrigated paddy land and the primitive form of unirrigated cropping that goes by the name of *chena*. Essentially chena is the same thing as the shifting cultivation which goes by various names throughout southeastern Asia.

The economy of Ceylon depends almost entirely upon the plantation industries of tea, rubber, and coconut palm products of oil and copra. Each of these is a monocrop with enormous compact blocks of country devoted almost entirely to the one thing, thus leaving little space or encouragement for any sort of livestock farming. A hundred years ago great tracts of hill jungle were cleared and burnt to make room for coffee, mostly on pretty steep slopes. The coffee flourished for a time but was hit in the 1880s with a disease which swept the industry off the map. The survivors tried many alternatives, such as cinchona bark, cinnamon, etc., but there was a longish pause before tea was accepted as the right answer. Today there are approximately 600,000 acres of tea, slightly more of rubber and about a million acres under coconut palm. The cocoa bean comes next with somewhere about 30,000 acres. This is being extended as an underplanting of over-age seedling rubber, now rather a problem crop because the costs of replacement with high-yielding clonal plants is too high to be attractive.

In terms of soil erosion these plantations all have their own problems, with tea having earned an unenviable reputation as the soil waster par excellence. In the early days rubber was clean weeded and the soil which was lost then from rubber land is just nobody's business.

Fortunately in the early 1920s a fashion for leguminous creeping cover crops was taken up widely and in a very short time the erosion menace disappeared so far as rubber is concerned. Where this crop is still "losing the bus" is in the failure of the rubber growers to appreciate the vital necessity for water conservation on their steep slopes and shallow soils. Rubber growing in 140 to 200 inches of rain is almost constantly suffering from shortage of soil moisture, and looks like it, too. Although these ground covers are largely edible fodder, grazing is discouraged by the rubber estates, partly because of the loss of latex through cups being broken down by the animals, partly by the extravagant claims for the death of inquisitive cows who lap up the latex when it is milk-like in consistency, only to find later that they have swallowed an embryo motor tire.

Even in the hills, pasture is a problem, for the natural grasslands are artificially maintained as such by a vicious fire cycle which prevents the true ecological climax of tree growth to come in again. The soil at best is a thin one derived from the gneiss shield, and consists of a coarse gravelly sand with a slight admixture of kaolin clay and mica. Under a forest cover it builds up into a reasonably fertile soil, but under a constant regime of grass fires it gets steadily poorer.

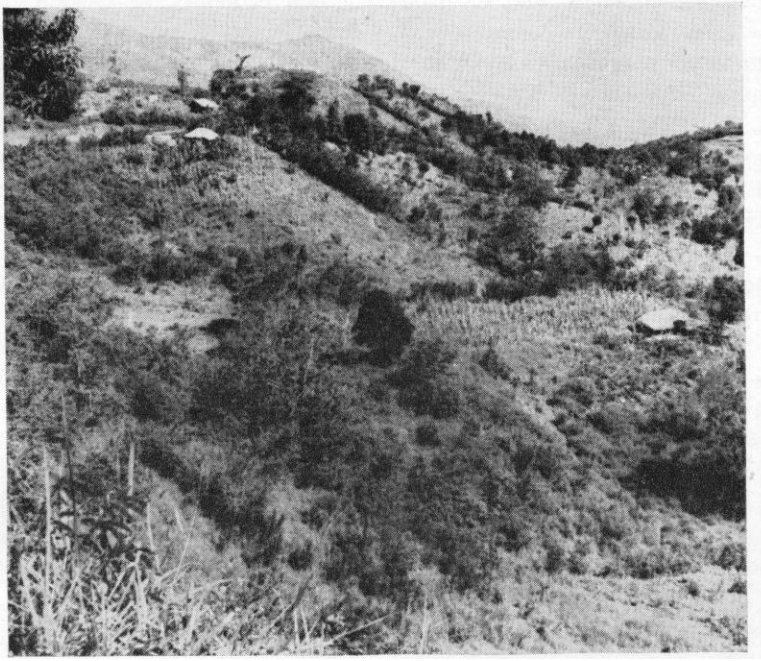

FIGURE 1. Recently established village extension at 3500 feet near Mulhalkelle. Community is already short of water as the water-table is fugitive since the forest cover has been destroyed.

The dominant *Cymbopogons* and *Chrysopogons* give a green bite for a few weeks after they have sprouted but subsequently are useless for grazing until they are again burnt off. No crop such as tea or maize will give much return on this unimproved *patana* soil. The only sure way to make it pay is to build up stored fertility by contour plowing, sow a thick crop of *mana* grass (*Cymbopogon confertifolius*) and keep fire out for 3 or 4 years while a deeper soil is built up.

The average villager is of course not prepared to take this trouble, and so the opening up of newly cleared *patana* land for village extensions (Fig. 1) is apt to degenerate in a very few years to the level of a rural slum.

In the animal husbandry farms in the high hills, there are many interesting problems of cultivation, drainage, soil conservation, and the establishment of sward pastures, but unfortunately the experience gained in them is not applicable to any very large area of land outside their boundaries. The African *kikuyu* grass (*Pennisetum clandestinum*) forms a turf (Fig. 2A) much more readily than any of the local grasses, but so far no legume except *Parochetus communis* has been found to combine with it to make a reasonable sward. The Australian molasses grass (*Melinis minutiflora*) combines with a local legume *Smithia blanda* to make a very palatable and persistent sward (Fig. 2B).

In the lower foothill elevations with better distributed rainfall such as is experienced in the central Experiment Station at Peradeniya (1700 feet and 90 inches of rain) a considerable variety of swards (Fig. 3) have been produced, both in the open and as a carpet under coconut palms. Here the *Paspalums* combine readily with indigenous legumes of the *Indigofera*, *Desmodium*, *Alysicarpus* type of ground cover.

In the arid northern plains, the clearing of forest to make way for new settlements is going ahead fast. Dry farming is not yet established as a dependable technique in the wake of programs which allocate 4 or 5 acres of irrigated paddy rice land and a 3-acre unirrigated block for a house and dry farming or mixed garden crops. Each householder is given two buffaloes and a cow, but so far little plowing is done, although the keeping of plow bullocks is being encouraged. The need for pasture is, however, fairly clear here, and in the true dry farming allotments it is planned as an integral part of the field rotation of 4 years cropping followed by four years under a grass ley. This grass ley is not yet a standard practice, nor is it fully proved that we have

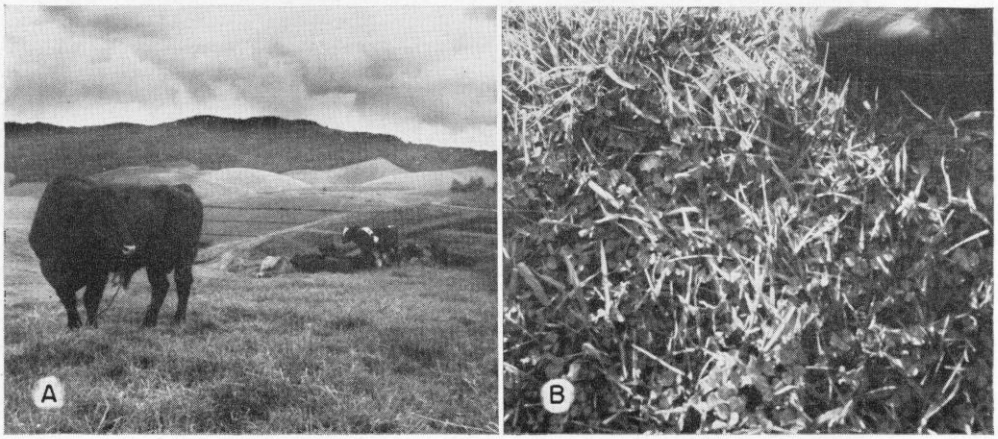

FIGURE 2. SWARD PASTURES, AMBAWELA GOVERNMENT FARM, 6200 FEET. A. Red Poll bull and calves in a *kikuyu* grass pasture. Contour ridges on steep cleared slopes and natural forest along the hill top. B. A cultivated mixture of *Melinis* grass and indigenous legume *Smithia blanda* shows great promise as a pasture mixture.

evolved a grass and legume mixture which will outlast 3 or 4 years of alternate monsoon and drought. So far the best mixture appears to be the *Melinis* with another Australian *Stylosanthes* as the leguminous component. Several of these "Stylos" are being tried, and so far *S. gracilis* has been the most promising. As a cover between field crops, the Bombay cowpea looks like being the mainstay of the crop rotation.

lated hilltop of tea severely mauled by a concentration of buffaloes surreptitiously herded in during one of their off-duty periods of relaxation from "mudding" the paddy fields.

In a well managed tea estate there is of course no room for grazing animals, though most of the Indian Tamil laborers keep stall-fed cows in their lines, and there is a big demand for cut fodder grass. Clean-weeding continues as stand-

FIGURE 3. Wimera grass sown broadcast on unterraced slopes has taken well except where main drainage of a storm has gullied away the young plants. Mahaberyatenne, an uptodate commercial dairy farm, lower hills at about 1700 feet.

In a land where there are very few sheep or goats, few pigs, and practically no horses, mighty little plowing, and a negligible demand for milk, one might expect to be rid of the spook of overgrazing. Compared with India's 80 million head of scraggy cattle, the Ceylon cattle are a comparatively simple problem, but even here one finds the inevitable sore spots where the neighbours' cattle, often semi-wild, do damage in the coconut estates. Recently I was shown an iso-

ard practice in tea, but current developments favor the retention of low ground cover plants such as *Oxalis*, *Drymaria*, *Hydrocotyle*, etc. The chief defence against soil loss is the network of deep contour trenches with "lock and spill" partitions which delay the run-off and allow the recovery of part at least of the washed soil from the bays in which the water is ponded back. A good cover of well grown tea with these trenches every 20 to 24 feet down the contour has the surface

well mulched with green manure lopped from hedges of leguminous shrubs such as *Crotolaria* and *Tephrosia*, and from wider spaced shade trees such as *Albizzia*, *Grevillea*, and the Australian wattle *Acacias*.

nursery stock of selected transplants, and gives advice upon the management of coconut estates. The grazing problem in the latter is usually confined to tethered animals, but a great deal of uncontrolled grazing takes place, leading to consider-

FIGURE 4. Unterraced planting of tea in a small holding at 4000 feet. Gum plantation, planted by the Forest Department, forms much needed shelterbelt (*Eucalyptus rostrata, E. microcorys, E. saligna, and E. robusta*).

The type of tea that causes most damage to the soil is the small holding with an open scatter of scraggy ill-tended bushes with their roots exposed until they have the form of the old-fashioned piano stool (Fig. 4). Such crops seldom have any contour drains, so that the sheet erosion is terrible, particularly after cleaning of weeds is done with a heavy mattock. Fortunately Government has realized the need for action and is in progress of building up a new extension service of small-holding tea instructors to be attached to the Tea Research Institute. A similar unit is already in existence for helping the rubber small holders with technical advice and a supply of high yielding clonal planting stock. The Coconut Research Institute is also running an extension service which provides

able erosion and water losses in the sandy coastal plains.

Apart from the destructive *chena* or shifting cultivation in the lowland forests and the hill man's equally destructive unterraced cultivation of maize on very steep slopes, the average villager has only one interest as a farmer and that is his rice paddy crop. The best paddy lands have enough irrigation supply for two crops, and the land is prepared by "mudding," or puddling it by walking two or three water buffaloes around till the mud assumes the consistency of a slushy concrete mix. The transplanting of young plants in preference to direct sowing is being encouraged by the agricultural advisory staff, and some attention is paid to using pure line strains. Even so, the yield is lamentably poor.

There is a fetish that irrigation must be continuous throughout the life of the crop until it can be ripened off, so the amount of water wasted is lamentable. Instead of 3.5 to 4 acre-feet as is used in other irrigation countries, the water used here is 14 or even 20 acre-feet per crop. Thus the buffalo is the main plowing unit, and as the unirrigated crops are largely worked on hillsides with a mattock instead of a plow, there is little need for any plow bullocks. The chief use for oxen is in drawing the light country carts, and the average animal is so slightly built that he has a pretty grim struggle, but they are game little beasts.

There is a considerable and new demand for milk in the towns but not yet in the villages, so milk production is not yet a prime necessity as it is in the western countries. The Agricultural Department has several cattle farms, those in the high hills aiming at establishing European breeds as pure herds of Ayrshires, Jerseys, Red Polls, and those in the plains devoted to the Asiatic breeds such as the Indian Scindi, Tarparkar, and Sahiwal. Experience to date shows that even with a reasonably high yielding strain of milker crossed with the local hill type, the so-called "Dutch" or "Cape" cow, the milk yield drops when these animals are kept long in the lower elevations and in the tropical heat and dry spells of the low country. The disappointing milk yield is probably due to the high absolute humidity and the lack of diurnal fall in temperature in the moist lowlands. It seems therefore that the special problem of the milk supply for the larger towns may be to maintain the herds in the high or middle hills and provide special transport for the milk to get it to market in a good condition. Some excellent pioneering has already been done by a few individuals and plantation companies on these lines, in urban dairies where the feeding and management are reasonably good.

INTERNATIONAL COOPERATION

Recent history has shown that the ultimate boundaries of the free world will depend in large part upon land policies. There are few countries which are not faced with major problems of land tenure and national resource development. Through improved transportation and the wide scope of World War II, people of different nationalities have been brought closer together as never before. Exploited people are learning better ways of life. Persons who had no hope of owning land or of obtaining equitable rights to resource use are insisting that aggressive steps be taken to eliminate conditions of peonage. They inherently want a secure right to land—one of the fundamental incentives to increased production and raised living standards.—*Byron C. Denny,* Our Public Lands, April 1952.