

The Effect of Basin Listing on Run-off and Erosion in the Dry Zone of Burma

BY

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THERE is a dearth of information on the quantities of surface run-off and soil erosion in Asia. The present small experiment which was carried out in Central Burma is now reported because it provides some data which, though not directly applicable to Ceylon, are indicative of the quantities of soil which may be lost under different systems of tillage. The writer has reason for thinking that the original records of this experiment have been lost and as there is particular interest at present in information of this kind the experiment is briefly recorded. The soils of the Dry Zone of Central Burma are calcareous loams often having a fairly high proportion of sand. They erode easily but not so easily as some of the non-lateritic soils of the Dry Zone of Ceylon. The land is mainly undulating, slopes up to 5 : 100 being common and sometimes twice as steep. The rainfall is 30 to 35 inches, nearly all falling between April and early November, the precipitation being characterized by its irregular distribution, frequent violent down-pours occurring which cause much sheet erosion. A drought is frequent lasting three to six weeks in July and early August, so that conservation of soil moisture is an essential of good husbandry as well as anti-erosion measures to cope with the heavy rains of late August and September.

The crops grown are cotton, beans, sesamum, sorghum and ground-nut, all line sown and intercultivated with bullock-drawn implements. Early trials with various methods of tillage and intercultivation had indicated that the use of basin listing greatly reduced run-off and soil losses. The making of tie-ridges with intercultivation implements is simple. It is only necessary to raise the implement by its handle-bars at suitable intervals (generally 6 to 8 feet), so leaving a small ridge of soil across the furrow. The tie-ridges should be staggered in adjacent rows. This simple method of basin listing was found to be very effective in holding up water and checking soil loss. Though the method had been widely accepted as beneficial there was no precise data on its effectiveness until the experiment recorded below was carried out. This experiment was done by the late H. F. Robertson in 1940 and 1941, after which the war stopped it.

The experiment consisted of seven plots of 18 × 4 feet on a slope of 6 in 100. The soil was Mahlaing Farm Upland, a very friable sandy loam with numerous calcareous nodules. At the lower end of each plot a tank

was sunk into the ground with arrangements for collecting the run-off water and eroded soil. The treatments were as follows:—

1. Fallow uncultivated. Ground left untouched and weeds (mostly grasses) allowed to grow. The soil surface became compacted and held by the fibrous roots of the weeds.
2. Fallow cultivated ... Cultivated with a *pauktu* (a heavy hoe) frequently and after each cultivation harrowed with a Burmese-type wooden-toothed harrow into low ridges diagonally across the slope. Cultivation was done after each fall of rain which was enough to pack the surface layer. Weeds were not allowed to develop.
3. Basin listed ... Hand cultivated into ridges such as would be raised at the final cultivation of cotton and tie-ridges were put in. Cultivation was done at irregular intervals after rain and tie-ridges were then re-made. Few weeds developed.
4. Cotton repeated ... Cotton was grown each year with the normal cultivation ending with basin listing. Cotton sown in squares with ridges across the slope.
5. Cotton rotated ... Cotton grown in the first year as in 4. Second year sesamum in the early rains followed by beans (*Phaseolus lunatus* Linn.) in the late rains (sown late August or early September). Normal sesamum cultivation in lines across the slope without basin listing and ridges low as raised by normal harrowing.
6. Sesamum repeated .. Sesamum followed by beans in the late rains as in the second year of 5, repeated each year.
7. Sesamum rotated ... First year sesamum as in the first year of 6 (and second year of 5) followed by beans in the late rains. Second year cotton as in 4. This treatment is the same as 5 but reversed.

With this arrangement there were two cotton plots and two sesamum plus beans plots in each year, in 1940, Nos. 4 and 5 being cotton and Nos. 6 and 7 sesamum followed by late rains beans while in 1941 Nos. 4 and 7 carried cotton and Nos. 5 and 6 sesamum plus beans. Measurements of surface run-off and of surface-eroded soil were made whenever necessary. Only rain of considerable intensity caused any erosion. Combining the figures for both years the quantities of water and soil collected are given in Table I in tons per acre.

TABLE I

Quantities of Run-off Water and Eroded Soil in Tons per Acre. 1940 and 1941 combined

Treatment		Tons of run-off water per acre	Tons of eroded soil per acre
1. Fallow uncultivated	..	742	6.4
2. Fallow cultivated	..	1119	22.1
3. Basin listed	..	363	12.7
4. Cotton with basin listing at last intercultivation	..	574*	11.1*
5. Sesamum followed by beans (Harrow-ridged but not basin listed)	..	1091*	31.0*

*Total of four plots (2 for each year) divided by 2.

The effect of uncultivated fallow with weed growth in preventing soil loss is clear but it allowed a good deal of water to run off. Cultivated fallow caused heavy loss of soil and with it went a lot of water. Sesamum followed by beans (the beans developing after most of the monsoon was over) was equally bad, if not worse. The two basin listed treatments, one bare and the other carrying cotton, gave the best retention of water with fairly low soil losses considering that in these cases frequent intercultivation kept the soil loose. Basin listing on fallow land has been better than when cropped with cotton so far as water retention is concerned but it is to be remembered that on the bare basin listed plot the basins were in existence throughout the year whereas in the cotton-cropped plot they were only built at the last intercultivation at the end of July.

It would be unwise to place complete reliance on figures for only two years but the indications are very much in favour of basin listing and they agree with the general experience in the area.

The soils of the Dry Zone of Ceylon differ considerably from those of this experiment. They are not calcareous and their low base exchange capacity indicates a kaolinite type of clay colloids less efficient in the formation of stable crumb than the tertiary soils of Burma. The rainfall and its distribution are similar or possibly more violent in Ceylon, while the crops which will have to be included in any rotation are similar. It seems safe to conclude that the losses of surface water and of soil are likely to be at least as high in the Dry Zone of Ceylon as in Burma and may even be more severe. The necessity for the adoption of methods of agronomy which will minimize such losses is imperative.