Sinhala × *Fresian Cows on Brachiaria Pasture at Bandirippuwa Estate*

UTILIZATION OF THE SPACE AMONG COCONUTS FOR INTERCROPPING

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In the earlier talks in this series my colleagues have pointed out to you the work in progress, at the Coconut Research Institute of Ceylon, to increase and improve the production, protection and processing of coconuts. I shall be dealing with another aspect of the work in progress, namely, studying the possibilities of growing another crop with coconuts so as to increase the total income to be derived from an acre of land.

Intercropping with coconuts is an age old practice in all coconut growing countries including Ceylon. In the Philippines, coffee, cocoa and pineapple are grown under coconuts on a commercial basis. A recent report shows that highland paddy has also been successfully grown under coconuts there. Here in Ceylon pineapple and to a small extent cocoa, are being grown on a commercial basis. Large numbers of cattle are maintained in the coconut growing areas, and the Coconut Research Institute has been interested in studying the possibilities of pasture production under coconuts.

Though systematic experimentation was started only a few years ago, and that too restricted only to the Institute's estates at Lunuwila and Madampe, some very important basic principles have been elucidated.

In attempting, to establish a pasture under coconuts, one replaces the existing weeds with grass and leguminous plants that are capable of producing good quality and quantity of feed for the cattle that graze them. This pasture will have some effect on the yield of coconuts, resulting in any one of the following conditions:—

(*a*) The yield of the coconut may be reduced.
(*b*) The yield of the coconut may not be affected. or
(*c*) The yield of the coconut may be increased.

In one experiment we observed that a pasture of *Brachiaria brizantha* reduced the yield of coconuts by 13%; the plots without pasture produced 5085 nuts/acre/year while those with pasture produced 4446 nuts/acre/year. In another experiment there was no change in the yield of coconuts due to the presence of the pasture.

Let us now examine how a pasture would effect the yield of coconuts. When two plant species such as coconuts and pastures are grown together a biological phenomenon called interspecific competition comes into operation. The plant species would compete with one another for the essential factors for growth. These factors are, light and carbon-dioxide above the soil surface and soil moisture and plant nutrients below the soil surface.

Competition for light operates when one species shades the other. In the present context, because the leaves of the coconuts are held at a considerable height there would be no competition for light detrimental to coconuts. Similarly there would be no competition for carbon dioxide detrimental to the yield of coconuts. Thus you will see that when an intercrop is planted with a mature stand of coconuts the yield of the coconuts will not be affected due to the growth factors of the atmosphere.

Unlike the separation of the leaves of the coconuts and the pasture plants above the ground, the roots of the two crops intermingle in the soil. Both crops would absorb soil moisture and plant nutrients at the same depths, and competition for these factors would be operative when any one of them are in supply below the combined demands of the two crops.

Considering soil moisture competition first, it is not difficult to visualize how this could be operative. In two experiments at Lunuwila it has been shown that when the two crops are adequately manured there was no loss of yield of coconuts. This means that under the rainfall pattern at Lunuwila there was no competition for soil moisture. In another experiment the yield of coconuts without pasture was 3512 nuts/acre/year and under pastures of *Brachiaria brizantha* and *Brachiaria miliiformis* were 3737 and 3726 nuts/acre/year respectively. This is a very important finding of wide applicability, i.e. it permits us to conclude that in all areas where the rainfall is similar to that at Lunuwila there would be no competition for soil moisture when a pasture is grown under coconuts. Lunuwila is just outside the northern boundary of the Wet Zone of Ceylon and receives an annual rainfall of 75″ from both the S-W and N-E monsoons. We may then conclude that in the Wet Zone a pasture will not adversely affect the yield of coconuts due to soil moisture competition.

Competition for plant nutrients would occur when any one or more of them are in short supply. Competition would be severe for the major nutrients, nitrogen and potash and to a lesser extent for phosphoric acid, calcium and magnesium. When no fertilizer was applied to the pasture the yield of coconuts was reduced from 1173 lbs. copra/acre/year to 619 lbs. copra/acre/year, but with sufficient manuring for the pasture the yield of coconuts was restored.

Thus in the Wet Zone of Ceylon the only factor for which pasture will compete with coconuts would be plant nutrients, and that can be completely eliminated by proper manuring. Proper manuring depends on two factors, namely, the quantity of the nutrients in short supply and the method of application. We have reasons to believe that if all the fertilizer is applied, over the entire area of the pasture, broadcast, the quantity required would be very high. In the alternative if the coconuts are manured in the usual manner in circles round their base, then a smaller quantity broadcast for the pasture would eliminate all competition. Our experience shows that coconuts should be manured once a year at least, with the mixture recommended by the Coconut Research Institute, in circles, and the pasture should be manured broadcast at the beginning of each monsoon with a mixture of 1 cwt. ammonium sulphate, $\frac{1}{2}$ cwt. muriate of potash and $\frac{1}{2}$ cwt. Saphos phosphate per acre.

The pasture I have been talking about up to now is that of a single grass species of either *Brachiaria brizantha* or *Brachiaria miliiformis*. An ideal pasture however should have in addition to the grass another species of plants called legumes. In the tropics it has not yet been possible to find a legume that would grow in association with the grasses. This problem is now receiving the attention of pasture ecologists in all tropical countries and we are confident that in the immediate future it will be solved. The incorporation of an effectively nodulating legume into the pasture would increase the protein content of the feed and reduce the amount of fertilizer nitrogen that has to be applied to eliminate competition for that nutrient.

We may then conclude the foregoing discussion by stating that pasture can be grown under coconuts in the Wet Zone of Ceylon without any bad effects to coconuts, with the application of fertilizers in addition to that applied to the coconuts.

This then brings us to the problems of selecting a good pasture grass and an efficient animal to graze this pasture and convert it into milk and or meat.

The choice of a pasture grass for the purpose is very much restricted at the moment. There are only two proven species available in Ceylon. They are *Brachiaria brizantha* and *Brachiaria miliiformis*. We have found *Brachiaria miliiformis* to be somewhat superior to *Brachiaria brizantha* in the following considerations:—

1. *Brachiaria miliiformis* is cheaper and easier to establish than *Brachiaria brizantha*. All that one has to do is to spread the cuttings on the land and run a harrow or partly cover the cuttings by mammoty hoeing. The grass will quickly grow and spread.

2. The growth and spread of *Brachiaria miliiformis* is such that it covers the entire area within a month or two and generally chokes out weeds.

3. It withstands grazing and drought as well as or even better than *Brachiaria brizantha*.

4. *Brachiaria miliiformis* is more tolerant of shade than *Brachiaria brizantha*. This would be an added advantage under coconuts.

5. *Brachiaria miliiformis* produces similar amounts if not more feed than *Brachiaria brizantha* under similar conditions.

6. Important of all is their relative effect on coconuts. In an experiment in progress at Lunuwila to assess the competitive effect of the two grass species on coconuts for nitrogen it is observed that coconuts in *Brachiaria miliiformis* pasture yielded 3582 nuts/acre/year while those in *Brachiaria brizantha* yielded only 3249 nuts/acre/year; a difference of 233 nuts.

The indegenous cattle, called the Sinhala is a small animal capable of producing only 4.0 points of milk per day, is inefficient and uneconomical. For dairying to be profitable under coconuts the animal used should produce at least 8 pints of milk per day. Such efficient animals could be raised by cross breeding the local cows to the exotic Jersey. The Department of Agriculture has recently imported large numbers of good quality Jersey cattle for breeding purposes and distributes semen through a net work of artificial insemination centres throughout the country. Interested persons should contact the local Agricultural Instructor for advice on this matter.

We may now conclude that in the Wet Zone of Ceylon a pasture of *Brachiaria miliiformis* can be grown under coconuts without causing loss of yield of coconuts and the venture would be economical if an efficient animal is raised on the pasture.

A considerable number of people have taken up to proper dairying under coconuts and we hope to see many more to join us to make Sri Lanka self-sufficient in her requirements of dairy produce.