GRASS UNDER COCONUTS

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Is grass good or bad for coconuts ?

"REHABILITATION" is a word with which, in recent times, anyone who has anything to do with coconuts has become familiar. Land that has been under a single crop for a long period loses much of its fertility, and it is a fact that much of the land that has been under coconut for half a century or more is now beginning to show conditions approaching desert. Any scheme for the rehabilitation of the industry must therefore include, as a major requirement, the restoration of fertility to a worn-out soil.

There are two distinct parts to the management of a coconut plantation—the management of the palms in order that the largest possible crop should be secured, and the proper management of the soil in order that its fertility should in no way be impaired. It is not proposed to deal with the first part, because it is the side of the question to which attention is almost invariably confined; the second part is, however, almost as invariably neglected.

One of the early symptoms of deterioration in a soil is a reduction in its capacity to retain moisture, with the result that a comparatively short dry period causes drought conditions. A soil in "good heart" will not display these conditions unless the dry spell is unduly prolonged. It is only by increasing the humus content in a soil that its capacity for holding moisture may be restored, and the question that arises is what is best to be done to increase the humus content.

It is both interesting and instructive to consider nature's method of restoring fertility to a worn-out soil. With the first rains a crop of weeds will grow, to die when the rains are over. With the next rains, a second crop of weeds will grow and, again, die. The dead and decaying weeds will provide the food for the succeeding generation, and each generation will be stronger and provide more organic matter than the last. Some of the vegetation will be deep-rooted and, while living, will draw up some minerals required for their growth, and deposit these in the surface layer when they die and decay. There will be leguminous plants that will capture nitrogen from the air and enrich the soil in nitrates. While nature's method is very sure, the process of rehabilitation is very slow, too slow for Man who is always in a hurry.

The question is whether, following nature's method, we cannot hasten the process. The addition of mineral salts or organic materials such as fish or bone meal, will not restore fertility to a dead soil directly. Indirectly, by encouraging a lush growth of vegetation which, on its return to the soil, will help in the formation of humus, these fertilizers may have their uses.

It may be possible, by repeatedly returning to the soil the larger quantity of vegetation, produced with their assistance, to do in five years what nature, left to herself, would require ten years to perform.

The choice of vegetation to grow in any scheme for the restoration of fertility is a matter for consideration. The use of animals in combination with the vegetation would be worth considering at the same time. Dr. Waksman* has defined humus as "a product of decomposition of plant and animal residues through the agency of micro-organisms." If this definition is accepted, then the vital need for animals in the scheme becomes clear and so the choice of vegetation will be limited to such herbage as the animals will eat—in other words, to *pasture*.

Good pasture consists of three distinct classes of plants,—grasses, legumes and other herbs Unfortunately grass has been given a bad name by some of the visiting agents of coconut estates, and some planters have also been heard to express the opinion that it poisons the soil. No scientific data have ever been given in support of this opinion. On the other hand, the work done by Sir George Stapledon and others has proved, beyond a shadow of a doubt, that pasture, the chief component of which is grass, properly managed, which would include regular, controlled grazing, has no equal as a means of restoring soil fertility, and Ley Farming has become recognized as essential in soil conservation. Is it not perhaps possible that Stapledon, whose conclusions were reached after much scientific investigation, is right and that the others are mistaken?

In rather picturesque language an American Lawyer, John J. Ingalls, has this to say of grass: "Our earliest recollections are of grass; and when the fitful fever is ended, and the foolish wrangle of the market and forum is closed, grass heals the scar, and the carpet of the playing infant becomes the blanket of the dead.

"Grass is the forgiveness of nature, her constant benediction . . . Forests decay, harvests perish, flowers vanish, but grass is immortal . . . Its tenacious fibres hold the earth in its place and prevent its soluble components from washing into the wasting sea . . ."

The grasses, legumes and other herbs that combine to make pasture each have an important part in the restoration and maintenance of soil fertility. Grass throws out more roots than any other plant and these not only bind the soil and prevent erosion, but give it the crumb formation which is one of the important attributes of a fertile soil. The legumes increase the nitrogen content in the soil; other herbs, particularly the deep-rooted varieties, draw up plant nutrients from lower levels and leave them in the upper layer of top soil when the plants either are returned to the soil through an animal or are cut down. Their roots leave passages through which both air and water percolate into the subsoil.

Life, death and decay are all part of a cycle which has been beautifully described by Prof. J. Arthur Thomson†. "As Heraclitus said, 'all things are in flux. 'The rain falls; the springs are fed; the streams are filled and flow to the sea; the mist rises from the deep and the clouds are formed which break again on the mountain side. The plant captures air, water and salts, and, with the sun's aid, builds them up by vital alchemy into the bread of life, incorporating this into itself. The animal eats the plant; and a new incarnation begins. All flesh *is* grass. The animal becomes part of another animal, and the reincarnation continues.' Finally, if we can use such a word, the silver cord of the bundle of life is loosed, and earth returns to earth. The microbes of decay break down the dead and there is a return to air and water and salts."

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* Quoted by Balfour [illegible] iving Soil."
† "Introduction to Sc[illegible]" — Arthur Thomson.

It is usual in Ceylon to differentiate between the shorter grasses on which cattle graze, and which are known as " pasture grasses," and the taller varieties, such as Guinea and Napier, which are known as " Fodder Grasses." The latter, which are cut and fed to cattle, are cultivated as a crop and, like every crop grown in mono-culture, result in the ultimate impoverishment of the soil. The experiment carried out on Kirimetiana Estate by the Coconut Research Institute has shown that the cultivation of Guinea grass had an adverse effect on the coconut. The effect of good pasture, properly managed and grazed under control, should be beneficial to the soil, to judge by results obtained by Stapledon and others. The effect on the coconut crop under similar management remains for investigation. The writer's own experience is that there is a definite improvement in the soil and that there is no shortfall in the crop of coconuts.

It is a fact that very few of the local grasses have common names and in describing them one is compelled to use the botanical names. In this respect Ceylon today is much in the same position that England was in a little less than two centuries ago, when Stillingfleet " assigned English names to our commoner grasses, though in most cases he was content to translate from the Latin of Linnaeus .... To name is to create interest, and the awakening of a grass consciousness embracing something more than just grass may be said to date from Stillingfleet."*

Among the common grasses that are known by names other than the botanical are :—

1. *Axonopus Compressus* : " Carpet grass " ; Sinh. " Pothu thanakola."
2. *Panicum repens* : " Couch grass " ; Sinh. " Atora."
3. *Eleusine indica* : Sinh. " Bala thanakola." (The first " a " in Bala as in " Ballet.")
4. *Brachiaria muticum* : " Water grass." Sinh. " Diya thanakola " ; Tam. " Tanni pillu."
5. *Cynodon dactylon* : " Doob " or " Bermuda " grass. Tam. " Aruwam pillu."

In Fiji and some other of the Pacific Islands, *Brachiaria distachya* is known as " Thurston grass "; the same name may be used locally. Among the common legumes are :—

1. *Desmodium trifolium* : Sinh. " Undupihili " ; Tam. " Mossel pillu."
2. *Desmodium heterophyllum* : Sinh. " Maha undupihili " ; Tam. " Periya Mossel pillu."
3. *Desmodium heterocarpus* : Sinh. " Ath-undupihili."
4. *Alyssicarpus vaginalis* : Sinh. ".Aswenna."

A distinction may be drawn between cultivated and uncultivated grasses. The latter do not provide very much nourishment for animals and if over-grazed, as is usually the case on coconut plantations where animals are kept, may cause damage to the soil. On the other hand, cultivated pasture and controlled grazing will provide food for both animals and soil. Again, it is necessary to draw a distinction between the so-called fodder and the pasture grasses. The former are cut, carted off the land and fed to the animals in stalls. In order to secure a heavy crop, the land between the stools of grass is kept clean-weeded. The regular removal of the fodder grass is a steady drain of soil fertility ; the exposure of bare soil to the strong tropical sunlight results in desiccation and the oxidation of the humus, while both wind and rain will cause erosion.

* " Ley Farming," by Sir R. George Stapledon and William Davies.

In the case of pasture grass, with the exception of the small quantities of mineral salts assimilated by the animal, there is no loss, and the carpet of grass protects the soil from both oxidation by sunlight and erosion by wind and rain. There is a steady accretion of humus under good turf, and Stapledon and his helpers have shown that the quickest and surest way of restoring fertility is by cultivating good pasture.

The study of the succession of grasses is interesting. The first to make their appearance on poor land are the pioneer grasses, such as *Digitaria longiflora* and "Doob" (*Cynodon dactylon*). They are the short, creeping grasses that one usually sees on coconut plantations. Frequently in association with these is to be found the smallest of the *Desmodiums*, *trifolium*. They, so to speak, prepare the way for the better grasses. They do not, except after a long period of undisturbed growth, provide sufficient material to be turned into the soil, and premature ploughing or over-grazing will result in the persistence of the original conditions of soil poverty. If, however, there is careful management and controlled grazing by animals that have been fed with some concentrates, it will be found that, after a time, the better grasses begin to make their appearance. Among these are Carpet grass (*Ischaemum compressus*), Thurston grass (*Brachiaria distachya*), *Dactyloctenium aegyptium*, and *Ischaemum ciliare*. The larger *Desmodium*, *heterophyllum*, and *Aeschynomene* (*Alysicarpus vaginalis*), flourish with some encouragement.

Again, over-grazing or premature ploughing, will cause deterioration of conditions, and nothing would be easier than to return to the stage when only the pioneer grasses will attempt to grow. Feeding the animals with concentrates or manuring the pasture will speed up the process but, if the latter alternative is chosen, it must be appreciated that the manuring of the pasture is something distinct from manuring the coconut palms that stand in the pasture. The one is intended to prevent the development of desert conditions by increasing soil fertility; the other is intended to increase the coconut crop.

It has been the writer's experience that, of the imported grasses, *Paspalum dilatatum* will stand competition with the local grasses and persist in pasture, unless it is badly over-grazed. To a limited extent and under high shade, Guinea grass will do the same. Of the imported legumes, Vigna (*Dolichos hosei*) has proved to be the best; neither *Pueraria javanica* nor *Centrosema pubescens* has stood up to regular grazing or competition as well.

Of the deeper rooted herbs, "Heen madu vel" (*Ipomoea aiculata*) is a favourite with cattle The larger "Madu vel," which thrives exceedingly well in some places, does not do equally well here. It is eaten readily and should be valuable in a pasture. "Gira palla" (*Commelina spp.* and *Ruellia* are not so deep-rooted, but are valuable.

In writing the foregoing the writer has drawn chiefly on his own experience under a particular set of conditions. Under different conditions of climate and soil, results may be different It would be well to remember, therefore, that if adoption of certain methods do not give good results, adaptation may succeed.

(Correspondence on this important subject is invited.—*Ed.*)