WEEDS ON COCONUT LANDS AND THEIR CONTROL

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INTRODUCTION

Weeds are an eternal problem on all crops. A variety of annual and perennial weeds are present on most coconut lands, and their eradication and/or control is one of the important aspects of efficient cultivation and successful agronomy.

On a perennial crop like coconuts, compared to an annual crop with a short growth period, say like paddy or wheat, the complete eradication of weeds may not be an absolute necessity. Weeds no doubt rob plant food from the soil and deprive the main crop, say coconuts or rice, from the legitimate utilisation of native and added fertility. While in the case of an annual crop, a competitive weed may effect the harvest materially, by depriving it of nutrients at a critical stage of its growth and development; in the case of a perennial such an effect may be only temporary, as the plant food robbed by a competing weed flora can be turned back into the soil by harrowing or ploughing, and on decay in the soil, the nutrients released would be utilised by the Coconut palm for growth and production.

PART I

THE BIOLOGY OF WEEDS

How Weeds Spread

In studying the establishment, dispersal and control of weeds, the **Biology of weeds** i.e. how weeds germinate, grow in competition with the main crop, flower, seed and re-propagate, need particular attention and careful consideration.

Weeds propagate in a variety of ways and among numerous methods of weed dispersal the following deserve particular notice:

1. **Vegetatively** — i.e. by stolons (suckers), rhizomes, bulbils or underground organs, e.g. *Cyperus rotundus* (Nut grass. Sinh. **Kalanduru** කලාඳුරු; *Panicum repens*, Couch grass. (Sinh. **Etora** ඇටෝරා. Illuk grass, (*Imperata Cylindrica. Imperata arudanacea*) (Sinh. **Illuk** ඉලුක්).

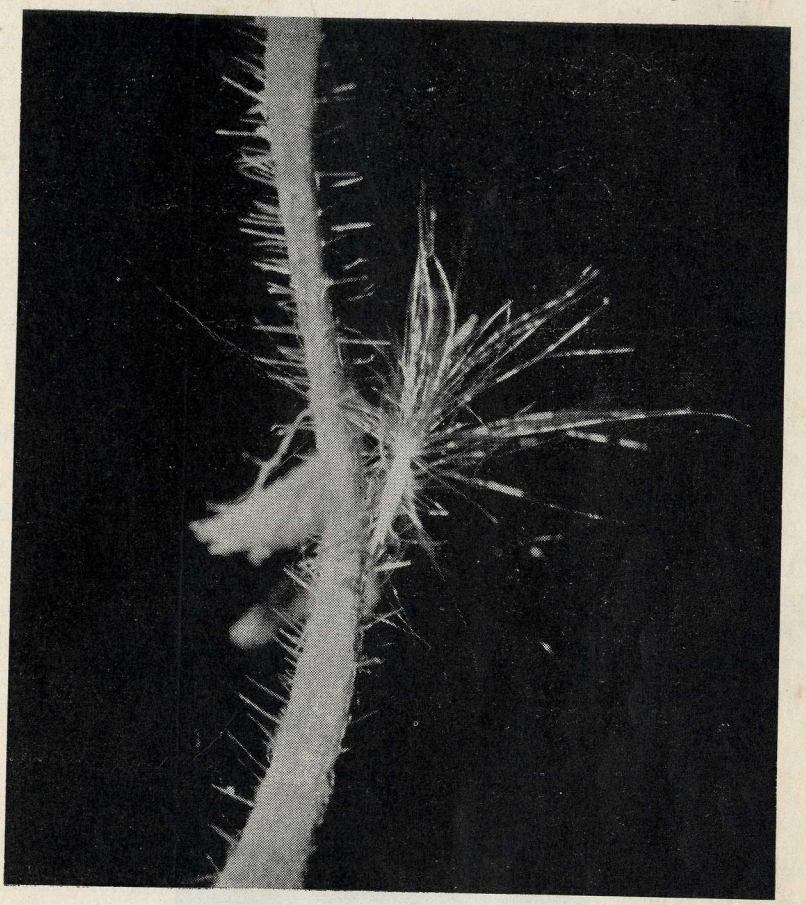

Plate I — A wind-blown seed attached to the hairs of a weed (Croton glandulosus) (Note mechanism for dispersal by wind)

2. **By seed** — Seed dispersal is the most important method.

Seeds are dispersed in a variety of ways, e.g. by *wind*, when seeds having a parachute mechanism as in (Plate No. 1), are carried long distances such as seeds of Vernonia Cinerea (Sinh. **Monara Kudumbiya** මොනර කුඩුම්බිය) by *birds* as in the case of Careya Arborea (Sinh. **Kahata** කහට). Careya arburea with its fleshy fruit embedded with seeds; the Sacred Bo (Ficus Religiosa); *animals* and *humans*, as in the case of seeds where the seed coats contain spines and thorns, such as in Queeni grass (*Cenchrus echinatus*) now common as a troublesome weed in some estates in Bingiriya and Chilaw, which get attached to clothes and footwear and are thereby dispersed by human agency.

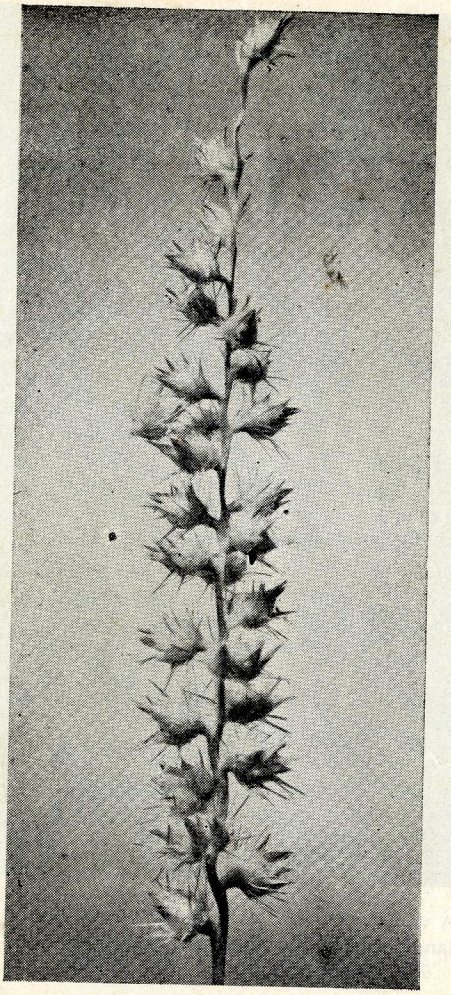

Plate II — Seeds of Cenchrus echinatus
(Note Spines which help in dispersal by animals)

There are several cases of noxious weeds recently introduced from other countries in supplies of green manure and/or vegetable and other seeds, or in food grains. A case in point is *Mimosa Invisa,* a recumbent bushy legume with large spines, much more noxious and irritating to labour working barefoot than our common *Mimosa pudica* (Sinh. **Nidi kumba** නිදිකුම්බ).

Under the heading **''Biology of weeds'', Weed ecology,** or growth of weeds in relation to their environment needs primary consideration. For example some weeds are adapted to be dominant on an acid soil, the clas-

sical case being that of the English weeds Spurrey and Sorrel (Rumex acetosella); some dominant on saline soils, such as on salt marshes (e.g. *Salicornia brachiarta*) and the shrub Lunu-warana ලුණුවරණ (*Crataeva roxberghii*); yet others on sandy wastes, e.g. the woody shrub *Calotropis gigantea* (Sinh. Wara වරා); yet others do not survive on water logged soils while on the other hand the rushes and sedges (e.g. Typha) thrive on such lands; the perennial and ubiquitous *Mimosa pudica* Sensitive Plant (Sinh. **Nidi kumba** නිදිකුම්බ) grows particularly luxuriantly on over-grazed gravelly soils. On the other hand *Illuk* is also adapted to almost any soil, more so on light sandy soils where its suckers can develop easily underground.

Most weeds do not tolerate shade, while some do, such as those that survive the dense shade of coconut palms, particularly where close planted and the ground completely shaded.

Among weeds dominant on all environments, on almost all soil types and ranges of climatic is *Eupatorium odoratum*, growing luxuriantly and covering acreages of coconut lands of the Southern Province from Galle and Baddegama with its lateritic soils and high rainfall to the rich alluvial soils under conditions of low rainfall and certain droughts in Weeraketiya, Walasmulla and Middeniya in the Hambantota District, and recently colonising coconut lands in the Chilaw district (Coconut Research Institute, Bandirippuwa Estate being the latest victim).

Viability and Dormancy of Seeds

The essence of weed control, where weed dispersal and propagation is by seed, is the adoption of such methods, mechanical or chemical, so as to prevent flowering, and seed setting. Such methods involve weeding by hand implements, say with mammoties as used to be done when labour was cheap and in plenty, or by mechanical methods such as disc-harrowing or mowing, and chemical methods such as the use of weedicides.

Weeding incidental to grazing by cattle so common on coconut estates when the weeds, may be grasses in particular, are eaten up without giving such weeds a chance of flowering and seeding, is one of the most important techniques of weed control on coconut estates.

Some weeds such as *Hyptis suavolens* (similar to 'Maduru tala' මදුරු-ටලා) produce a large number of small flowers and correspondingly large number of tiny seeds which on fertilisation set seed and mature in a very short period. These are shed on to the ground, remain viable (i.e. show ability to germinate) for long periods, and when one crop of weeds is eradicated, the seeds buried in the ground germinate with one shower of rain, and a second crop of noxious weeds come up (Plate III) and pro-

duce another. The recent introductions *Euphorbia geniculata* and *Croton glandulosus* which made their appearance on coconut estates of Chilaw district and in Bingiriya not more than ten years ago during the second World War belong to the Family Euphorbiacae and germinate from shed seeds buried in the ground, have a short period of growth (a few weeks) during which the new plants mature, flower and/or produce thousands of seed, which on the eradication of one crop of weeds by disc harrowing, germinate with the slightest shower of rain and continue its vicious cycle of weed propagation and dispersal, and competition with the coconut palm.

Plate III — *Croton glendulosus* a new dominent weed on Coconut lands

It may also be mentioned that cattle, buffaloes and goats, which normally keep weeds on coconut estates under control also help in their dispersal by grazing on green vegetable matter and incidentally consuming thereby some seeds, which are evacuated on to the soil, in which ideally suitable medium — (dung) they germinate and grow luxuriously.

Similarly Kahata (Sinh. කහට *Careya arborea*) is dispersed by birds such as Crows, and Minas; the seeds of the grass *Pennisetum* a Millet type of fodder which was some years ago introduced to some of the Farms of the Department of Agriculture in the Kurunegala district and which has now become a pest in the coconut holdings of Kobeigane and Ganewatte (Plate V).

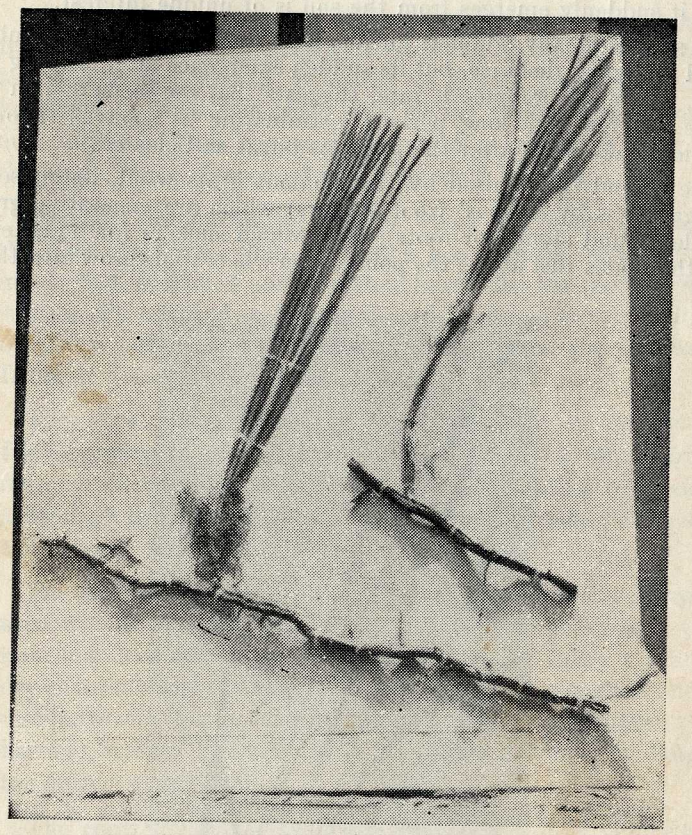

Plate IV
Illuk growing through Coconut Roots

PART II

SOME COMMON WEEDS AND THEIR CONTROL

In this series of articles, the common noxious weeds on coconut lands will be discussed, their characteristic features explained, and suitable methods of control recommended.

No. 1 — Illuk

Illuk is the local Sinhalese name of this noxious troublesome weed that most coconut land owners have to tackle, unless a careful watch is kept. In Malaya it is called '*Lalang*' and is a universally troublesome cosmopolitan weed in the Tropics. Its botanical name is *Imperata cylindrica* (*arundanacea*) and belongs to the Gramineae or Grass family.

Method of propagation and dispersal — The establishment of this noxious grass on young coconut clearings and even on mature areas where it suddenly emerges from the soil is of unique interest.

The seed is ideally adapted for dispersal by wind and is undoubtedly carried to a great distance, but its sudden emergence after clearing virgin jungle, where its presence is rare, suggests that the seeds remain viable on the soil for very long periods, germinating as soon as favourable conditions take place after the jungle is burnt and cleared.

Once a land is colonised by this noxious grass weed, its subsequent propagation is by '*stolons*' (root suckers) which are vegetative growths of underground stems (or roots), from which suckers (or buds) emerge from the nodes just above the points from where roots grow into the soil.

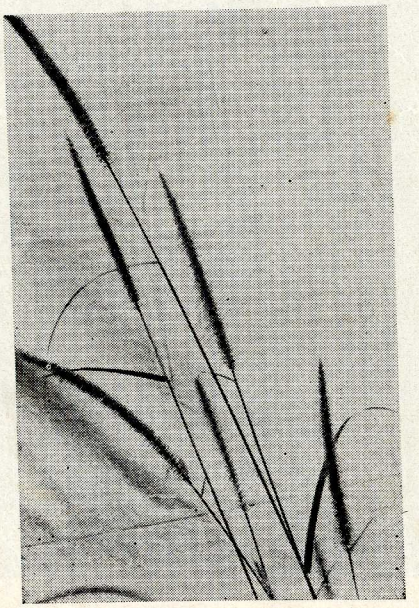

Plate V
Pennisetum — A new weed

Control of Illuk

The basic principle in *Illuk* control is not to allow its incipient establishment on the land. With the first appearance, the stolons should be dug, pieces left underground carefully picked out and burnt.

Once established through neglect and/or bad cultivation, or when abandoned estates have been inherited, the problem of eradication demands careful and sustained attention, and considerable expense.

METHODS OF ERADICATING ARE EXPENSIVE, LABOURIOUS AND TIME CONSUMING and fall under the following categories:

1. Mechanical Methods

(*a*) *Ploughing or Digging* — This is expensive and labour intensive. Too frequent cultivation damages the soil and coconut roots. Once *Illuk* infested land is ploughed, it should be lightly disc-harrowed and cross-harrowed to break the clods, and all the stolons and suckers collected and burnt. A chain harrow attached to a tractor is very efficient for this work; in its absence a hand rake could be used.

Frequent disc-harrowing (except where heavy tractors are used and the discs run deeper than 4 inches) is less harmful than frequent ploughing. In fact, sustained and persistent harrowing has been the method very successfully adopted in the control of *Illuk* in the manurial experiment on young palms at Ratmalagara Sub-Station of the Coconut Research Institute planted in 1948 December.

This experimental area was, before planting, secondary jungle with *Illuk* growing at least 2 feet high, with a thick impenetrable mat of roots and dead stolons. The soil is a loam about 1½ feet deep overlying a compact gravelly sub-soil, occasionally interpersed with ferrugineous concretions, and/or angular quartzitic gravels.

The method successfully adopted was persistent disc-harrowing simultaneous with the manuring of the young palms in circular trenches and inter-manurial disc-harrowing at least twice or thrice a year during the dry months. Once in 1954 the entire land was ploughed and since then disc-harrowing has been a regular practice, using Ransom's Eight-Disc-harrows, buffalo drawn in the early days and drawn by Ferguson Tractor during recent years.

The control of *Illuk* has been most remarkable; and the succession of grasses that have replaced the noxious *Illuk* most revealing. *Illuk* was very largely replaced in successive stages by the grass *Rhynchelytrum repens* with its characteristic pink white inflorescence and subsequently occassional patches of Couch, *Panicum repens* (Etora — Sinh.

ඇටවරා) have followed and become dominant. The dominant herbarceous weed subsequently established was the newly introduced coloniser of coconut lands, *Euphorbia geniculata*, which drastically smothered the *Illuk* and on the *Euphorbia* being disc-harrowed, other grasses such as *Rhynchelytrum repens* or even *Brachchiaria distachia* succeeded, this phenomenon being evidence of dormant seed lying buried in the soil and remaining viable for long periods.

Grazing and Illuk

Young immature *Illuk* is eaten by cattle, particularly by Buffaloes when other luscious fodder is not available as during droughts.

It is traditional practice to keep both neat cattle and buffaloes on coconut estates, mostly for manuring by tethering to the palms at night and for internal transport. Cattle keeping on coconut estates, except in a few cases, does not form a part of systematic animal husbandry as such, but serves the very useful purposes of keeping the land free of weeds; and of these weeds it is *Illuk*, that endemic weed of coconut lands, that the grazing animals help to keep under control. This is particularly true of areas of low rainfall such as the Puttalam and Kurunegala districts, where *Illuk* grows faster than other weeds, and in due course becomes the dominant vegetation competing with coconuts for plant food and moisture.

Two classical cases have come under our notice and deserve record: (*a*) During the Second World War, following an epidemic of Rinderpest, a large estate in the Puttalam district (near Mundel) lost the entire herd of neat cattle and buffaloes. Subsequently barely six months later when the writer visited the land, he was surprised to find *Illuk* rearing its head from below ground and most fields where it was never seen, completely covered by a thick growth, at least 6″ high of luscious *Illuk*, which subsequently reached nearly a foot high during the rainy season.

Similarly on a co-operative manurial experiment conducted by the Coconut Research Institute on an estate at Bingiriya which normally had a large cattle population, at least one head or more per acre of both buffaloes and neat cattle, and was well managed, as soon as cattle were kept out in the interests of exigencies involved in the experiment, *Illuk* was evident barely six months later where not a blade was seen before, and now after 12 years, inspite of disc-harrowing, with mechanical aids, *Illuk* has become the major problem of the land under experiment, perhaps vitiating the results of this experiment.

A similar problem, exists in the Puttalam district (round Mundel area) where lands underplanted and kept free of cattle, to prevent cattle

damage to these seedlings have all been faced with the problem of *Illuk* which seems to thrive on the rich sandy loams of this district.

Control by Buffalo Penning

In the incipient stage of *Illuk* being established on the land, if growth is not extensive, covering a large area, nor intensive, growth being not thick, penning buffaloes, (and particularly if the process is repeated) can not only successfully control this noxious coloniser, but also add fertility to the land. Whether it is the persistent grazing and/or the stamping by the heavy hoofs of the buffaloes, or the action of the urine which is alleged to smother the underground stems (stolons), it is difficult to say; but the fact remains that even when the growth is heavy, effective and successful control is economically possible by this method.

Cover Crops to Control Illuk

Where rainfall is not low (above 75 inches) as in the Gampaha, Veyangoda, Galle and Matara districts, cover crops have been successfully utilised to smother illuk and thereby control and finally eradicate it. The actively growing creeping Legume *Pueraria javanica* is the most suitable, while *Centrosema pubescens* is rather too slow growing, and *Calapagonium mucunoides* dies back in March during drought, when *Illuk* again rears its head and establishes itself.

The *Illuk* should first be disced or yet better ploughed and the *Pueraria* seeds broadcast at a rather heavy rate (7 to 8 lbs./acre) broadcast, (or 3 to 4 lbs. if planted in rows) at the beginning of the rainy season. The *Pueraria* should not be grazed and/or slashed or disc harrowed for at least two years until the undergrowth of *Illuk* has been completely smothered and eliminated, and shed seeds of the cover are dominant in the soil to regenerate. Grazing of *Pueraria* is usually a prelude to *Illuk* re-establishing in patches.

Tephrosia Candida (Boga) as a Control crop

In trials at Ratmalagara sub-Station where, as stated before, Illuk was a major problem, the growth of *Boga* in rows between palms, (1 foot between rows and 6" along rows), and cutting and mulching the Boga between rows, over the *Illuk*, very successfully controlled and even eliminated *Illuk* grown in observation plots some years ago. This method is however costly today with high cost of and shortage of labour.

It is recorded that this method has been successfully tried in Africa.

Euphorbia Geniculata **as a Smother Crop**— *Euphorbia geniculata* has been previously mentioned as a troublesome new herbaceous weed colonising coconut lands that has become evident both at Bandirippuwa and Ratmalagara Estates belonging to the Coconut Research Institute,

in particular, and most of the estates of the district in general. It has however one redeeming feature — it effectively controls *Illuk*. This weed produces a massive growth of seeds, which quickly germinate, grow up for over a foot high in barely one month, persists during dry weather and does not give the *Illuk* a chance to regenerate. Whatever the reasons may be, e.g. toxic root secretions which this Euphorbiaceaous plant produces, or some other competitive factor, *Illuk* has completely disappeared from most of the plots of the manurial experiments on young palms at Ratmalagara, where as mentioned before, repeated disc-harrowing also may have been no doubt a contributory factor.

This plant, typical of the family Euphorbiacae secretes a latex, which may also be present in the roots and enter the soil, producing a toxic effect on the *Illuk*.

Thatching and Mulching

After ploughing, disc-harrowing, or digging the soil with the *Illuk*, thatching with cadjans, or with the leafy ends of fronds, several layers thick, has been successful in smothering *Illuk*. The mulch has however, to be thick if it is to be effective so that by cutting off light completely the weed is smothered. Where the land is termite (white ants) infested, the thatch or mulch decays in no time and the *Illuk* rears its head and re-establishes itself.

In any case under present day costs and shortage of labour this method may be a counsel of perfection.

Burning

It used to be the practice in the old days of the nineteen thirties, to burn *Illuk* during the dry season. The danger of starting 'Bush Fires' that can do considerable damage to coconut palms, where the *Illuk* is thick should also be stressed.

Burning causes regeneration of young succulent *Illuk* (which of course cattle and buffaloes relish), but unless heavily grazed by penning cattle, the remedy is worse than the disease — and new growth is more luxuriant than the old, the flush resulting from the ash and mineral nutrients liberated by the burning of the *Illuk*.

Chemical Methods of Control

Chemical methods have been recommended and various claims made by proprietary weedicides, but our experience in these methods is very little and limited.

Arsenates have been tried in Malaya, but the danger of poisoning both cattle and humans on coconut estates remain a major risk, as well as the pollution of water supplies on estates.

Among weedicides DOWPON has been claimed to be effective, but at the rates recommended it is costly and even prohibitive particularly when the price of coconut produce is low, such as today.

(*To be continued in the next number*).