https://doi.org/10.29321/MAJ.10.A04520

# PLANT RESOURCES IN AGRICULTURE

By

S. N. CHANDRASEKHARA IYER, M. A.,
Government Lecturing and Systematic Botanist)
and
S. V. PARTHASARATHY, B. Sc., Ag., & DANIEL SUNDERRAJ, B. Sc., Ag.,
(Assistants in Botany)

## Introduction.

In post-war planning it is important to tap all the possible plant resources of the country. Many of the agricultural departments are mainly concerned with the breeding of improved strains of crops of major importance. For some time the plant breeders were concerned with the cultivated plants only in their breeding programmes but later, some of the wild allies came in as parents in hybridisation. The importance of wild plants in such breeding programmes was more than emphasised by the survey of plant resources of the world by Vavilov. His work is by no means complete and India is yet an unexplored region. The survey has two main objects: (1) to investigate the possibilities of directly bringing the plant under cultivation and utilising the economic product it yields. (2) to use it as a parent in hybridisation programmes so as to transfer one or more of its valuable characters to its cultivated ally. Valuable progress has been made in Russia in both these directions.

In India, the only organisations that can take up this work are the Herbaria. There are three important herbaria in India viz., (1) the herbarium at Royal Botanic Gardens at Sibpur, Calcutta (2) the herbarium of the Madras Agricultural Department at Coimbatore, S. India and (3) the Forest herbarium at Dehra Dun. In spite of the fact that the Herbaria can play a vital role in the economic structure of a country the public of this country take very little interest in them. These organisations have so far served as centres for identification of the plants on the taxonomical scale and for this purpose have been collecting, drying and preserving type specimens. Huxley (1942) has rightly drawn attention to the new orientation that is necessary in the new systematics. The expanse of the world shows far more variations than what could be typified by the dried specimens of the Herbarium. And yet to indentify these variants, a well equipped herbarium is the first requisite and the time has come for us not only to identify these but to investigate to what possible use they could be put to.

If the economic resources of the vegetation of the country are to be fully utilised, it is not enough if a handful of plant breeders concentrate on the improvemnt of the cultivated crop plants of the country. It is essential that the whole country must be combed for varied types of plants

for varied purposes. An intensive programme of research on (1) new plants which may serve as economic resources (ii) new economic uses for known plants are necessary. The herbarium is an ideal organisation for such plant surveys. In this short note, a few activities of the Madras Herbarium are mentioned.

## I. Fodder.

In view of the fact that there are specialists for important crops of the Presidency, the Madras Herbarium took upon itself the study of the fodder problem of this province. Important fodder grasses of the province were botanically studied and a book on the fodder grasses of Madras Presidency was published (1) Recently a survey of the fodder grasses of this presidency was carried out district-war and a map showing the important annual and perennial forms have been recorded for each district. (2) This information is very useful in formulating any future programme on pasture improvement. A survey of the fodder grasses of Chingleput District showed that nearly a hundred species of grasses occur in that district but not all of them are of fodder value. (3) Twenty-seven species are listed by us as of fodder value, but a preliminary trial in the tract is necessary before the important ones can be chosen for large scale multiplication in pastures, waste places and bunds. Our observations further reveal the fact that by choosing a few species suitable to appropriate environments such as road-sides, waste places, bunds, pasture areas and reserve forests, the unwanted and uneconomic grasses may be eliminated and their place taken up by more useful ones. That this is possible is shown by our observations at the Central Farm, Coimbatore, where Kolukattai grass (*Cenchrus ciliaris*) which was not common on road-side a few years ago is now the dominant type. This grass is the staple type for the Kangayam tract and is one of the most desirable types. Our survey in respect of Chingleput district has shown that though this district requires about 3656 million lbs. of fodder it actually produces only 3080 million lbs. There is thus an apparent deficit of 576 million lbs. which will be really more if the cattle are to be well fed. Establishment of a few high yielding good quality grasses in this district is likely to increase the fodder production.

At Coimbatore about 100 indigenous and 30 exotic species of grasses were collected and tried in small observation plots and out of these, 18 desirable and promising ones are under yield trial in bigger plots. These, grasses are valued for their yield, drought resistance, palatability and regenerating capacity after the receipt of first monsoon showers. *Panicum antidotale* the Australian drought resistant type is really drought resistant. It is green even during the worst summer months. On an average it yields 15 to 30 thousand lbs. per annum in 2 or 3 cuttings. It is highly desirable that this grass should be tried extensively in this province. *Cynodon*

*plectostachyum* is another introduced grass. At first it was reported to have cyanogenetic contents to a lethal extent to cattle, but the chemical analysis followed by feeding trials conducted by the Government Agricultural Chemist in collaboration with us have shown that it is harmless. This grass is of value not only as a fodder grass but also as a soil binder. It is quick growing and is easily propagated by cuttings. Growth measurements have shown that in one case it grew 26 feet in 63 days. It is superior to the common hariali *Cynodon dactylon* in its growth, yield and fodder value. We are mentioning here two types only as prominent examples and the remaining ten species are also likely to be useful to different tracts.

In solving the fodder problem it is necessary to introduce legumes in pastures to increase the feeding value of the same. In Europe clovers play this part in pastures, *Alysicarpus rugosus. A. longifolius* and *Rhynchosia minima* are found to be good as annual legumes in the pastures. Fifteen species of leguminous plants including Soya beans and Kudzu (*Pueraria thunbergiana* are just under trial this year. Though it is too early to judge *glycine javanica* collected in the nearby forests appears promising.

It is not sufficient if the fodder requirements of the cattle are sought to be met by the production of straw from cereal crops or of grasses in pasture lands. In dry areas such as the Ceded Districts, seasonal conditions are often highly precarious and fodder production from the above two resources fail. Therefore the problem in such and similar areas may be solved by extensively growing trees whose leaves are eaten by cattle. By virtue of their extensive root system and size, the trees are likely to bear leaves during famine periods and these can be utilised to tide over critical periods. These trees can be planted on roadsides and village common grounds and pasture areas. A search for such forage trees was made and a list of 72 trees has been published. Preliminary tests to judge the suitability of some of these to different tracts is a problem on hand.

## II. Famine Food.

The work of plant breeders is set at nought during periods of famine because most of the improved strains evolved by them are cultivable during normal periods only. During famine, the labouring class of people resort to eating the naturally occurring vegetation. From time immemorial the use of *Bassia latifolia* in famine periods is well known. The plant deserves to be grown all over the province for its many uses. Many of the grasses growing wild are of great use in this direction. The grass *Brachiaria ramosa* is reported to be used in Anantapur and Vizagapatam districts of the Madras Province and the grain is reported to be superior to the widely cultivated millet *Panicum miliare* (samai). A full knowledge of the natural flora that can be used as food will be useful to th

Sixty-eight species of wild plants are listed in the Herbarium whose fruits are edible. (6) A list of 38 species of plants whose leaves are used as vegetables has been published. Many of these are wild and growing in field bunds and waste places. (6A) More extended search and trials among the flora of this presidency is expected to enlarge the list of wild plants which may yield edible products especially during periods of famine.

## III Land Reclamation and Soil Conservation

There are swampy and saline areas which can be reclaimed by raising suitable vegetation in the early stages. One species of grass, *Brachiaria mutica* is a useful type for reclaiming marshy areas. It is also a good fodder grass. We have started trials with this grass in Madura district. The saline soils which cannot bear any crop can be profitably turned into grassland with species like *Chloris barbata*, *C. bourneii* and *Sporobolus tremulus*. There is an urgent need for an intensive search for more species that may prove valuable in soil reclamation.

We have been very frequently addressed for suitable soil binders. For canal bunds, we have found that *Pennisetum hohenaekeri* (Avaru grass in Telugu or Manjapil in Tamil) is a very good one and the Madras P. W. D. has been every year addressing us for seeds of this grass. We have also tried *Cynodon Plectostachyum* but more extensive trials are necessary before we can recommend this to other areas. Mention may be made of *Clerodendron inermis* which is excellent in preventing erosion (by sea) along the sea shores. It is not enough if soil conservation is sought to be done by cultural practices in cultivated fields. It is essential to prevent erosion even in waste lands and the most efficient and economic method of doing it is to plant out natural vegetation to prevent erosion. *Pueraria thunbergiana*, which is reported to have been highly efficient in U. S. A. is under observation at Coimbatore.

## IV Utilisation of wastes.

The herbarium is an ideal place for listing up plants which have potential uses for them. Suggestions for varied uses of many of the known plants can frequently emanate from the Herbarium Botanists. They are also in a position to state the locality where the plants are available. In addition to this it very often happens that exotic plants are introduced and these may prove useful or harmful. In either case, the Botanist has to note them; if useful, suggestions for proper utilisation are to be given.

In Madras a list of 20 introduced weeds has been published. (7) Possible uses for some of them have also been suggested. The following are some of the suggestions which we reproduce here.

*Croton sparsiflorus:* This has been analysed for use as manure. The Government Agricultural Chemist remarks "This contains fair amount of Potash and Nitrogen and can be very well used as a manure by composting" (8).

*Tridax procumbens:* This has been chemically analysed for use as fodder. The Government Agricultural Chemist remarks "The sample contains fairly good amount of food ingredients, but the fibre content is a little too high. Probably it is this factor that makes it more favoured by buffaloes than by cows. The weed is particularly rich in lime content" (8). We have also noted that the oil from the fruits of *Thevetia nereifolia* can be used for lamps (9). Such and similar uses for very many plants have been recorded from time to time. Local enquiries and trials are likely to reveal new and unknown uses for many of the waste plants. It has been recently brought to our notice that the weed *Tridax procumbens* contains fungicidal properties.

We wish to mention here another important but little utilised waste plant of our province, and which we had occasion fo study. We refer to the sea weed *Gracillaria lichenoides.* Due to war, there was dearth for the imported agar-agar, a product much used in culture media and in medicine. This product is prepared from the Red alga *G. lichenoides* which is found in sea.

A survey by us revealed the presence of this sea weed in immense quantities in the Ramnad District sea coast starting from Kilakarai down to Rameswaram. At present a few local merchants collect *G. lichenoides* and after some crude washing and drying, the material is exported to Ceylon. Mixed with sugar, 'Halwa' is prepared. Sometimes, the poor prepare 'Kanchi' when other staple grains are not available to them. The Government Agricultural Chemist, Coimbatore, has already studied the process of manufacturing the finished product agar agar (10). The finished products of the Government Agricultural Chemist's laboratories are found to well satisfy B. P. Standards. The State can build a flourishing industry with this raw material to manufacture agar.

During our survey in these coastal areas we found large quantities of sea weeds going to waste year after year. Local trials by the Agricultural Department showed that there is good scope for utilising the sea weeds as manure. Preliminary trials reveal that not all the sea weeds compost equally well. Extensive studies to utilise these sea weeds at least as manure is highly desirable.

The utilisation of sea flora in the preparation of iodine, alginic acid, etc., are too well known to be mentioned here, but what we wish to

emphasise is that these plants exist in large quantities along the coast of our Province and any serious attempt for utilisation of these is bound to be crowned with success.

Another product which forms a good source of raw material for industry is the tender seedlings of Palmyra Palm (*Borassus flabellifer*). There are a large number of trees in this province. Our investigations have shown that the seedlings form an excellent source for starch. The first swollen leaf, which is ensheathed by the cotyledonary tube when the seed germinated is found to contain good amount of starch. Chemical analysis of the crude preparation showed that it contains 72 to 88 per cent of starch and that it is a good substitute for arrow-root starch. However feeding trials are to be conducted before this recommendation is placed before the public. This finding is particularly useful now as the Government have launched total prohibition. The palmyra palm, instead of being tapped for sugar manufactiire, can be allowed to fruit and from the seedlings starch can be prepared. The starch in addition to being a food product can be used as a raw material in industry.

## Conclusion.

In this short note we have attempted to bring out the role of plant survey in Agriculture by mentioning a few instances from the recent work of the Madras Herbarium. We feel that for maximum utilisation of the plant rosources of the conntry from the point of view of Agricultural progress, every Agricultural Department of this country must build up and maintain a valuable Herbarium with facilities to acclimatise and study live plants. Apart from its value to the Agricultural progress of the country, these serve the needs of the research workers of the various university colleges who are working in taxanomical studies. The utility of the extensive exploration of the flora, cultivated and wild, has been well brought out by Vavilov. Recent advances in crop breeding technique necessitate that the plant breeder must have a collection of all variable types of cultivated as well as allies and progenitors of cultivated plants. While crop specialists confine themselves to the crops in their charge, the herbarium Botanist is left with all other vegetation of the country. Leaving apart the considerations regarding the expansion of staff, etc., we feel that an interest must first be created in the public for the following reasons (1) it must be in constant touch with the herbarium and make use of all the available information relating to identifications, uses, availability, etc,. of the local flora (ii) it must act as a reporting agent and inform the herbarium authorities the various uses to which the local flora are put to, and (iii) it must take to plant collecting as a hobby. If such Herbaria are built up and botanical surveys reorganised there is vast scope in this country to discover new plants of economic value or to acclimatise exotic ones.

## VI Literature.


1. Rangachary K. — Fodder Grasses.
2. Cherian Jacob K. — Unpublished data of the Madras Herbarium.
3. Chandrasekara Iyer, S. N. & Parthasarathy, S. V. — A note on some fodder grasses of the Chingleput Dt. *M. A. J. XXXII*, 1944, p. 142.
4. Chandrasekara Iyer, S. N. & Venkataramana Reddy, T. V. — Some common fodder yielding trees in the Madras Presidency — I, *Indian Forester, 1942.*
5. Cherian Jacob, K. — A new millet — Brachiaria ramosa: *M. A. J. XXXI*, 1943, p. 12.
6. Do. — A note on the edible fruits found wild in the Madras Presidency. *M A J XXVIII*, 1940, p. 170.
6. (A) Chandrasekara Iyer, S. N. — A few important cultivated and wild leafy vegetables of S. India. *M A. J. XXIX*, 1941, p. 137.
7. Tadulingam, C. & Narayana, G V. — Some introduced weeds of South India. Proc. Econ. Biol. Assn. CBE., Vol. 1. 1933, p. 53.
8. Chandrasekara Iyer, S. N. — Two exotic weeds — How best to use them. *M. A. J. XXVIII* 1940, p. 377.
9. Do. — Wealth from waste. *M. A. J. XXX*, 1942, p. 392.
10. Karunakar, P. D. — A simple method for the manufacture of agar—agar from *Gracilaria lichenoides Curr Sc.* 13. April 1944. p. 99.
11. Huxley, J. S. — New Systematics (1942)


## Conclusion.

The following species are recommended for extensive trials:—

1. Chionachne semiteres Fisher.
2. C. Koenigii, Thw
3. Sehima nervosum, Stapf.
4. Amphilophis pertua, Stapf.
5. Chrysopogon montanus, Trin.
6. Dichanthium caricosum, A. Camus.
7. D. annulatum, Stapf.
8. Heteropogon contortus, Beauv.
9. Iseilema laxum, Hack.
10. I. anthephoroides, Hack.
11. Eremopogon foveolatus, Stapf.
12. Andropogon pumilus, Roxb.
13. Panicum antidotale, Retz.
14. Cenchrus Ciliaris, L.
15. C. setigerus, Vahl.
16. Enteropogon monostachyos, Schum.
17. Cynodon Dactylon, Pers.
18. C. plectostachyum.
19. Chloris Bournei, Rang & Tad.
20. Panicum maximum, Jacq.
21. Pennisetum, purpureum.
22. P. clandestinum, Hochst.
23. Sorghum sudanense, Stapf.
24. Chloris gayana, Kunth.

These grasses may be tried under natural conditions in waste lands, pastures and in reserve forests. By such trials, the fodder output from waste lands, pastures and grazing areas can be increased. At present, even some of the improved strains of crops, are not extensively cultivated because of the low yield or quality of the straw. G. E. B. 24 of Madras can be quoted as an instance. If the fodder output from other sources is increased there will certainly be greater output of grain from cultivated fields.