million tons of dry roughage per year. It is here that we have to examine the scope of mixed farming as a possible solution. In a mixed farming system, the farmer grows all the fodder that is needed for his livestock, on his own land. The manure obtained from his livestock is returned to the fields year after year and thus the fertility of the soil is maintained at a high level and crop yields increased. The results obtained in mixed farming experiments both in India and abroad, have shown that mixed farming is the only way to bring back the fertility of soils and secure high yields of grain and straw. A healthy relationship between animal, plant and soil is essential for success in farming and mixed farming is the only lasting solution for maintaining this relationship and solve our urgent food and fodder problems.

Some useful plants for green manure purposes, for the saline tracts of the Presidency

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"GROW MORE FOOD" is the slogan which we hear everywhere now, partly due to the after effects of World War II and partly due to the shortage of food crops on account of the ever-increasing population. India is passing through a critical period with regard to her food problem. India's production of food crops has not yet reached a level so as to be reckoned as self-sufficient. To keep pace with the rapidly increasing population, there should be a corresponding augmentation in production. The countries from which she was getting her food supplies, especially rice, from Burma, Siam etc., to meet her deficit, have also suffered during war and countries all over the world are not happy to ensure imports. There is besides, economic considerations, and we cannot be indefinitely importing. With the available cultivable lands, we are faced with problems of increasing food production by adopting all possible ways and means. Among the various methods suggested, the problem of manuring the fields has to be given a very prominent place in this work as it is a well known fact that our lands are impoverished.

Among the food crops of our Province, rice occupies a pre-eminent place as it forms the staple food for the majority of the population. The present area under rice is about 11 million acres and it forms the largest acreage of any one food crop of our Province. Rice is cultivated under a variety of conditions namely, dry, semi-dry and wet; there are again the alkaline or saline lands and those irrigated by fresh water. To suit the various conditions of rice culture one has to select a suitable manure. For the wet cultivation of rice, green leaf manure has been proved to be the best. The green leaf is either obtained by loppings of trees and shrubs or by raising green manure crops in the field and ploughing them "in situ". Trees and shrubs will be available in plenty only near forest areas but near the sea coasts or in the deltas, a crop has to be grown for green manure purposes. Most of the green manure plants come up well in good soils in fresh water; but regarding alkaline or saline soils the problem of growing suitable plants that will withstand the salinity has to be considered. For the delta areas many green manure plants are cultivated such as Sunnhemp, Daincha, Kolinji, Pillipesara etc., but there are vast paddy areas near the coast or adjoining the back-waters, as in the West Coast, where saline conditions do require some special plants which will withstand salinity.

To have some idea of the saline lands, a short introduction regarding their situation may not be out of place. The 'Back-waters' or 'Salt lagoons' are quite common on the West Coast while in the East Coast they are more or less confined to the estuaries of big rivers like Godavari and Kishna. On the West Coast of our Presidency the broken nature of the country has brought about innumerable rivers and on account of heavy rainfall the volume of water carried by them is very great at times and the tidal influence is felt for many miles in the interior, especially during the summer when sea water freely flows into the river and this naturally renders the rice fields adjoining the back-waters saline.

In Malabar, 'the back-waters' and 'salt-marshes' are confined to the taluks of Chirakkal, Tellicherry, Calicut and Ponnani. In Chirakkal, the Baliapatnam river is one of the biggest and tidal influence is felt to a pretty long distance in the interior but the coconut gardens occupy the very edge of water for a fairly long distance, with scattered rice fields; similarly the Feroke river which is also saline, has coconut gardens almost up to the water edge. The salt-marshes near about Tellicherry, Badagara, Calicut and

the surroundings can be planted with any of the useful plants given below instead of the present vegetation which mainly consists of *Acanthus ilicifolius* L. This plant is spinescent all over and forms impenetrable bushes all over the marshy areas very rapidly, and if left unchecked, in several places it blocks irrigation channels and canals and is as big a menace as the Water Hyacinth in Bengal; this plant is unfit for any use. In Ponnani taluk salt marshes are abundant on either side of the Canolly canal and especially the area between the sea and canal towards the coast; towards the coast the canal is intercepted by several arms of back-waters which form the net work of canals near about Chawghat and Chetwayi. In this one comes across large areas of paddy fields, which are necessarily alkaline or saline on account of their proximity to back-waters. For these fields, the leguminous crops dealt with in this note will be of great use. In the South Canara district there are six principal rivers, namely Netravati, Gangolly, Sita nadi, Swarna nadi and Chandragiri, the back-waters or salt marshes formed by these rivers are met with in Kasargod, Mangalore, Udipi and Coondapur taluks. Of these the biggest back-water area is met with in Coondapur, where the Gangoolly river which is formed by the confluence of the waters of 'Kollur and Haladi rivers' joins the sea, resulting in an extensive back-water area. During the summer months, on account of the free onrush of tidal waves, salinity is felt several miles to the interior. Here we meet with typical forests of mangrove trees on either side of the rivers. These mangrove plants are specially adapted for saline or salt marsh areas and some of them grow to medium sized trees and are useful in preventing soil erosion of the banks. These trees produce abundant quantities of leaves and these can be readily used for manuring the rice fields adjoining these rivers. Mangrove plants particularly *Rhizophora mucronata* which grows to good dimensions in these tracts, may be used in planting the sides of the big rivers like Netravati, Baliapatnam, Feroke etc. When properly attended to, and pruned regularly, these plants are never a menace to the rivers; rows of these plants may conveniently occupy about 10 to 15 feet on each ride of the river. As already pointed out the salt marsh tracts of Tellichery, Badagara and other places which are now foul with *Acanthus ilicifolious* and other useless plants may be usefully planted with one of the mangrove trees listed below, for green manure purposes.

The following are some of the plants recommended for planting along the sides of back-waters.

1. *Rhizophora Mucronata, Lamk* (Rhizophoraceae). This plant is known in Tamil as Kandal, in Telugu, as *Upoo-pooma*. This is an ever-green tree often appearing buttressed by the mud being washed away from the branching aerial roots, the lower part of the stem dying off. The bark is a valuable tanning material, wood is dark red, very hard and an excellent fuel. *Propagation :* The fruits are viviparous and as soon as they fall from the trees on the miry soil, strike root.

2. *Kandelia Rheedii W & A.* (Rhizophoraceae) A small tree ; bark reddish brown ; used only for fire-wood ; Telugu – Thuvar kandan.

3. *Bruguiera Conjugata,* Merr (Rhizophoraceae). A large ever-green tree ; wood red, extremely hard, used for building and for fuel. Telugu-Thudda Ponna. Hindi : Kankara.

4. *Excoecaria Agallocha, Linn* (Euphorbiacea). An ever-green tree with a poisonous milky juice, bark grey, shining, wood white very soft. Telugu-Thilla ; Tamil-Tilai – Malayalam : Komatti.

5. *Dolichandrone Spathacea* K. Schum (Bignoniaceae). A moderate sized deciduos tree common on the blanks of rivers and back-waters. Wood, white soft, Tamil-Vilpadri ; Malayalam –Nirpongilium.

6. *Derris Uliginosa :* (Papilionacae). A large ever-green climing shrub with rose coloured flowers and rather large leaflets. It occurs in the sea coast forests and tidal river banks on both sides of the Peninsula ; it is found climbing over trees growing along muddy salt water creeks. The leaves are poisonous and not relished by cattle ; along with loppings of tress these may be also pruned. This flowers in August and September and the seeds are available from November onwards.

II. Plants recommended for the sand banks : A little away from the sea water front :

Morinda Citrifolia, Lin : (Rubicaeae) Tamil : Nuna ; Malayalam-Manhanathi ; Telugu-Sira Njikadai ; occurs in the coastal forests of North Circars and West Coast : cultivated widely in many places throughout India. The roots furnish a valuable red dye. The fruits are cooked when unripe and eaten when ripe. This was found growing along sand banks adjoining the back-waters of Udipi. It is a medium sized tree producing broad leaves in plenty.

Scaevola frutescens, Krause (Goodeniaceae) Marathi: (Bhadrak). It occurs in the West Coast near the sea; found near the water-edge of the back water, very close to the sea near Malpi. A large shrub with large fleshy leaves, white flowers in axillary cymes and a white somewhat lobed droupe. Found also near the sea shores of India from Sind to Ceylon. It is stated that the juice of the berries were used for clearing off opacities in the eyes and to take away dimness of vision. Leaves are eaten as a vegetable (Watt).

Pavetta indica L. (Rubiaceae) (Hindi : Kankro). A small sized tree with white flowers found growing along the sand banks at the junction of the sea and back water near Nileshwar and Kasargod; the root and leaves are used as medicine by Ayurvedic doctors (Watt). The fruit is eaten in some parts of Madras (Watt).

III. Leguminous plants recommended for saline rice fields.

Crotalaria striata: (Papilionaceae) (Tel.-Munga). A tall herb growing upto a height of 2 or 3 feet occurs in low lying areas and sandy tracts; it was also found to occur under extreme saline conditions namely on the sea sand near the junction of back water and sea, near Nileshwar. This is cultivated on a large scale in Nileshwar coconut farm, and seeds may be available there.

Crotalaria Verrucosa: (Papilionaceae) (Tamil: Vuttei Khilloo) (Tel.-Ghele gherumta). It occurs under a variety of conditions, namely Nilgiris, Cuddapah and sandy belts near the sea coasts. This is recorded along both the sea coasts. This is found growing very near the reach of tidal waves also. Grows to a height of 2 to 3 feet; much branched undershrubs with blue flowers. Propagation by seed.

Rothia trifoliata Pis. (Papilionaceae) T: Nurrey pittan keeray; Tel: (Nucka Kura). A much branched and spreading annual, spreads to a radius of 1 to 1½ feet. Leaves and pods are boiled and eaten as a vegetable in times of famine. (Flowers in September and October).