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THE METHODS OF CURING TOBACCO FOR CIGARETTE PURPOSES PRELIMINARY TO THE CONSTRUCTION OF FLUE-FITTED BARNS

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Introduction. In response to the article on "The Position of Madras in the Tobacco Industry of India" published in this Journal, July 1934, there have been some enquiries from tracts of probable suitability for growing cigarette tobaccos. The enquirers want to know whether there are any methods to find out whether the tobacco of a particular tract is suitable for cigarette purposes before they can commit themselves to the construction of costly flue-curing barns. In reply to this enquiry the following information is furnished with the hope of kindling greater and wider interest in the trial of cigarette tobaccos.

In view of the co-ordinated programme of research on tobacco under the aegis of the Imperial Council of Agricultural Research in all the provinces, the possibilities of all the tobacco-growing tracts of a province have to be thoroughly explored; and for this purpose the provision of only a pair of flue-curing barns in each province by the Imperial Council of Agricultural Research may not be found adequate to tackle all the tracts. Hence the necessity and importance of such methods cannot be over-emphasized. Even if the tobacco were to be unsuitable for cigarette purposes we do yet require some methods of finding whether the tobacco of a particular tract can be cured for export because we find that a large quantity of Indian exports is used in the manufacture of pipe tobaccos.

At the outset it may be stated that growing tobacco for cigarette purposes is an art by itself. Many of the precautions and instructions were given in the Bulletin No. 187 of the Imperial Department of Agriculture. However a few hints may be included here. Light sandy loams, preferably silted, should be grown with cigarette tobacco types H. 142, 177 of the Botanical Section, Pusa. Variety Harrison Special of the Indian Leaf Tobacco Development Co. may also be tried. Better results will be obtained in curing, if the crop could be grown on soil moisture alone without supplementing it with irrigation. But if the soil and local conditions require irrigation the number of irrigations may be as few as possible and may be restricted only to the earlier period of the crop. The manuring is best done with 1–2 cartloads of well powdered farm yard manure compost mixed with a manure mixture containing 5 lb. nitrogen, 30 lb. phosphoric acid, and 45 lb. potash per acre. It is to be applied in the furrows opened for planting tobacco seedlings. The compost is prepared by stacking farm yard manure

with an equal quantity of soil or silt in a pit for an year or two, when it is taken out and powdered for use. The nitrogen may be obtained one-third from organic manures and two-thirds from mineral manures. The exact dose of manure required can be judged by preliminary trials in the localities concerned. If a crop is found to grow rank due to unavoidable circumstances the crop may be allowed to flower to reduce the rankness of the leaf.

Curing Methods. The methods suggested here are not meant to replace the method by flue-curing. But they are only as preliminary tests to find out the suitability of the tobacco of a particular tract for cigarette purposes. The tobacco cured by these methods does not equal the flue-cured tobacco in all qualities but makes a near approach. How far this would occur in a particular tract with its own peculiar limitations can best be estimated by a trial.

All over South India, the tobacco crop comes to maturity in February—March. But the cigarette tobacco types are earlier to mature than the local varieties in as much as the leaves are not to get thickened. Further the planting should be so arranged that the ripening process should be complete by the end of January so that there is no stimulation to new growth when the temperature begins to rise in February. The season therefore imposes very definite limits for the growth of the tobacco. The leaves shall have to attain their full size by the middle of December. During the cold weather the ripening process shall have to take place. If late planted, tobacco does not complete its growth till the end of January when the crop again begins to grow with the rise of temperature. The plant endeavours to make suckers and as such cannot be induced to ripen off sharply. The rise of temperature synchronises with the setting in of the "corn wind" called *Pyru gali* in the Northern Circars and *Uppam Kattu* in the Southern districts.

The mature leaves should be stripped from the plant as in flue-curing, but the stage at which the leaf should be picked is that it should be "almost fully ripe" whereas for flue-curing it should be "fully ripe". This difference can be recognised after some experience. The leaves should be strung on to bamboo stakes and hung up in tiers in a shed. It is most essential from considerations of safety that the shed is one of galvanised iron sheets the sides being covered by the same. To reduce the cost of the shed the covering of the sides may be done by mud plastered bamboo thatties. Provision should be made in the roof for escape of moist vapours from the leaf by inserting small chimneys made of galvanised iron sheet. Provision can also be made in the original construction by a double roof along the length by providing cross raftered couples. The 1 foot space between the top and bottom roofs may be closed at will by canvas *purdahs* hanging down from the top roof. Trenches may be dug in the ground 15 inches wide and 9 inches deep to take in the charcoal. The details of the

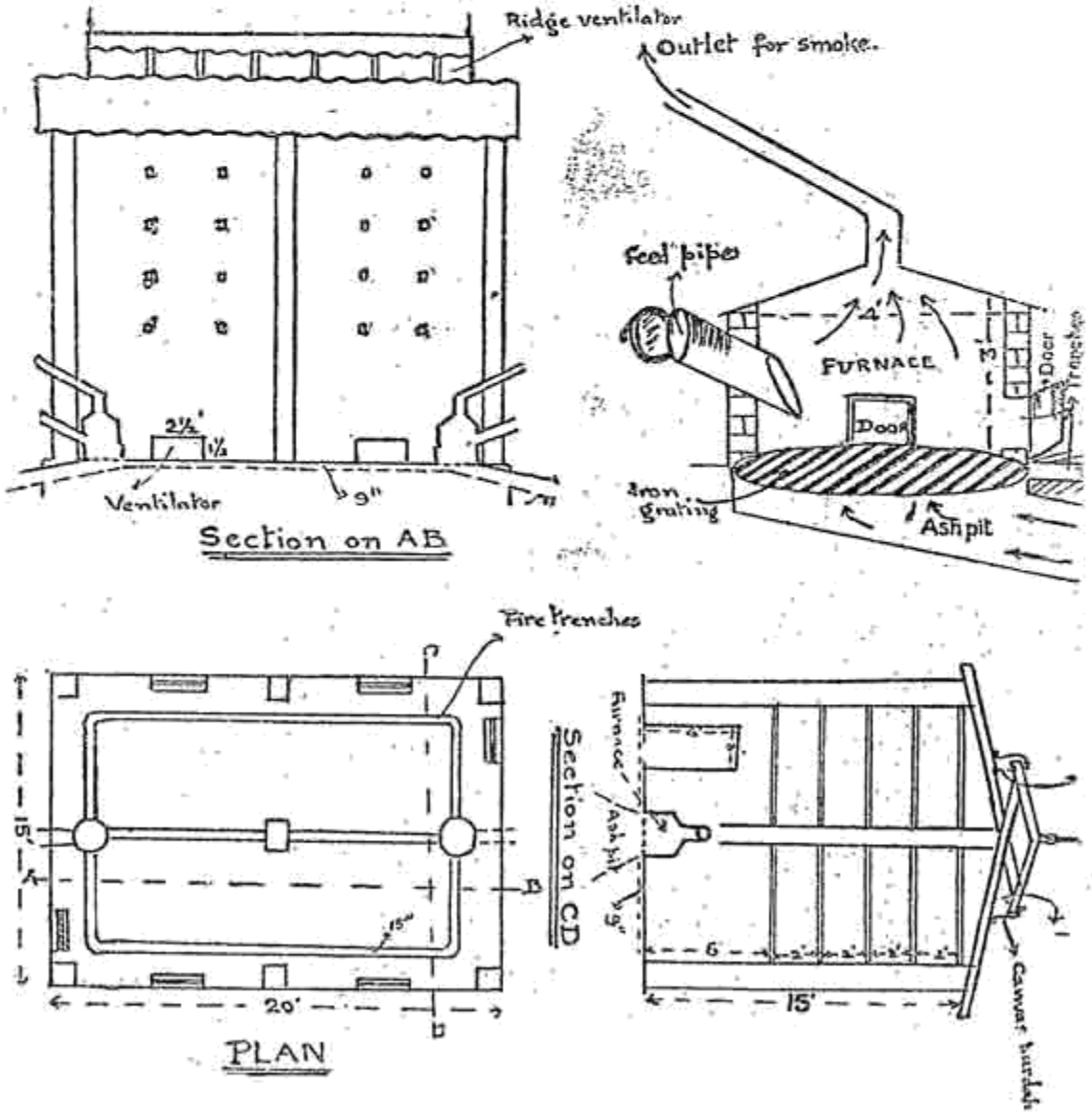
arrangements for feeding the fuel and leading off the smoke are shown in the plan.

As regards the fuel to be used, experiments in America have proved that charcoal is much better than other kinds of fuel, which seem to posses the disadvantage of fire hazard and the need of relatively frequent attention. Further the charcoal possesses the unique advantage of being available even in the smallest village and it can be easily prepared by burning some wood in a pit.

When the charcoal is fed into the pits, there will be some smoke given out which will be led away by the provision made. After the smoke ceases the red hot charcoal may be distributed in the trenches by dragging it with a long-handled spade.

If new sheds are going to be put up the following plan may be adopted. Otherwise in make-shift arrangements the provision for the fundamental needs e.g., for fire, escape of smoke and moist vapours and inlet of air may be made as best as the shed needs.

Plan of Curing Shed.



The tiers may be so arranged that the distance from the tip of the leaf of the lowest tier to the ground is about 4 to 4½ ft. This arrangement for a preliminary trial can be conveniently fitted up in any pucca shed of a farm, e.g., an unused store or a cattle shed etc. The bamboo stakes supporting the leaves are to be spaced at 9″—12″ in the top tiers and 6″—9″ in the lower tiers for aiding free circulation of air. As the season of curing advances and the atmosphere becomes hotter the stakes may be kept closer. The purdahs at the top should be closed. The leaf becomes yellow within 4 to 5 days. If the nights are heavily dewy at this time small fires may be maintained to help the leaf to continue the yellowing process without any check.

The yellowing process takes place best between 85° and 95°F. The humidity at this stage may be maintained from 95 to 85. The humidity will automatically adjust itself at these temperatures. The temperature at 8 a. m. during the months of January, February will be about 73° to 75° F. in most parts. The mean temperature of the day at this period will be about 80°F. So the temperature of the shed should be gradually raised to 85°F. within 24 to 36 hours after loading the shed. The temperature will then have to be gradually raised to 95°F. within 36 to 48 hours. This temperature of 95°F. is to be maintained for 6 to 12 hours according to the condition of the leaf. It is during this stage that the yellowing becomes uniform all over the leaf. It is the slow and steady yellowing that contributes a good deal towards the body, grain and texture of the leaf.

After this stage the purdahs on the top should be kept open. When about 85 to 90% of the leaf has yellowed the temperature may be briskly run up from 95° to 105° F. within 6 to 12 hours. The humidity during this stage drops down from 85 to 65. Then the bottom ventilators are to be kept half open to drive off the moisture in the shed. Though this will make the temperature fall down a little the temperature will have to be rapidly increased from 105°F. to 125°—130°F, within 8 to 10 hours. The humidity falls from 65 to 35. It is only during this stage that all efforts to increase the temperature and lower the humidity will help to fix up and retain the yellow colour obtained. Otherwise the resulting product will be dark coloured. The only test to find cut whether the fire is properly maintained or not is that the tips of the leaves of bottom tiers should not wilt away prematurely before the base of the leaf has dried.

This temperature of 125°—130°F. may be maintained for about a week till the midrib of the leaf gets dry. If it is possible to increase the temperature it is better; if not this temperature has to be maintained till the midrib is completely dry. A rough test for this is only the brittleness of the leaf midrib when broken between fingers. Afterwards the fire may be put out and the shed allowed to cool. When the leaf has become soft after absorbing some moisture from the atmosphere, the leaf may be removed, unstrung, tied into hanks and bulked up.

Under ideal conditions the leaf cures to a moderately bright yellowish mahagony colour. Every little precaution taken from the beginning of the crop till the curing process in maintaining the leaf thin and controlling the curing will help a great deal to secure bright coloured product. A modest price for such a cured stuff may be between Rs. 125 and 150 per candy of 500 lbs. Two candies of cured leaf per acre may be obtained realising about Rs. 250–300.

An easier but less paying method is the combination of this method with sun-curing. The leaf is kept in the shed as above till yellowing when it is removed out into the sun for drying. The leaf after being thoroughly dried may be tied into hanks and bulked. The method is not feasible when the weather is cloudy and moist. This can however be used only for the top leaves when the season has become pretty hot.

Conclusion. The production of a desirable quality of tobacco depends quite as much upon the curing process as it does upon the growth of the crop in the field. The potential quality of the crop may be developed to its highest point, or the crop may be badly damaged during the curing process, the success of the cure depending upon the conditions of temperature and humidity maintained in the shed. In the natural or air-curing method, the air conditions are largely determined by the prevailing weather, except in so far as they are modified by the protection afforded by the shed and any artificial heat provided during the curing process. The air conditions which influence curing are essentially temperature and humidity.

The curing process is often regarded as an art which may be developed to a high degree by some, but which is more generally lacking in the average grower. There are good reasons to believe that the best methods in present use may be improved, but the greatest value accrues by the adoption of better practices by the average grower, who now depends largely upon crude methods. It must be admitted that any attempt to determine definitely an optimum set of conditions is beset with many difficulties. It would be hazardous to conclude that all types of cigarette tobacco or qualities of leaf can be cured most favourably at a certain temperature and relative humidity. Approaches to optimum conditions will be obtained by gradual experience of the crop of each locality.

Now-a-days growing ot new crops especially those which require specialised treatment for the product is beset with fears and suspicion from many points of issue. Firstly the crop may not be suitably adapted to the tract; the yield may not be commensurate: and the methods of preparing the product may require special adjustments to suit local conditions. Secondly the question of making initial investments on speculative crops will not be easily favoured by the ryot apart from the availability of the money the pinch for which he always

feels. Thirdly the prospects of attracting the attention of the buyers may present problems of its own which are further complicated by the existing conditions in these days of economic depression. The preliminary experiences may be gained by planting about half an acre of cigarette tobacco types. For such small areas, small cattle sheds or temporary sheds may be used. Even if a new one is to be put up it can be done at a small cost on rented material. It is better to have two sheds for this purpose so that by the time the leaf is ready on the field after 7 to 10 days after loading the first shed, the second may be loaded with another picking of leaves. By this the work runs concurrently without having to allow the leaf to overmature in the field.

With the encouragement of the small scale trials by make-shift arrangements, permanent sheds may be constructed. Wider and larger scale trials for about 2 or 3 seasons will determine whether the tobacco of that tract is suitable for cigarette purposes or not. Later on when typical flue-curing barns are constructed these sheds will serve as godowns, bulking sheds etc. Thus there is very little that is lost in these preliminary trials. This will lead to the gradual replacement of a major portion of the area under country tobacco with that under cigarette tobacco which fetches better returns per acre.

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Research Notes.

The Fungus which causes 'Foot-Rot' of Paddy in South India.

In an earlier communication[1] the writer stated that the 'Foot-rot' of Paddy (*Oryza sativa*) was caused by a species of Fusarium and that attempts were being made to determine its exact identity. From the time the disease was first noticed in S. India in 1930, a vigorous search was made to discover the perfect stage of the fungus and several attempts were made to induce the development of the perfect stage in a variety of cultures. These efforts have not met with any success so far. The identity of the fungus has therefore been made from a prolonged study of the conidial stage. Despite some important differences mentioned in the previous paper, there were several points of resemblance between 'Foot-rot' and the 'Bakanae' disease of rice in Japan so that it was considered not improbable that the 'Foot-rot' fungus and the 'Bakanae' fungus might prove identical or very closely allied. Though originally called by different names, the 'Bakanae' fungus has now been established to be *Gibberella fujikuroi* (Sawada) Wr. and its conidial stage *Fusarium moniliforme* (Sh.) var. *majus* Wr. & Rg. In

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