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Where is Money in Cotton ?

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"Agriculture is and for many years to come must remain India's greatest industry and the foundation of the State". The average man today has a better realisation of the importance of agriculture to India than he had a few years ago, and the general agricultural awakening continues to expand. Nevertheless, we are still living in a stage of transition so far as scientific agriculture is concerned. Our interest in agriculture has received a strong stimulus from the work of the Royal Commission on Indian Agriculture and we all hope to enter an era of agricultural consciousness and scientific revelations in our onward march to solve the economic problem of the Indian agriculturist.

The economic problem of agriculture expressed in one word is "Income". All the workers in the field of agriculture aim at solving this one problem, each by means of his own special line of attack. We have the various experts may be the crop specialist, the Entomologist, the Mycologist, the Bacteriologist, the Chemist, the Live-stock Expert, the Engineer or the Extension officer-each attacking the economic problem in his own specialised way. It is proposed to confine attention, in this paper, to a consideration, in outline, of the work that is being done by the Cotton Breeder and to a preliminary survey leading unto it, in order to appreciate the scope of his work in contributing to the material welfare of the agriculturist who is "the foundation upon which the whole economic prosperity of India rests and upon which the structure of her social and political future must in the main be built".

Cotton is one of the chief raw products of India playing an important role in the material prosperity of a great percentage of her people who depend upon it directly or indirectly. The need for improving this crop is, therefore, obvious. India is the second largest country in the world in the production of cotton, the first being the United States of America. She produces about a third of the

output of America or about a fifth of the total world production. The average yield of cotton in India is exceedingly low and works out at about 82 lbs. of lint to the acre, i. e., about a third of the average production of the cotton areas of the United States of America. (It is pleasing to note from a report of the Review of Agricultural operations in India for the year 1927-28, that the yield of cotton lint increased from 81 lbs. to 95 lbs. per acre.) Secondly, the quality of the Indian cottons is also poor the bulk of it being classed as short stapled and unsuited for competition, in the world's cotton markets. The staple of the Indian cottons ranges from 3/8 to $\frac{3}{4}$th of an inch with a maximum spinning capacity of 30's, the major portion of it being suited to spin from 11 s. to 20 s. only. For comparison with the superior world cottons, the best of them produce lint of a staple of over 2 inches with a maximum spinning capacity of 300 s.

There has been an ever increasing demand for long staple cotton and steps are to be taken to produce more of this kind. Besides this inherent defect in our cottons by way of short staple, various other causes such as the incorporation of leafy matter due to defective methods of picking, stained material caused by insect and fungoid diseases and the adulteration of superior cotton with inferior cheap quality cotton are to a great extent responsible for the poor prices fetched by the Indian cottons. An improvement of the cotton crop has, therefore, two very important objectives :—(i) the improvement of quantity and (2) the improvement of quality. It will not be out of place here to make mention of the institution of a permanent committee. The Indian Central Cotton Committee with head-quarters at Bombay by the Government of India Resolution dated 31st March 1921, and the establishment of a spinning and a Research laboratory also at Bombay, the former in the year 1924 and the latter in 1925. The scope of these establishments is wide and these work towards the improvement of Indian cotton in most of its aspects. This cotton committee finances various schemes to improve cotton by breeding methods, to study the biochemical aspects of the cotton plant, to investigate the bionomics of insect and fungoid pests attacking cotton in

order to bring them under control, to promote the improvement of cotton marketing and to prevent mal-practices. The spinning and the Research laboratories which together form the Committee's Technological laboratory, have for their immediate aim the provision of facilities for determining the quality of raw cotton thus forming' the last link in the chain of Agricultural Research directed to improving the cotton crop of India'. The existence and the labours of these institutions have given a definite impetus to cotton cultivation and 1921 the year of the formation of the Central Cotton Committee, marks an important event in the history of cotton cultivation in India. The completion, by about the year 1932, of Sukkur Barrage scheme, a colossal undertaking which is expected to bring about three million acres of new land under cultivation, will mark another such event.

Now, confining our attention to Madras, a glance at the geographical distribution of the various types of cotton in the presidency will be necessary before proceeding further. We have five fairly well-defined zones extending over the presidency. The first in the North-west of the presidency, comprises the districts of Anantapur and Bellary, and is known as the 'Westerns' zone. G. Herbaceum with variable and relatively small amounts of G. Indicum thrives here and is mostly poor quality cotton, being short and leafy. Adjoining this zone and commanding the districts of Kurnool and Cuddapah (only a part), we have the zone of the 'Northerns' also a leafy cotton being a mixture of G. Herbaceum and G. Indicum. The third zone, situated in the north-east part of the presidency and including the district of Guntur and parts of Nellore, Krishna and Godavari, is known as the 'Cocanadas' zone where predominates a mixture of immense heterogeneity-G. obtusifolium Cocanada forming the prominent part of the mixture. This cotton is also inferior in quality and is suited for the production of Khaki yarn. The fourth and the Central zone encloses the districts of Coimbatore, Salem, S. Arcot, Trichinopoly and west Madura where are grown cambodia, karunganni, uppam and Nadan (a perennial cotton). The last zone but of great importance is situated in the southern most part of the presidency embracing the districts of Tinnevelly, Ramnad

and Madura. It is here that the cotton of the trade name 'Tinnies' flourished and karunganni the best indigenous cotton of Madras, is the type that is largely grown now. All these zones in the presidency are together responsible for about a tenth of India's total production.

With a view to improve cambodia cotton by the isolation of pure strains a central station was started at Coimbatore in the year 1920 and the scope of the station has since been enlarged. With this station as the nucleus, work in the other zones was started by Cotton Assistants. Later in the year 1926, with the idea to give more attention to the improvement of cotton and to allied agricultural problems, Koilpatti station was made a regular sub station under the charge of the first Assistant Cotton Specialist.

Having obtained an idea of the origin and expansion of cotton stations in this presidency, we turn to a consideration of the problem 'improvement of cotton' at these stations. The primary object of all these stations is to analyse the several constituents of the local mixtures by the selection of pure lines. There are various heritable characters that go to make up the two objectives cited before, viz., (1) improvement of quantity and (2) the improvement of quality. The recognition of these heritable characters and their definition or method of measurement and the isolation of pure strains in which these characters are combined in various ways together form the foundation of all plant-breeding work on cotton. Detailing the stages, the work can be classified in to

(1) the testing of varieties,

(2) the isolation of lines from the mixture with desirable characters,

(3) testing their purity for the defined economic characters,

(4) comparing the yielding powers of the breeds declared pure with the local mixture or the district strain when there is one under cultivation, and

(5) testing the spinning quality of the strain and multiplying the seed.

These, in brief, are the various stages of pure line work in cotton before a strain could be released as of utility

to the ryots—not to mention of various other trials that it has to be subjected to on the station, such as manurial trials, spacing experiments, proper time for sowing, the effect of the strain on the preceding and the succeeding crops rotating with it, cultural and irrigation experiments and so on.

When the economic possibilities of isolation of pure lines of any tract are exhausted, a manipulation of the various desirable characters by crossing strains with a view to introduce variability and with the object of forming new combinations of characters and the fixing of the desired combinations will be taken up. This work of hybridization has been in progress at the Cotton Breeding station, Coimbatore, and the endeavours will, ere long, bear fruit.

Having thus outlined the main lines of work, we will attempt at a broad analysis of the characters that go to make up (1) Quantity and (2) Quality in cotton. Quantity per acre and quality together go to make up the monetary value of the cotton crop per acre. Quantity of lint per acre depends upon the number of plants per acre and the yield per plant, both of which, in their turn, depend upon the interaction of hereditary characters and enviornmental factors. Number of bolls per plant, number of loculi per boll, number of seeds per loculus, the weight per seed and the weight of lint per seed are the hereditary characters affecting the yield of lint per acre. Characters which affect the quality of the lint are length, strength, colour, lustre and uniformity in each of these. A strain in cotton with a good germination percentage with a capacity for resistance to insect and fungoid pests, which will be capable of thriving under a wide range of diverse conditions, which will yield a good number of bolls of a big size the majority of them dehiscing early in the season, the bolls containing the maximum possible number of locks, each lock containing a good number of big seeds full of lint, long, strong, silky, white lustrous, uniform, with very little waste and capable of spinning high warp counts and with few or no undeveloped ovules, is the ideal before the cotton-breeder. It is, perhaps, next to impossible to achieve this ideal, but it is quite possible to strike at a strain wfth a number of these useful characteristics. The cotton-breeder is ever watchful of

useful combinations of these characters in his line of work with the aim of solving the economic problem of agriculture viz, 'Income'.

It has been said with reference to America "Agriculture is not merely a way of making money by raising crops, it is not merely an industry or a business; it is essentially a public function or a service performed by individuals for the care and the use of the land in the national interest, and farmers in the course of their pursuit of a living and a private profit are the custodians of the basis of the national life. Agriculture is, therefore, affected with a clear and unquestionable public interest and its status is a matter of calling for deliberate and far-sighted national policies, not only to conserve the natural and human resources involved in it but to provide for the national security, promote a well-rounded prosperity, and secure social and political stability". When such is the status of Agriculture under American conditions, its place in building up the national interest in India, out and out, an agricultural country, is of supreme importance The heterogenous mass of material at the disposal of the cotton-breeder in these cotton stations, which occupy a place of vital importance in any scheme of agriculture in the presidency, is a mine of wealth, as it were, and to work these mines, patriotism, patience and perseverence on the part of the breeder and funds, sympathy, trust and patience on the part of the public are required. Here, then, is money in cotton for the benefit of the tiller of the soil and for the lasting glory of India.

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