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Some Aspects of Cotton Industry in India

THE cultivation of cotton in India dates back to pre-historic times. Until a few years ago our only sources of information regarding the antiquity of cotton were scanty references in religious books, which left it uncertain whether India or Egypt was the first country to grow and manufacture cotton on a large scale. Recently, however, when the excavations at Mohenjo-daro made 'the dead yield up their secrets', a few specimens of beads, razor blades and other household articles were unearthed, which were found to be wrapped up in some kind of textile material. Time had treated this material none too gently, it was so tender that it fell to pieces in handling; with great care, however, some pieces of fibres and bits of yarn were removed from it, and these showed unmistakably the characteristics of cotton. It was thus proved, beyond a shadow of doubt, that the world is indebted to India for the first steps in the cultivation and manufacture of cotton, which to-day constitutes over 75% of all the textile materials.

These tests, which were carried out at the Technological Laboratory of the Indian Central Cotton Committee, further revealed the fact that as far back as 3500 B.C., not only was cotton being cultivated in India, but that its manufacture had reached a surprisingly high standard for those ancient times. Since then the cultivation and manufacture of cotton in India made a steady progress, until, in the middle ages, the fame of her fabrics spread far and wide, and she did a flourishing trade in textiles with other countries. The enchanting beauty of her muslins and nainsooks and the amazing variety in design and colour of her fabrics have become legendary and need no repetition;

what is perhaps not generally known is the fact that, as late as 1815, India exported to England alone cotton goods worth £1,300,000. These halcyon days of industry and prosperity were followed by a dark period of decline and depression, when India lost not only the major part of her export trade in cotton fabrics, but also the seed of some of her best cottons. The development of her own textile mills and the demands for raw cotton from outside markets helped to revive the industry and to expand the area under cotton. During the last few decades efforts have been concentrated upon improving the quality of the indigenous types or upon the introduction of exotic varieties, which may give a higher monetary return to the grower. Although these efforts have, to some extent, been thwarted by bad picking, defective ginning, adulteration, watering, etc., it can be claimed that a very definite measure of success has already been achieved.

India to-day occupies first place in the British Commonwealth of Nations and the second place in the whole world in respect of the total *quantity* of cotton produced each year. The area under cotton has ranged from 22·4 to 27 million acres in the last decade, yielding a crop of 4½ to over 6 million bales per annum. But India of to-day is not a mere cotton-producing country. Beginning in a modest way in 1851, her textile industry has developed steadily until in 1937 her 370 mills, equipped with over 9 million spindles and nearly 2,00,000 looms employed over 4,00,000 hands, and produced more than 3,000 million yards of cloth. Even these huge figures do not complete the picture; India, after satisfying the major portion of her own needs, has been able to export every year nearly 3 million bales, worth about Rs. 30 crores, in these days of low prices, to other countries. Thus, if we consider the triple aspects of cultivation, manufacture and export trade, cotton represents easily the largest and the most highly organised industry of India.

The cultivation of cotton in India possesses certain features, which are not seen, at least to the same extent, in the other principal cotton-growing countries. It will be instructive to consider them briefly. In the first place, cultivation of cotton in India is not confined, as is the case in the United States of America or Egypt, to a narrow belt in which the soil and climatic conditions do not undergo large variations. With the exception of Bengal, Bihar, Assam and the N.W.F. Province, cotton is grown over the entire length and breadth of this sub-continent. This wide-spread cultivation has two important consequences. Firstly, owing to the widely different conditions of soil and climate prevailing in different parts, the Indian cottons range in quality from the coarse and short-stapled Bengals (which incidentally are not grown much in Bengal) to the fine and long-stapled Sind-Egyptian or Punjab-American 289 F. Probably no other country in the world offers such a striking contrast either in the times of sowing and harvesting of its cottons or in their physical characters. Secondly, each large tract has its own special problems of varietal improvement, agronomy, cotton diseases and pests, etc.; and though co-ordination is desirable to avoid duplication, it is necessary that botanical, physiological and agronomical researches must be carried out at several centres. For this purpose funds, and more funds, are required, which should be made available in view of the position which cotton occupies in our national economy and industrial development.

The second peculiar feature of the Indian cotton crop is its low yield per acre. The

average for the whole country for the last 10 years has been only 85 lbs. of lint per acre, which is very poor as compared with the American average of 190 lbs. per acre and miserable as compared with the Egyptian average of 446 lbs. A direct result of this low yield is that unless the price of cotton is high, the small cultivators, owning a few acres of land, live in a state of semi-starvation, and after satisfying their bare needs have no money left to put back into the land. Unless some extraordinary events occur, the world factors do not indicate that any substantial increase in the price of cotton is likely to occur in the near future. It is, therefore, essential that the means which are already being adopted to increase the yield per acre should be intensified so that the farmers may raise their standard of living. These means consist of the development of high yielding varieties, the use of manures and fertilisers, the supply of water by canals, wells and tanks to areas which depend at present upon the vagaries of monsoon, the conservation of moisture by bunding, the prevention of soil erosion by reafforestation, the application of better methods of sowing and tillage, the elimination of weeds and the control of pests, etc. Some of these measures like elimination of weeds, preparation of bunds, etc., the farmer himself can undertake provided they are demonstrated to him; in others like the supply of cheap fertilisers and manures, maintenance and supply of pure seeds, control of pests, etc., he needs the assistance of co-operative bodies or the Local Governments; in yet others like irrigation schemes, re-afforestation, etc., he is directly dependent upon State aid. Some of these measures are being tried in limited areas; it is necessary that they should be extended considerably; others have been sadly neglected, it is imperative that they should be taken in hand according to a well-designed plan. Only in this way will it be possible to re-habilitate the fertility of our soils and improve the condition of the millions who derive their living from it.

The third peculiar feature of the Indian cotton crop is the distribution of the different varieties in it. We have mentioned above that these varieties cover a wide range of staple length, but the distribution is far from being even; the comparatively long types are grown in small quantities, while the short-stapled types are grown in superabundance. It is estimated that in the total crop of over 6½ million bales of 1936–37, only 200,000 bales or 3% possessed a staple of 1" or more, while fully 4 million bales or 66% possessed a staple of 11/16" or under. These percentages offer a striking contrast to conditions in U.S.A., where out of a total crop of 12 million bales in 1936 only 9·5% were shorter than 14/16". The direct result of this grossly uneven distribution of varieties in regard to length is that while, on the one hand, we are burdened with a surplus of short-stapled cottons for which we must find export markets, on the other hand we are faced with a deficiency in long-stapled cottons for the growing needs of our cotton mills. It is, therefore, necessary that we must plan the development of our improved varieties and their cultivation on such a scale that the supply of different types fits in more appropriately than at present with our requirements in the home market and abroad. If such measures are co-ordinated with those directed towards raising the yield per acre, it is possible that we may have to reduce the total area under cotton. There are some 'marginal lands' where the cultivation of cotton under the present-day conditions is hardly a paying proposition; if the yield in

other lands is raised and improved types are grown on them, these marginal lands can well be utilised for growing food crops of which there is a considerable deficiency for our vast and rapidly increasing population.

We have made a passing reference to the large quantities of cotton purchased each year by other countries which in 1937–38 amounted to nearly 17% of our total exports. The Indian cottons have to sell in an open world market in competition with the produce of other countries; it is therefore very necessary that the quality and grade of our cottons should be maintained at as high a level as possible so that the agriculturists may reap the maximum profit from their labours. The terms 'quality' and 'grade' are sometimes vaguely used as being synonymous; when applied to cotton, each has a definite significance. Quality refers to the physical characters of the fibre such as average length, fineness, maturity, etc., which have a bearing upon its spinning performance; while grade refers to the amount of trash and foreign matter such as leaf, seed-coat bits, sand, etc., present in the cotton. Improvement in quality is a slow and difficult process, but improvement in grade can be effected more quickly and easily by paying proper attention to picking, pre-cleaning, ginning and pressing. It is unfortunately the case that often the good quality Indian cottons do not obtain their full value on account of their poor grade. The presence of leaf bits, cut and unripe seeds, stains, etc. 'hits the customer in the eye', so to say, and detracts from the real merits of the cotton. These defects can be removed by cleaner picking and better ginning and pressing. For the former vigorous propaganda is necessary; for the latter both propaganda as well as systematic investigations on the optimum conditions of ginning Indian cottons are required. During the last few years a great deal of work along these lines has been done in the United States of America, where the authorities are fully alive to the necessity of improving, or at least maintaining, the grade of their crop in these days of severe competition; in India with the exception of a few large firms we have eschewed this important field. It is, however, a matter of gratification to note that the Indian Central Cotton Committee has recently sanctioned a scheme for starting a Ginning Section at its Technological Laboratory, where these problems will be studied in a scientific manner and the results placed at the disposal of the ginning factory owners.

While we are on the subject of quality and appearance of the Indian cottons, we may also mention two other sources of weakness, which require increased attention and vigorous steps to eradicate them. These are the two malpractices commonly known as watering and mixing. The former consists in deliberately adding water to cotton, over and above what it normally absorbs from the atmosphere, in order to increase the weight of the bale. The water thus added makes the fibres matted and helps to multiply the bacteria and fungi, which, to a greater or less extent, are generally present in cotton, but which do not thrive in a dry atmosphere. These micro-organisms, if allowed to grow when the cotton is stored for some time, destroy the cotton fibre, give it a peculiar dirty-grey colour and altogether reduce the quality of the material. In view of the damage done by watering, every effort should be made to stop this malpractice. In some cases the Provincial Governments have passed the necessary legislation to punish those who indulge in it; this should be extended immediately wherever this undesirable practice raises its head.

The second malpractice consists in deliberately adulterating a good quality cotton with an inferior and cheaper cotton and passing it off as the former. This practice is more widespread than watering, and because the detection of two cottons in a mixture presents certain technical difficulties, it is more difficult to tackle successfully. It enables the party indulging in it to make a short-lived profit, but as the mills fail to obtain the expected results, they grow suspicious and the whole district, or even the tract, suffers in reputation. Vigorous propaganda, backed by legislative measures such as preventing the transport of inferior varieties in the areas growing superior cottons are necessary to curb this malpractice.

The two malpractices referred to above are objectionable from another point of view. During the last two decades considerable amount of work has been done in evolving new and improved varieties, in which the Indian Central Cotton Committee has played a very important part. This work has entailed the labours of a large number of research workers and the expenditure of moderately large sums of money. It is capable of yielding the best results only if the varieties so evolved are grown in a pure state and presented to the customers in an unadulterated and clean condition. If these pre-requisites are not fulfilled, neither the growers nor the consumers would get the fullest benefit from the efforts of the research worker, who is sometimes blamed by persons, not in the know of facts, for not producing spectacular results.

These are some aspects of the Cotton Industry in India relating to its progress from the field upto the factory. There are others which relate to its treatment within the factory and its utilisation for other than textile purposes. We shall deal with these in a subsequent issue.

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OPTICAL instruments are playing an increasingly important rôle in modern science and industry. The biologist needs his microscope, the engineer his transit, the metallurgist his spectroscope, the movie technician his camera and floodlights, the astronomer his telescope, and the flight navigator his drift indicator and sextant. Specialised knowledge and skill are required in the design and manufacture of all these instruments. "Optics" has thus become a profession which demands the service of experts in optics and optical engineering. The future of the profession is no less promising: already, more and more opportunities are provided in the applications of photo-electric cells, the electron microscope, television, etc.

It was essentially to meet these demands that the University of Rochester, founded in 1930 an Institute of Optics, with the enthusiastic co-operation of the famous firm of Bausch & Lomb Optical Co. The Eastman Kodak Co. has also made substantial contributions towards the establishment of this Institute. Rochester is in the centre of the great Optical Industry of America and by associating the Institute, with the well-known Department of Physics of the University, unique facilities are afforded for full instruction in all the fundamentals of optics and at the same time connecting the classroom work with research and practical achievement in the profession itself. The course is a four-year one, leading to the degree of *Bachelor of Science* in Optics. Those interested in further details, regarding expenses, student life at Rochester, list of courses, etc., are invited to write to the Director, The Institute of Optics of the University of Rochester, Rochester, New York.