https://doi.org/10.29321/MAJ.10.A04265

A Production Plan for Raw Cotton in the Madras (Undivided) State

by

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Introduction: During the first half of the nineteenth Century, the East India Company conducted extensive trials on the cultivation of American Cotton all over India, in order to develop the raw cotton resources of the colonies for feeding the textile industry of England. The results though disappointing opened the eyes of the then State Governments and indicated the desirability of taking up improvement work on the indigenous races in addition to acclimatisation of extra-Indian varieties of Cotton. The progress of cotton research in India has since then not only kept pace with the growth of mill industry but has also helped the country in forging herself to a very prominent place among the nations leading in textile manufacture. The textile industry of the Madras State owes a great deal to the fruits of cotton research done at Coimbatore and attached centres.

The position in regard to supply and distribution of cotton for the year 1952–'53 was estimated at 67,25,000 bales and 50,45,000 bales respectively with a carry over stock of 16,80,000 bales. The whole of the estimated Indian production of 36,65,000 bales less exports of short staple varieties, was consumed and the demands for the foreign cotton were in excess of the imports. The target for the cloth production fixed for the year 1956 by the Planning Commission was exceeded in the year 1953 itself. In spite of improved domestic supplies during the last few years, there is considerable shortage of raw cotton and India is obliged to import from East Africa, Egypt and other countries. Competition, exchange and price structure will exercise a great influence on the quantitative aspect of imports even if cotton was available from East Africa, Egypt, U. S. A., Brazil, Peru and Pakistan. It is therefore imperative that India which leads Japan and Britain in textile exports must produce more cotton if the present supremacy is to be maintained and if the stability and progress of the industry are to be assured.

In any national drive for self sufficiency or maximum production the gaps in supply have to be made up either through increase in yield per acre or through rise in planted area. The programme should consist of short and long term policies, the former

getting the precedence over the latter since haste is the primary consideration. The methods suggested must suit the conditions of the peasant farmers who form the bulk of the cotton growers in the states and whose joint contribution even at small levels of increase will ultimately result in substantial overall production without the need for providing vast amounts for capital expenditure or special equipments. There are a number of items of agronomy which have proved their worth in the experiments conducted at the Agricultural Research Stations and which can be put across to the cultivators without seriously upsetting the existing farming practices. The long and short term measures advocated in this article are those found useful in the experiments conducted by the Madras (Undivided) state and tested partly or wholly on cultivators' lands under Cotton Extension Plan or on which further research will prove profitable.

Improvement of Irrigation Sources — Long term: Largest measure of increase in yield per acre is realised from irrigation and therefore improvement of irrigation sources will result in a substantial increase in production. The whole of the irrigated cotton in Madras is grown under wells fitted with electric power, oil engines, *mhotes* or *picotahs* depending on the activity of underground springs and the height of lift to ground level. The information on the wells in the several districts having independent ayacuts and supplementing known irrigational sources is furnished in Statement I. It may be seen that the majority of districts have wells with an average capacity of less than three acres, the exceptions being Ramnad and Nellore. The low ayacut is partly due to intensive cultivation of crops like sugarcane, paddy and plantains requiring greater quantities water and partly due to poor springs in the wells. The subsidised well digging campaign recently launched by Government, followed up with hand and power boring for tapping underground water, extension of electric power and supply of oil engines in non-power area will leave a lasting impress on the agriculture of the tract especially in the existing cotton growing districts of Coimbatore, Salem, Tiruchirapalli, South Arcot, Madurai, Ramanathapuram, and Tirunelveli where the practice of raising two crops in one year based on cereal—cotton rotation is already in vogue, and where the average yields per acre are high on account of good land use and farming standards. Water stress and intensive cropping necessitate the cultivation of short duration cotton varieties. The spread of Cambodia cotton in Ramanathapuram district as summer crop would not have soared to 29,000 acres during the peak period but for the development of MU 1. Evolution of long staple varieties having

STATEMENT I

Districts	Rainfall June to August (inches)	Total No. of wells of all sorts	Area under wells having independent ayacut (acres)	Area under wells supplementary recognised sources of irrigation (acres)	Total area irrigated from wells (acres)	Average area irrigated per well (acres)
Nellore ..	7·1	13,834	164,256	1,001	165,257	11·1
Chingleput ..	10·5	27,935	15,267	35,380	50,467	1·8
South Arcot ..	10·1	78,003	18,734	69,440	88,174	1·1
Chittoor ..	9·5	33,436	84,142	3,348	87,490	2·6
North Arcot ..	11·1	134,663	121,673	52,729	174,402	1·2
Salem ..	9 0	102,287	117,982	62,417	180,399	1·8
Coimbatore ..	5·0	108,244	376,355	112	376,467	2·6
Trichinopoly ..	6·7	72·020	91,623	205	91,828	1·3
Tanjore ..	7·1	33,134	1,976	10,201	12,177	0·4
Madura ..	5·4	59,857	134,929	384	135,313	2·5
Ramnad ..	4·5	18,743	104,139	993	105,832	5·6
Tinnevelly ..	2·3	41,527	94,677	644	95,321	2·3

a shorter life than MU 1 will help the expansion of cotton crop in other districts where the limiting factors are water, planting time and climate during growth or harvest.

It is very fortunate that cotton among the irrigated crops requires the least quantity of water during growth, can withstand a certain amount of water stress and can be normally grown in all seasons provided atmospheric temperature is not very high at flowering phase or the rainy weather does not coincide with ripening and harvest phases. The successful utilisation of rice fallows in the State will therefore depend on the development as well as the solution of problems pertaining to the three following main groups :—

(a) The tracts where the South West monsoon is weak and the North-East rains are strong and where during the June, July and August months, the temperature does not fall below 80°F or the winds do not blow with excessive velocity, are mostly the canal-fed portions enjoying fair supplies of underground water for lift irrigation during summer months or capable of development through assisted well sinking. Such areas can be further sub-divided into long and short fallows.

(i) Long fallows extending over seven months from middle of February to middle of Septemper exist in single crop wet lands fed by canals from river projects and tanks. The districts coming into this category will be the whole or part of Tirunelveli, Ramanathapuram, Madurai, Tiruchirapalli, Tanjore, South Arcot, Chengleput, North Arcot. Chittoor and Nellore.

(ii) Short fallows of five months from mid-January to the cultivation of *Kuruvai* paddy in July (the actual fallow months being specific to each region in a district) are found in areas where two crops of paddy are taken, one closely following the other or with a long gap between the two. In the latter case where the paddy is grown during summer months, cotton can replace it. The area falling in this classification lies in Tirunelveli, Madurai, Tiruchirapalli. Tanjore, South Arcot and Chengleput districts. Fuller details about the possible developments of the rice delta of Cauveri are furnished by Balasubrahmanyan (1949, 1952).

(b) The zones where the South West rains are plentiful, the second monsoon is weak, winter temperature is not low, the

summer temperature is not too exacting and good surface springs exist, comprise the rainfed paddy areas in portions of Malabar and South Kanara districts especially near river courses. Cotton can be planted in September—October and kept on till March—April months.

(c) The regions where both the monsoons are fairly active or where the winter temperature touches low levels ranging from 54°F to 65°F or where the summer is characterised by hot winds or high temperature exceeding 110°F and where good underground springs can be tapped, cover the districts of Srikakulam, Visakhapatnam, East Godavari, Kistna, Guntur, Kurnool, Bellary, Anantapur, Cuddapah, Salem and Coimbatore. This area will admit of cotton planting in December but the crop will have to be removed by mid June to give place to rice crop.

Any improved variety developed for item a (i) at Srivilliputtur in the long staple cotton scheme, will suit all the specified districts except the delta and river project areas where the double and single crop wetlands lie intermingled, where the cultivation of the former will affect the cotton grown and retained in the latter, and where the field to field irrigation and seepage from canals cannot be avoided. P. 216 F and development of similar short duration varieties possessing a total crop life not exceeding four and a half months will fit in the category a (ii). Long and short duration cotton types will suit item (b), the two limiting factors being the availability of water for plentiful irrigation during the hot months of February and March and the capacity of cotton varieties to resist the adverse effects of heavy dew in December—January. High temperature and low humidity have been shown to cause contabescence, to induce flower shed and to affect proper seed development. Item (c) will come under this distress group. The preliminary observations on early sown cotton crop in these districts have shown that the cold soil in winter is not conducive for growth and that the crop remains stunted till the summer weather sets in. There is thus no great advantage in early planting during November—December. In other words, a variety having not only a shorter duration than P 216 F but capable of withstanding a high atmospheric temperature exceeding 110°F. during flowering phase must be found.

The larger development and utilisation of the three categories of fallow land outlined above are delayed not on account of non-availability or impossibility of breeeding suitable varieties of cotton

but due to the existence of inadequate facilities for off seasonal irrigation. Recent efforts made by the State Agricultural Department in tapping underground water resources by sinking filter points have demonstrated a new idea for an average farmer. The success and possibilities have been well commented upon. The filter point wells cost Rs. 200 for sinking and Rs. 1,750 for power. Ten acres of cotton can easily be cultivated under each such well as the crop normally requires irrigation only once in ten days during the hottest period of summer. The expenditure incurred on driving filter points and on providing the necessary power for lift irrigation will be paid many times over in the course of a few years by the increased profits brought in through the off seasonal cultivation of a cash crop like cotton. It is time that funds from private sector are mobilised and utilised for the rapid development of the water resources of the tract instead of depending on the slow assisted development by the State. Formation of co-operative societies for the grant of loans required for well sinking and purchase of oil engines or electric motor with pump sets and for assistance in marketing the crop, will go a long way in the above programme. Other possibilities which require examination and implementation at State level are the river pumping schemes and provision of irrigational facilities for cultivation of cotton crop during summer months in localised compact blocks under perennial canal zones. The yields of the new short duration cotton P 216 F were so encouraging that big rice farmers of Shiyali Taluk in Tanjore district owning lands under the South Rajan canal and Pudumane river sent a representation to Irrigation Department and appealed to brother farmers for giving up the limited cultivation of short duration rice in summer and for switching over to the more paying cotton on wider area for the same quantity of irrigation water.

The trials with cotton variety P 216 F on Agricultural Research Station at Aduthurai and the results of pilot schemes launched under the Cotton Extension Scheme in the year 1950 in the Tanjore and South Arcot Districts have demonstrated beyond question that cotton could be grown profitably during the short follow period of four and a half months on all kinds of soils in both single and double crop lands provided adequate and timely irrigation was given and that no untoward effects on the succeeding rice crop need be apprehended. The green residue amounting to 6,000 lb. per acre left by cotton crop when incorporated in the soil, acted as green manure and registered yields similar to another field receiving green manures of other types. The development of such

tracts is primarily dependent on the creation of irrigational facilities during off season but not on evolution of other special short duration varieties. Ultimately it will be possible to rope in at least five lakh acres for growing cotton on rice fallows. We have now correct and good information about possible centres of useful material. They are Africa, America, Persia. Punjab, and Bombay. The list can be amply supplemented with other world collections and early duration hybrids synthesised at Coimbatore from wild cotton varieties and early duration types. These varieties can be tested first for growth, duration and yield on different soils, planting dates and climatic factors and observed for shedding, pests, diseases and fibre properties. The selected types after one or two seasons may be tried on half acre plots. The agronomy of the crop must receive greater attention than breeding and the effects on succeeding rice crop must be correctly established. No crop of cotton should be advocated for growing without the application of fertilisers. The enquiry must be on optimum dosage required for obtaining a good return from cotton and the succeeding paddy as well.

In parts of Chengleput, North Arcot and Chittoor districts, large blocks of land are lying fallow during summer in spite of the existence of a number of wells, as the tendency is to grow rice in preference to other crops. The Agricultural Department demonstrated that the short duration cotton could be grown with advantage on thrice the area with the same irrigation and labour facilities. Of late the stemborer damage on rice crop has been rather serious and regular, that the farmers have developed a voluntary desire for growing alternative cash crops requiring less attention and greater profits in the present context of falling prices for food crops. The main bottle neck for expansion is stated to be marketing and if measures for the quick disposal of harvested cotton at fair price can be devised in such non-cotton growing districts, there will be a greater enthusiasm for its cultivation.

Two new projects viz., Tungabadhra and Lower Bhavani are nearing completion and water is expected to be let in during 1954–55. The entire estimated ayacut will, however, take time to develop and to settle down to normal cultivation. Other projects are in the offing. In addition to the direct benefits accruing from the major river projects, it is also expected that the water table in the project zones will rise when the canals carry water and enable sinking of wells to supplement the water supply in high level lands

situated in the vicinity of the canals throughout its course. Eventual increase in cotton area inclusive of the immediate expansion anticipated in the two completed river projects can be placed at four lakh acres. Breeding work and agronomical enquiries done on American cotton at Siruguppa for the Tungabadhra project have yielded valuable information. Varieties resistant to blackarm (Balasubrahmanyan & Kesava Ayyangar, 1952) have been evolved and agronomic problems relating to Jassid damage (Balasubrahmanyam & Kesava Ayyangar, 1950) have been solved. Luxmi cotton can be recommended for large scale cultivation until seeds from more productive, better quality and higher resistant types already evolved by breeding are multiplied and supplied. The problems of Lower Bhavani Project are comparatively simple. The cultivation of Cambodia cotton is not new to the area and M U 1 variety fits in well. The urgent need of the tract is improvement of the fertility status of the soil and layout of the individual holdings for canal irrigation. The State has already taken the necessary steps to provide the technical and monetary help in the project areas and it is hoped that with the contribution made by the benefiting farmers, the production targets will be realised sooner than anticipated.

Manures—Long Term: A majority of farmers in Madras State apply all the cattle manure and compost available with them to cereal crops like Sorghum, finger millet and Italian millet which precede the cotton crop in normal rotations under a belief amounting to conviction to that direct application of manure to cotton encourages the leaf growth without increasing its yield per acre. It is only the cotton farmer of the irrigated cambodia who devotes some attention to the aspect of manuring crop with his own farm and animal wastes while a few of them who are progressive in out look and who are conscious of the benefits from oil cakes and ammonium sulphate resort to such supplementary applications as a regular feature. The rate of manuring however varies considerably from holding to holding and is entirely dependent on the solvency of cultivator. It is this factor which is responsible for the wide range of yields varying from 200 lb. to 900 lb. lint per acre and for an overall average of 270 lb. lint per acre for all irrigated cotton in the State.

The average acre yields of cotton in America are 450 lb. lint under irrigation and 250 lb. lint for unirrigated crop. The corresponding figures for Madras are 300 lb. and 125 lb. per acre for the

highest yielding zones in Cambodia and Karunganni tracts. In many of other areas, the yields are very low and do not exceed 50 lb. lint per acre. No American farmer will think of growing cotton without manure whether he raises the crop under irrigation or with the aid of rains. The national yield of America which was 160 lb. per acre in the year 1929 was raised to 289 lb. per acre in a period fifteen years through (a) increasing both the plant-food of contents and the quantity of fertilisers applied to every acre from 266 lb. to 326 lb., and (b) restricting the application of commercial fertilisers to zones receiving adequate rains or served by river projects.

The analysis of manurial trials done by Panse (1945, 1952) had definitely shown that manuring was profitable in areas where the cotton crop received irrigation or grew with an annual rain fall of about 30 inches. In the experiments carried out on the Government farms of the State, the cotton crop did benefit by manuring and did register increases in kapas yield especially in the irrigated Cambodia area and the un-irrigated Karunganni tract wherever the levels of soil fertility ranged from medium to high. The average responses of 200 lb. seed cotton per acre for a dose of 40 lb. Nitrogen (2 cwt. of Ammonium sulphate) on irrigated Cambodia and 70 lb. kapas per acre for an application of 20 lb. Nitrogen (1 cwt. of Ammonium sulphate) on un-irrigated Karunganni were obtained. At Koilpatty which is a rainfed Karunganni area, application of every pound of Nitrogen yielded an extra pound of lint on soils of low to medium fertility and two pounds of lint on lands of high fertility. The response of un-irrigated Cambodia enjoying a pre-war normal area of two and half lakhs of acres will be the same.

The best way of applying the fertiliser to Cambodia is to spread evenly by broadcast one cwt. before ridging up the fields for planting and to apply the second cwt. at hoeing in the month of December. In the case of farmers who are obliged to plant cotton late in stubbles after a crop of ragi, the first application may be in the month of December followed by another dose in January. Irrigation should invariably follow the manure application when the crop is on the field. On the blacksoils where Karunganni and Tinnies cottons are grown, one cwt. of Amonium sulphate may be spread at about the same time the seeds are sown broadcast and covered with country plough.

The largest demand from the Textile Industry of India is for cottons of the medium and long staple ranging from 12/16 inch to 17/16 inch which are suitable for spinning 30's to 40's warp counts. Internal production of these styles, if stepped up, will reduce the foreign imports. The easiest and surest way of achieving the above objective is without doubt through a wider use of artificial fertilisers in the districts of South Arcot, Tiruchirapalli, Salem, Coimbatore, Mathurai, Ramanathapuram and Tirunelveli where good quality cotton varieties are now grown both as irrigated and rainfed crops. The Sindhri Fertiliser Factory has already been geared for full production, at the rate of 1,000 tons of ammonium sulphate per day. Even though the entire nitrogen requirements of the cotton area in Madras State cannot be met from the internal production, it will prove cheaper to import fertilisers than raw cotton. The data collected during the years 1950–53 from the Cotton Extension work in Madras disclosed that the farmers of irrigated Cambodia who spent Rs. 35/- per acre on fertilisers were able to reap on an average a gross profit of Rs. 100/- while their bretheren growing unirrigated crops could realise profits of Rs. 30/- on every acre of Karunganni cotton manured at a cost of Rs. 17/- per acre. A very significant finding was that in the two regions manuring was a profitable venture even under adverse climatic conditions. Regeneration of growth and bud formation soon after rains and after a wave of insect damage was much more evident in manured lands than unmanured blocks.

It is very necessary that persistent and intensive propaganda for application of nitrogenous fertilisers in the two project areas nearing completion viz. Lower Bhavani and Thungabadhra, where irrigated cotton will figure as important item, is done by special staff until the entire ayacut is fully developed and agricultural practices are fully established

Crop Rotations — Long Term: Minor adjustments in crop rotations have been known to bring about a marked change in the productive capacity of the soils especially on the unirrigated areas. In such agronomic enquiries the legumes have played a major role. The experiments conducted at the several centres in Madras have already been summarised by Balasubramanyan (1947). The review indicated that legumes other than groundnut, tur, horsegram and gram for seed and *pillipesara*, *guara* for green manure were unprofitable.

Irungu sorghum for fodder and *bajra* for grain are the two principal rainfed crops grown by the cotton farmers of Ramanathapuram, Mathurai and Tirunelveli Districts over an area of 3,50,000 acres every year as a crop preceding Karunganni cotton. Irungu sorghum has been observed to have a depressing effect on the yield of succeeding crops. The loss in the yield of seed cotton following a crop of Irungu sorghum is estimated to range from 10 to 25 percent of a crop of cotton following *bajra*. The farmers though fully alive to this reduction are forced to continue the practice in order to raise the necessary cattle fodder needed by them. The monetary loss so sustained by every farmer for every acre of cotton planted after Irungu sorghum will be roughly Rs. 10/- on an average. The experimental data collected for over 10 years at the Agricultural Research Station, Koilpatti on the cause for the depression in the yield of cotton following Irungu sorghum and the ameliorative measures which would more or less correct them completely indicated that the mixed cropping of Irungu sorghum and indigo corrected the ill-effects and raised the yield of cotton to the level of the *pre-bajra* cropping. An average increase of 10 lb. lint per acre was obtained. Seeding Irungu mixed with 12 lb. indigo added about 20 lb. Nitrogen per acre through the activity of nodular organism in the roots and the opened up the soils well during summer. The yield of Irungu sorghum was not reduced in such mixtures. This practice when extended to the *bajra* crop was also noticed to benefit the succeeding cotton crop to an appreciable extend. A mixture of Irungu sorghum and *bajra* with 12 lb. of indigo per acre is recommended for general adoption. After the sorghum or *bajra* is harvested, the small indigo plants so far suppressed by shade and crowding of the associated crop put on good growth assisted at times by the summer showers received in April. The fields may be ploughed in May–June by incorporating the leguminous crop in the soil. The subsequent treatments are same as those of any other field on which cotton sowings are planned. It is a simple farming practice which if enforced will substantially add to the cotton production of the Karunganni tract.

The sorghum-cotton rotation in irrigated regions of Coimbatore district is an established farming practice. The sorghum crop is planted in March and harvested by July while the Combodia cotton in dibbled in by the end of August and removed by the beginning of March. The cotton crop was found to give only

about 90% of its potential yield leading to an average fall of 20 lb. lint per acre. Experiments conducted for a number of years at Cotton Breeding Station, Coimbatore revealed that summer sorghum and *guara* mixed in the ratio of three to one had no effect on the yields of both fodder and grain but increased the yield of the succeeding Cambodia cotton. All the ryots following the intensive rotation of cotton-sorghum under irrigation would be well advised to grow a three to one mixture of summer sorghum and *guara* instead of pure summer sorghum. The *guara* crop comes to the maturity more or less at the same time as the sorghum crop and can be harvested along with summer sorghum for being fed to cattle which relish the mixture better than the pure summer sorghum straw considered inferior to the rainfed *periamanjal* sorghum sown in cold whether in the same area. The practice if it gets into vogue will be similar to the legume mixtures like green gram, cowpea or lablab grown with the rainfed grain sorghum in other parts of the State. The improvement in the fertility of the soil will be gradual but lasting. It will be ultimately reflected in the yield of Cambodia cotton which will increase by 60 lb. kapas or 20 lb. lint valued at Rs. 25/- per acre. Lands can be enriched without any investment. Its adoption over the whole of the early planted area of 25,000 acres in Coimbatore district would raise the production of Cambodia cotton by 1,000 bales of lint per annum.

(To be continued.)

OBITUARY

We note with deep regret the passing away of Raja Sri V. Madhava Rajah of Kollengode who was one of our patrons from early days. He evinced keen interest in agriculture and its problems and was a frequent visitor to the College Day Conferences and was present even during the 1954 session. May his soul rest in peace.