

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

by

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(Continued from May issue Vol. XLII, p. 165)

Crop Mixtures — Long Term: The advantages of mixed cropping have been widely recognised by the dry land farmers of the Madras State and consequently it is common feature in almost all districts. John et al (1943) and Balasubrahmanyam (1950) have summarised the experimental data recorded at the Agricultural Research Stations while the latter had further opportunities for observing the potentialities under the Cotton Extension Scheme during the years 1950 to 1953 both on the Government farms and on the cultivators holdings.

The majority of dry land farmers in Madras State grow pure crops of groundnut continuously on the same land without any rotation while poorer cultivators owning small areas prefer to raise other crops mixed with it. The various crops with which groundnut is commonly sown mixed under rainfed conditions are gingelly and redgram in Visakhapatnam and Godavari; *Jowar*, Kodo millet, cotton, redgram and castor in Guntur, Krishna and Ceded Districts; redgram and castor in the Central Districts and redgram, *Jowar*, *bajra* and gingelly in South Arcot, Chingleput and Tanjore depending on types of soil and the rain pattern. The normal area under groundnuts in these districts is forty lakh acres per annum, a part of which alone is now being sown mixed with redgram, gingelly, castor, cotton or millets. A cotton crop will admirably suit such mixed cropping since the feeding zones of the shallow rooted groundnut and the deep rooted cotton lie at different soil depths and no competitive or depressing effects have been noticed in all the trials conducted so far. Mixed cropping with cotton is not only the most remunerative practice but is also an effective insurance against vagaries of the season and risks from damage by pests and diseases which the groundnut crop is usually subject to.

The crop of chillies grown as a rainfed crop over a lakh of acres in the districts of Guntur, Krishna, East Godavari and West Godavari is generally subject to severe damage bordering on total failure by an insect called thrips. The farmers who are obliged to

manure heavily, to cultivate the land properly and to raise healthy nurseries at considerable cost, suffer monetary losses which cannot be avoided even with the planting of thrip tolerant varieties like G 1 evolved at Guntur. Consequently, the area under the chilli crop has been steadily going down. Some of the farmers in East Godavari district are growing even today, chillies mixed with red cocanadas cotton. The chilli plant does not suffer by shading or competition effects of cotton which on the other hand bears a heavy crop on account of both the wide spacing of 7' x 5' adopted and liberal quantities of manure applied to the chillies. Experiments on such mixed cropping were conducted for over three years at the State farm in Guntur. The extra gross monetary return from the mixed crop ranged from Rs. 10/- to Rs. 90/- per acre depending on the extent of thrip damage, and in no year the return from mixed crop was lower than the pure crop. The device should therefore serve as an effective insurance in thrip-infested years and a harmless practice in thrip-free seasons. The cultivator runs no risk in any year and will produce on an average 40 lb. lint from every acre of such mixed crop.

Some farmers of Ramanathapuram and Tirunelveli Districts were cultivating Cambodia cotton as a mixture with irrigated finger millet. Of late, the area under such mixed cropping, has considerably dwindled mainly due to the attractive prices ruling for the food crop. The planting of finger millet and cotton (invariably Cambodia) is simultaneous and done in the months of August and September. Finger millet seedlings are transplanted in beds while the seeds of the Cambodia cotton are dibbled in both beds and on the sides of ridges. Sometimes it is also usual to broadcast the cotton seeds, form beds and transplant finger millet seedlings. There is no apparent difference between the two methods except in the ultimate seed rates. Hand dibbling requires about 6 lb. of cotton seed while broadcasting needs double this quantity. The cereal which outgrows cotton rapidly is harvested by the first week of January when a good hoeing and earthing up is given to cotton. The crop responds remarkably to the cultivation and yields a good harvest by the end of March. The farmers have not only not experienced any fall in the yield of finger millet in such associated cropping, but have actually obtained good yields of cotton depending on the fertility of the land and irrigations given till the middle of April. The farmers would be well advised to revive this sound practice which would reduce the gap in internal production of raw cotton in the country.

In the districts of South Arcot, North Arcot and Chittoor, the usual practice is to plant finger millet in the month of January and dibble later at the time of first hoeing the spreading variety of groundnut or sow bunch variety of groundnut at the time of the harvest of the cereal crop. Sometimes Cambodia cotton is grown after the harvest of cereal in March. Experiments were conducted at the Agricultural Research Station, Palur and observations were made on the cultivators' lands in all the three districts by planting cotton of the Uganda type along the ridges separating two contiguous beds and the irrigation channels. The seeds were planted after pre-treatment with cowdung and red-earth at distances of six to eight inches on the inner sides of ridges on the same day as the cereal was transplanted. A life irrigation was given after three days. Subsequent interplanting of groundnuts and treatment of the crop were in no way different in such mixed cropping as compared to the normal practice. The cotton crop was observed to grow well and did not in any way interfere with the ragi or groundnut. Their yields were not affected and cotton gave 100 to 475 lb. of kapas per acre depending on the dates of planting, soil fertility and frequency of irrigations. The harvests of cotton crop were completed by the time the groundnut was ready for lifting. No special treatment to cotton will be required in such mixed cropping except for irrigations, intercultivations and manuring given to the cereal. Although Uganda cotton was found to be a good type for mixing with finger millet and groundnut raised under irrigation during summer, Punjab 216 F which had a short duration was found more suitable in the areas where water was the limiting factor or where the bunch groundnuts had to be harvested earlier than in spreading variety. The quality of Punjab 216 F being very much similar to that of Uganda Cotton, should be preferred in such areas. Observations made on cultivators' holdings in Chittoor, South Arcot and North Arcot districts have also shown that cotton varieties like P 216 F could be grown mixed with irrigated summer groundnuts. The cotton crop came to harvest along with groundnut and no ill effects like shading of cotton plants on groundnut crop were noticed. The cotton plants were vigorous and prolific in yield. No extra expenditure was involved on manuring and irrigation by interplanting cotton in the groundnut crop. Yield as high as 400 to 500 pounds of kapas were obtained in addition to the normal yield of irrigated groundnut, thus bringing definite extra income to the cultivators. In the fourteen trials conducted on cultivators' holdings during the year 1951 MU 1 mixed with groundnut and finger millet, yielded on

an average 804 lb. and 677 lb. seed cotton per acre respectively while P 216 F. mixed with finger millet recorded 842 lb. per acre. The farmers of the districts of Chingleput, Chittoor, North Arcot and South Arcot can help in the production of more cotton, relieve the pressure on foreign exchange and benefit themselves by earning an increased profit of Rs. 50/- to Rs. 200/- per acre.

In Nellore, the finger millet crop planted in the months of November and December usually come to harvest in April and May. If cotton varieties like P 216 F having more or less the same duration could be grown mixed with it all along the ridges separating beds and also along the irrigation channels in such fields, it should be quite possible to extend this method over a greater part of 97,000 acres reported to be under finger millets annually in Nellore. A seed-rate of 6 to 8 lb. of cotton will be sufficient to plant one acre. The finger millet can be transplanted first and immediately it is over, cotton can be dibbled on the ridges separating beds at the rate of three seeds per hole spacing them about six to nine inches. A life irrigation may be given on the fourth day after such planting in order to soften the crust that may form and to help the germinating seedlings in pushing out the hardened soil at the top. Thereafter no special treatment to cotton is required except for the irrigations, inter-cultivations and manuring which might be the same as given to the cereal crop.

The cultivators in parts of Guntur and Krishna now grow one line of red cocanada cotton mixed with five to twenty one lines of groundnut in the months of June to August. The bunch variety comes to harvest in October while the spreading type is lifted in November or a little later. The cotton remains on the land till the end of March. The long duration of cotton necessitates keeping watch over the fields for preventing damage by cattle. A similar practice to a limited extent is also prevalent in other districts like Bellary, Anantapur, Kurnool, Cuddapah, South Arcot and Chingleput where the local varieties of cotton viz. Westerns 1, Mungari, Northernns and Cambodia are grown in association with groundnuts and cereals on lands of medium and high fertility under raingrown conditions.

The defects in duration and quality of local cottons were sought to be eliminated by replacement with short duration type capable of completing the harvests by the end of November i. e. a fortnight later than bunch variety of groundnuts. Experiments

conducted at Guntur showed that the early cotton variety H. 420 mixed with groundnuts in the proportion of 1 to 14 could yield gross gains ranging from Rs. 15/- to Rs. 75/- per acre depending on the soils and seasonal conditions. The cotton crop completed the harvests by the end of November and yielded on an average 40 lb. lint per acre. Trials conducted at Hadagalli in Bellary district showed that when the cotton-groundnut mixture was sown during the second week of July, the groundnut crop came to harvest by the end of October, while cotton has to be retained up to December. The yields obtained per acre were 25 maunds of cotton and 10 bags of groundnut. The ruling prices on the date were Rs. 20/- per bag in the case of groundnut and Rs. 10/- per maund for cotton. The net profit realised by the mixture was Rs. 299/-. Favourable reports of similar nature were also received from Mantralaya in Bellary district where a farmer grew such a mixture voluntarily under advice. The groundnut sowings were done in the first week of July in rows of 27 inches apart and Westerns 1 cotton was sown between the groundnut rows in September. Groundnut was harvested in October and Cotton was allowed to stand on the field till March. The yield of cotton crop was remunerative and in later observations better yields were realised when cotton was sown in August itself.

All farmers of the State planting *lcharif* crops on drylands will generally benefit if they sow short duration cotton H. 420 mixed with groundnut. In the districts of Salem, Coimbatore, Tiruchirappalli and Mathurai where the Pest Act is under operation, H. 420 can be grown with advantage since there is no prohibition against the retention of a non-American variety beyond September. One row of cotton can be sown for every 5 to 21 rows of groundnut depending upon the conditions of the tract. In Bellary, Cuddapah, Kurnool and Anantapur districts, Luxmi variety of cotton can be dibbled in the standing crop of groundnut in the month of August on the lighter soils while the Westerns cotton must be sown on deeper soils in the month of September.

The popularity of 420 cotton which was imported in large quantities from Madhyapradesh State and distributed under the Cotton Extension Scheme in the Ceded districts of Bellary, Anantapur, Kurnool and Cuddapah for being grown as a mixed crop with groundnuts and cereals in July has been well-established and it is finding favour in the circars especially Guntur and Kistna districts for the same purpose. Its extension in other groundnut

regions of Coimbatore, Salem and Tiruchirapalli can be achieved only slowly under steady and intensive propaganda. The cultivators appear to prefer the Punjab American variety P 216F or the Madras American Cotton MU1 in the districts of Chingleput, North Arcot and South Arcot for mixing with groundnuts and finger millets. The Westerns and Northern cottons are still in great demand when sown mixed with cereals during August. The efforts of the departmental staff in extending the cultivation of chillies mixed Coconada cotton in the Circars were unsuccessful. The main reasons were the soaring prices of chillies and the comparatively low prices offered for red cotton, the availability of insecticides at concessional rates for controlling thrip damage, the need for preventing cattle trespass and keeping watch over standing crop of cotton in such mixed crop areas long after the harvest of associated chillies. The practice is unlikely to extend unless short duration medium staple cotton varieties having the same crop life as chillies are evolved and there is parity in these prices of the two crops. The problem of cattle trespass can be solved only when farmers join together and grow the mixture in contiguous compact areas in each village.

Cultivation of Sea Island cotton in West Coast Long term: The rainfall and humidity of South Kanara and Malabar offered immense possibilities for the development of high quality cottons like Sea Island on the model of West Indies. Small scale trials were conducted in the year 1947 and later elaborated under a special scheme financed by the Indian Central Cotton Committee, Bombay. The experiments have reached a stage where the problem is not whether Sea Island can be grown but what agronomical treatments are to be done for making its cultivation remunerative to the growers. Early planting and application of fertilisers appear to be indispensable for success. The average yield per acre has to be pushed up to the level of 100 lb. lint. The process will prove less difficult if varieties having a shorter staple of about $1\frac{1}{2}$ " and higher ginning out-turn are evolved. It is possible to extend its cultivation as intercrop in coconut plantations covering four lakh acres, in *modan* lands over 65,000 acres during fallows and in another 65,000 acres of *Kumeri* lands where a system of shifting cultivation is practised. The cotton grown in the experimental area has been well commented upon by the Indian mills who manufacture sewing thread and who are obliged to import costly Egyptian cotton for such a purpose.

Improvement of farming practices Long term: The farmers in the blacksoil tract of Coimbatore District harvest their rain-grown *Periamanjil Jowar* in the month of February leaving 6 to 9 inches of the stubbles in the soil. These stubbles remain in the field till the cultural operations for the succeeding cotton are started in July and invariably ratooned after the summer showers. The limited moisture is thereby depleted during the hot months. The Karunganni cotton sown on such lands often records low yields, especially in years when the South-West Monsoon is weak the North-East rains are late. The reduction of the rainfed cotton amounts to 10 to 15 percent over an area of 50,000 acres in the district.

If the stubbles of cholam are immediately removed by working blade harrow instead of allowing the stubbles to stand on the field until sufficient rains are received for ploughing the field, the depletion of soil moisture can be prevented. The yield of the succeeding cotton crop which is increased by about 8 lb. of lint per acre more than compensates for the charges incurred on post harvest operations. It is a very minor variation of the local farming practice whose wholesale adoption in the district of Coimbatore and Trichinopoly will augment the output of Karunganni cotton to the extent of 1000 bales of lint per annum.

In this State, Cambodia is grown in two seasons viz., cold weather and summer months. The major area is cropped in cold weather corresponding to the period September–April between planting and end harvests. The early planting in September is largely in vogue in the taluk of Coimbatore where the farming system is aligned on an intensive *jowar*–cotton rotation, with September–March for Cambodia and March–July for *jowar*. In the late-sown tracts of Coimbatore, Salem, Tiruchirapalli and Mathurai Districts which constitute the bulk of the acreage, the prevalent rotation is finger millet–cotton or *bajra*–cotton partitioned on the basis of June–September for cereal and October–April for cotton. Water stress and seasonal limitations have circumscribed the components of the existing rotations, and the advantage of September planting could not be extended in *toto* in the late-sown areas. The experiments conducted on the agronomy of the crop at Coimbatore with the popular strain MU 1 in recent years by Kannian and Balasubrahmanyan (1952) have demonstrated that close spacing of 3" in line with 30" between rows (equivalent to 79,000 plants per acre) recorded the highest yields per acre

irrespective of sowing dates. Hence close planting of a late crop will never compensate for the delay in planting under Coimbatore conditions. The difference in yields between the normally planted and close planted crops was roughly 200 lb. seed cotton per acre. It was also found that planting in line on ridges and irrigating in furrows economised water and gave as much yield as the local system in which the sowing was broadcast and irrigation was through flooding in beds. The subsequent operations like weeding and hoeing could be done efficiently with labour saving implements like Junior hoe worked with bullock power as against costly mammoty and hand hoe requiring a large contingent of men and women. The practice merits large scale extension in the whole of Cambodia tract in Madras State.

Weather hazards Long term: In the raingrown tracts, the limiting factors affecting production are soil, drought, untimely rains and atmospheric temperature. The soil drought in arid regions is very much interrelated with erosion; control and soil conservation methods which cannot be accomplished without state aid. Bunding, tie ridging, wide spacing and drought evading varieties are the commonest recommendations made with regard to Ceded districts which grow seven lakh acres of cotton in normal years. Contour bunding as a soil conservation method has been done on a limited scale in the Bellary district. It will not be possible to cover very large areas in short time even with state aid. Private effort is equally indispensable, if substantial annual progress is to be ensured.

Cambodia Cotton in South Arcot District is at present planted in the month of March and irrigated from wells in the same manner as the *masipattam* Uganda cotton grown in the taluk of Srivilliputtur and its contiguous areas. The crop though extremely satisfactory from the point of growth and healthy appearance is very disappointing in seed cotton yields which seldom exceed half to two-thirds of the Srivilliputtur average. In addition, other defects like imperfect boll opening and poor seed germination are also noticed. Liberal applications of manures or irrigation water fail to correct them. The problem was taken up for a closer and intensive study at the Agricultural Research Station, Palur in South Arcot District from the year 1944. Flower drop was observed to follow periods of high atmospheric temperature and examination of such shed flower revealed the presence of a large proportion of defective pollen. It was concluded that if the hot periods during flowering and fruiting periods could be avoided, the various defects

could be rectified. Experiments aimed at forcing early maturity through (a) shifts in planting dates (b) close planting and (c) development of short-duration varieties, were conducted for over three years from the year 1946. The conclusions were that December planted crop of Uganda-1 always gave three times the yield of March-sown cotton, and that close planting combined with frequent irrigations during hot months increased the yields further. The quality of seeds, however, remained generally poor though some improvement in germination was registered. The cotton farmers of South Arcot, who are likely to experience the ill-effects of hot summer on the *masipattam* crop will therefore be advised (a) to plant cotton early in the months of December—January (b) to choose early duration varieties recommended by the Agricultural Department (c) to plant cotton close and irrigate frequently during hot periods (d) to use only seeds from other districts for sowing purposes and (e) to manure the early-planted cotton in preference to late-planted areas. The wholesale adoption of the above recommendations will help every farmer to treble his profits per acre and place the production of long staple cotton in Madras and India on a sound basis.

The main reason for the slow adoption of the above experimental finding by the farmers of the district is on account of their present practice of growing short duration finger millets in January and following it up with summer cotton in March. The defect can be partly got over if cotton can be grown as mixture with finger millets even in January and treated as a pure crop from March after harvest of cereal or if cotton is grown unmixed with finger millets in December-January since the nett profits will be more than either the mixed cropping or the one following the other. In the context of the present ruling prices for certified MU 1 cotton and falling prices of finger millet, pure cropping is bound to prove comparatively more remunerative.

The Karunganni crop of Tinnies area is subject to shedding of floral parts during periods of untimely rains in the month of February and to low yields in years of subnormal rains. On account of these hazards, the mean yield of the area has been fluctuating. Both these defects have been avoided through evolution of early maturing and drought resistant strain K. 2, whose spread will stabilise the annual production. The new variety K. 2, has recorded average yields of 350 lb. of kapas per acre even in a year of drought while the yields of the local variety ranged from total failure to

200 lb. per acre. Its outturn of lint in ginning and its mean staple length of 15/16 are other good points which have already attracted the attention of many mill-owners.

Homestead Cultivation—Long Term: The development of perennial cotton varieties for backyards, homesteads and unreclaimed waste blocks of average fertility, subject to outbreaks of malaria or labour scarcity offers another fruitful line of attack. The work done by Balasubrahmanyam (1950-52) has revealed that under the present day conditions which make possible the effective control of insect damage through pesticidal dusts and sprays, the evolution of suitable varieties in American 'Deshi' and first generation hybrids is desirable. In the State wide trial conducted over three years Moco with its long fine staple and resistance to pests among the South American perennials, Nadam in the short staple group among indigenous types and first generation hybrids between Moco and Cambodia hold out fair promise for extension depending on the conditions of soil and rainfall in the respective districts. The production will meet atleast the entire needs of Khadi and extra factory consumption which may be placed at 20,000 bales per year if a concerted effort is made for their propagation.

Breeding Better Varieties—Long Term: Madras has organised her research in such a way as to tackle regional problems relating to every trade variety in one of the permanent Agricultural Research Stations financed by the State or in special schemes subsidised by the Indian Central Cotton Committee, Bombay. The main aims of the breeding programmes are improvement in yield per unit area, higher ginning outturn, longer staple, better maturity of fibre, greater adaptability over a wider range of agricultural conditions and capacity for resistance to adverse factors like drought, pests and diseases.

The cultivated varieties of *arboreum* and *herbaceum* in Madras are low ginners ranging from 23% to 33% while most of the *arboreums* and *herbaceums* grown in other parts of India possess a higher ginning outturn. Varieties from *cernuum*, *bengalense* and *herbaceum* were used for hybridising with local types. All strains under release or in advanced stage of the trials in the various *deshi* cotton areas are mainly those derived from the progenies of the above hybrids. The low ginning trade varieties viz., Northern, Western, Coconadas, Chinna pathi, Umri, Uppam and Tinnies are either in the process of gradual elimination or has been already displaced by higher ginning

hybrid strains and new extra-state introductions. The use of *herbaceum* strains from Broach & Viramgam for crossing with Westerns cotton has given high ginning biotypes. The introduction of H. 420 from Madhyapradesh has helped the slow elimination of short staple mungari and chinnapathi as well as low ginning umri. Eventually it may become popular in the Cocanada region too. The synthesis of long staple *deshi* cotton exceeding one inch by Ball's Sorter test is yet another achievement in the *arboreum* group of cottons. They are expected to spin 40's warp and give an even nep free yarn on account of their high maturity.

The improvements registered in American group of cottons are equally noteworthy. Persistent and continued reselections in intrahirsutum and interspecific hybrids involving exotic varieties from East Africa, Egypt and West Indies have yielded stable, productive, long staple, high ginning and adaptive types. In some of them, duration has been reduced, a ginning of 38% realised, staple lengths exceeding 13/16" reached and resistance to blackarm and jassids registered. A new long staple substrain from MU 1 capable of spinning 40's warp counts and adaptable for being grown on rainfed and irrigated winter as summer seasons was developed. The still later strain MU 2 can spin 50's warp although it has only adaptability. In the rain grown regions, Luxmi cotton from Dharwar has acquitted so well on the black soils of average fertility in Bellary district that the area shot up to nearly one lakh acres during last year as per estimates.

The discovery of P 216 F as a suitable cotton for short summer fallows of Tanjore and other areas enjoying irrigation facilities is the outcome of research undertaken with a special purpose. In the new variety P 23 F, the duration has been still further shortened by about a week. Since the year 1945-46, the wild cotton varieties were employed in hybridisation for evolving hardier and better races. The derivatives of hybrids with tetraploid (*taitense* x *darwinii*) and hexaploid (*hirsutum* x *raimondii*) were the most promising. The former group crossed with Cambodia 4463 gave jassid and drought resistant strains while the latter group with Cambodia 7682 (an interspecific multiple hybrid (*barbadense* x *hirsutum*)) yielded productive, high ginning and blackarm resistant biotypes.

A general idea of the staple length and ginning out turn improvements realised in the last quinquennium compared to the standards of the varieties under cultivation is given in Statement II.

STATEMENT No. II.

Name of the variety	Parentage	Mean staple length 32nd inch.	Spinning value H. S. W. C.	Ginning out- turn	Special attributes and defective traits
American Cotton:					
(a) Under cultivation:					
CO 2	Pure line selection from imported Cambodia	28 to 32	24/35	35	Late maturing, susceptible to stem weevil
CO 3	Derivative of a cross between CO 2 and South African uplands	30 to 32	38	37	Early maturing, susceptible to stem weevil and blackarm
MU 1	A reselection from a derivative of a cross between CO 2 and South African uplands	30 to 34	10/45	35	Very early, tolerant to blackarm
MU 2	An inter-specific multiple hybrid derivative	31 to 34	52	35	Very early, high spinning
P. 216 F.	A selection from Punjab American	29	34	30	Very early suited for rice fallows, susceptible to red-leaf
Laxmi	G. 1 X CO 2 hybrid derivative	29	40	30	Early variety suited for unirrigated blacksoils of Ceded Districts
(b) Awaiting release:					
9030	Multiple hybrid derivative	31	42	36	Adaptable for Winter Cambodia tract
0734	do.	30	42	34	
0995	do.	30	39	34	
0744	do.	31	40	36/34	
(c) Special tracts:					
Sea Island	Montserrat in West Indies	48 to 36	100	28	Suited for rainfed cultivation in West Coast
Moco	G. <i>hirsutum</i> race <i>marie-galante</i> from South America	30 to 32	40	30	A good quality perennial variety for homesteads
Nadam	G. <i>arboresum</i> race <i>indicum</i>	18	12	23	An inferior quality perennial cotton resistant to droughty conditions
(darwinii X baikense) X <i>hirsutum</i>	Derivatives of hybrids with wild tetraploids	30 to 34	40	35	Culture 9-8-2 is <i>fassid</i> tolerant

STATEMENT No. II—(Contd.)

Name of the variety	Parentage	Mean staple length 32nd inch.	Spinning value H. S. W. C.	Ginning Out turn	Special attributes and defective traits
<i>rainondi</i> X <i>hirsutum</i> derivatives	Tetraploid derivatives of hybrids with hexaploids	30 to 34	40	32	Cultures 1-21 and 1-22 are blackarm resistant.
Deshi Cotton:					
(a) <i>Under cultivation:</i>					
K2	Derivative or cross between <i>indicum</i> and <i>cernuum</i>	28 to 30	30	34	Escapes untimely February rains in Tinnevelly area
K5	do.	28 to 32	30	34	Adaptable for Coimbatore tract
N. 14	Pure line from Northern (G. <i>arboreum</i> race <i>indicum</i>)	28 to 30	40	25	Low ginning, high spinner, suited to high rainfall regions
C. 1	Derivative of interstrain cross within G. <i>arboreum</i> race <i>indicum</i>	28	30	28	Red cotton, light brown in colour
C. 2	Derivative of interstrain cross within G. <i>arboreum</i> race <i>indicum</i>	28	30	28	Red cotton, medium brown in colour
Rayalaseema-1 (881-F)	Derivative of cross between <i>indicum</i> and <i>cernuum</i>	28	30	34	Late than Mungari local
H. 420	do.	27	26	33	Early variety, suitable for mixed cropping
Mungari	G. <i>arboreum</i> race <i>bengalense</i>	16 to 18	10	36	A coarse short staple type
Chinnapathi	G. <i>arboreum</i> race <i>indicum</i>	16 to 18	10	26	Early maturing, short staple type
Westerns-1	Pure line from Westerns (G. <i>herbaceum</i> tsyr <i>acerifolium</i>)	26 to 30	24	30	Early maturing, wasty cotton
(b) <i>Awaiting release:</i>					
6186-9	Derivative of cross between <i>indicum</i> and <i>cernuum</i>	30 to 32	34	33	Adaptable Karunganni selections with good yield and spinning
6188-8	do.	do.	39	33	
6312-4	do.	do.	41	33	
6874	do.	do.	40	33	
2711	Derivative of (W. 1 X Improved Jayawant) X 1027-ALF	26 to 30	30	35	High ginner and low fibre weigh
6234	Derivative of a cross between <i>indicum</i> and <i>cernuum</i>	30 to 32	40	33	Later in maturity than N. X 12 better in ginning and yield

The particulars also include new introductions and varieties developed for special purposes. It may be seen from the statement that all short staple varieties below $\frac{7}{8}$ " will be ultimately ousted and the whole of the Madras State will come under medium and long staple area.

Pests and Diseases Long and Short Term: Pink and spotted boll worms, stem weevil, jassids, red bug and leaf rollers among insect pests, and blackarm in diseases are the major affections in the province. The system of intensive cultivation of irrigated cotton involving a long non-cotton period of over five months has not very much altered either the initial incidence, crop loss or quality damage. The exclusion of desi cotton from the operation of cotton Pest Act and non insistence of any close period for unirrigated American cotton are responsible for the present pest situation. The damage caused by stem Weevil has been minimised by using the resistant Moco type as a parent. Further selection in the material is being pursued. The problem of Jassids has been fully investigated in the enquiries intituted both at Siruguppa and Coimbatore. The conclusions are summarised by Balasubramanyan and Kesava Ayyangar (1950) and Kannyan and Balasubramanyan (1952). Early and close planting of hairy resistant types offer the best solution. Gueserol 550 sprayed for controlling Jassid damage was found to reduce yields. Red strainers in South Arcot and boll worms all over lead to premature boll opening, stained cotton and poor quality lint. Insecticidal control is the only means of keeping them under some check in our present state of knowledge on their bionomics and life history. Breeding for resistance to boll worms using the wild cotton *thurberi* is already figuring in the programmes but it will prove to be a very slow and long drawn task requiring good deal of knowledge and patience for the proper synthesis. The extended use of methyl bromide for fumigation of all sowing seed soon after ginning of Kapas will not only keep down the cost of treatment and crop losses but will also improve the quality of harvests. The control of blackaram which is a disease of recent origin and which has assumed a major importance of late is being accomplished through selection for resistance by adopting the spray technique evolved by Dr. Knight in Sudan. The varieties given out for large scale propagation are being thoroughly tested first in pots by the Government Mycologist and later in field by secondary inoculation methods before release. The seed dressings with organo-mercurial compounds have proved their undoubted worth in controlling blackaram in Anglo-Egyptian Sudan. The adoption

of such pretreatments in so far as the American cotton seeds are concerned will stabilise the production, and quality of long staple cotton varieties of MU 1 and MU 2 class which are today the pride of India. There is an urgent need to organise and to develop effective control measures through pesticides, fungicides and fumigants in the state.

Seed Supply Short Term: Finance for seed multiplication work is now derived partly from subsidies granted by Indian Central Cotton Committee and partly from the State funds. The overhead charges on supervision and miscellaneous contingencies amounting to Rs. 5/- per bag of 100 lb. seed, has to be collected from the cotton farmer as premium for good seed if the schemes are to work on a self supporting basis. Majority of the farmers in the State are reluctant to pay the premium and as such the percentage of the growers who purchase the pure seed from the depots is low. The bulk of the sowing seed is supplied by private traders whose stocks are far inferior to the certified seeds. The defect can be remedied only when the growers themselves organise and develop the primary stocks of departmental seed by decentralising it on a village basis, leaving only the burden of supplying nucleus seed every year to the Agricultural Department. The other alternative will be to raise a separate pure seed fund by levying a small cess from the primary transactions of kapas and lint, sufficient to cover expenditure on seed production required for the whole area. It will not be possible unless the trade and the mill co-operate, and legislation is passed.

Marketing: The Madras Commercial Crops Markets Act has been recently amended so as to make it more efficient and to combine more than one commodity in markets where trade in crops other than cotton is in vogue. It will be possible eventually to open regulated markets in all important centres of the State. Such an expansion will instill confidence in the growers, avoid deliberate type mixtures and ensure maintenance of grade and purity. In the new areas, price guarantees and introduction of flat rates at all points with full and free facilities for transport will stimulate interest in cotton growing.

Legislation: The amendments incorporated in the Cotton Ginning and Pressing Factories Act (Madras) will effectively check the various malpractices of watering and mixing in the processing stages. The Madras Cotton Control Act aimed at the control of variety of cotton grown in a zone and at prevention of

mixing in any stage, will further tighten up the measures taken towards maintenance of quality from the field stage. An Agricultural Seeds Act or a state check in all stages like Egypt will be very necessary for ensuring purity and grade, and for building up reputation in trade, internal as well as external. The provisions of the Cotton Transport Act have to be strictly applied especially in border zones by tightening vigilance on road and rail transport of seed and kapas. Otherwise the purity of the crop in the areas will be slowly undermined. A cotton certification scheme for MU 1 cotton has been working in Madras State from the year 1951. Under its provisions, all certified cotton is eligible for prices above the ceiling fixed for Cambodia and during the period of decontrol of prices, it will equally command a premium based on the ruling rates for East African styles. It is stated that the consuming mills are able to obtain good quality MU1 cotton since the introduction of the scheme.

Conclusion: In the forgoing paragraphs an outline of the various measures by which the raw cotton production could be increased without clashing with food programmes of the state was given. Unlike other states in India, Madras has varied crops, seasons and soils which would lend themselves admirably for large scale extension under mixed cropping, fallow cultivation and intensive farming. The cotton crop which can be grown throughout the year in most of the places has only to be fitted in any one of the three broad categories named above, through a proper choice of variety and planting time. Substantial increases in production on the existing area of cultivation can be achieved through a wider application of agronomic recommendations made in the paper. All of them have been tested not only on the Agricultural Research Stations but also on the cultivators' lands as part of the Cotton Extension Plans. The targets for production given in Statement III are based on average responses obtained during the last two years. Even on a very modest estimate of roping in only a portion of the ultimate potential area the extra annual production of American (long staple) and Deshi (short staple) cottons will amount to 5,32,000 bales and 1,18,000 bales respectively. India is importing large quantities of cotton in the staple length group $1\frac{1}{8}$ " to $1\frac{1}{2}$ " for spinning yarn of fine counts. The price structure of the imported medium long and extra long staple cottons is largely dependant on the future developments and requirements of fine spinning industries in the world and on the extent of competition from the synthetic

STATEMENT No. III.

Item No.	Particulars of extension work	Acres		Estimated annual area over which the extension is proposed to be done	Anticipated average increase in lint yield per acre	Extra annual production in terms of bales of lint (400 lbs.)	
		Potential normal area over which the extension can be done	Acres			American Cotton	Deshi Cotton
					lb.		
1.	Utilisation of rice fallows in Cauvery, Kistna and Godavari deltas, tanked fed areas and other river projects where canal or underground water is available during summer ..	0,00,000	5,00,000	200	2,50,000	..	..
2.	Intensive cultivation and extension of cotton growing in new river projects viz. Tungabhadra Lower Bhavani and others under examination ..	5,00,000	2,00,000	200	1,00,000	..	..
3.	Application of fertilisers to existing area of irrigated Cambodia Cotton ..	2,00,000	1,60,000	80	32,000	..	..
4.	Application of fertilisers to existing area of:—						
	(a) unirrigated Cambodia ..	2,50,000	2,00,000	25	12,500	..	..
	(b) unirrigated Karunganni ..	4,50,000	3,00,000	20	..	15,000	..
5.	Mixed cropping of irrigated Cambodia with <i>guava</i> ..	30,000	20,000	20	1,000	..	..
6.	Mixed cropping of irrigated Cambodia with finger millet ..	2,50,000	1,00,000	100	25,000	..	..
7.	Close planting of irrigated MU 1 Cotton in early sown areas of Coimbatore District ..	30,000	20,000	20	1,000	..	..
8.	Early planting of irrigated MU 1 Cotton in South Arcot Dt. ..	3,000	2,000	100	500	..	..
9.	Development of perennials in homesteads, backyards and waste blocks:—						
	(a) South American types ..				15,000	..	..
	(b) Deshi-nadam ..				..	5,000	..

STATEMENT No. III—(Contd.)

Item No.	Particulars of extension work	Potential normal annual area over which the extension can be done	Estimated annual area over which the extension is proposed to be done	Anticipated average increase in lint yield per acre	Extra annual production in terms of bales of lint 400 lbs.	
					American Cotton	Deshi Cotton
		Acres	Acres	lb.		
10.	Utilisation of interspace in coconut gardens, <i>modan</i> fallows & <i>Kumari</i> lands of South Kanara and Malabar districts for growing Sea Island Cotton	5,30,000	2,00,000	100	50,000	..
11.	Mixed cropping with rainfed groundnuts:—					
	(a) American P. 216 F. and MU 1	15,00,000	2,50,000	40	25,000	..
	(b) Deshi H. 420 & W. 1	25,00,000	5,00,000	40	..	50,000
12.	Mixed cropping with rainfed chillies	2,00,000	1,00,000	40	..	..0,000
13.	Mixed cropping of indigo with cereals in Tirunelveli, Ramanathapuram and Madurai Districts	3,50,000	2,00,000	8	..	4,000
14.	Early removal of jowar stubbles in rainfed black soils of Coimbatore and Tiruchirappalli Districts	80,000	40,000	10	..	4,000
15.	Reduction in crop loss due to pre-treatment with methyl bromide and organo-mercury compounds and control of other insects by pesticidal sprays or dusts on American Cotton	1,50,000	1,00,000	40	10,000	..
16.	Organisation of pure seed supply and application of Cotton Control Act over the whole area	16,00,000	16,00,000	5	5,000	15,000
17.	Improvements through breeding new varieties capable of higher yield, ginning percent, resistance to adverse factors, insects and diseases. This will include also introductions like P. 216 F., Luxmi and H. 420 from neighbouring States	16,00,000	16,00,000	5	5,000	15,000
	TOTAL				5,32,000	1,18,000

fibres which are slowly taking the place of extra long staple in the manufacture of fine apparel goods, airplane fabrics, typewriter ribbons and other products. The breeding policy adopted in the State and outlined in the plan is aimed at stepping up the production of these styles through gradual replacement of medium staple American varieties. Extension of area in West Coast will increase the supply of extra long staple, while cultivation on rice fallows, under new river projects and as mixed cropping with finger millet will augment the medium long staple supplies. The implementation of the various ideas mentioned in the paper will require preparation of detailed districtwise plans and getting them executed under the district work programmes of the Department as well as the regional projects, if any, like Community Projects and National Extension Plan working in that area.

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ERRATA

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- Read Page 163. Line 15: *Modus operandi* for *Modes opurandi*.
 „ Page 183 heading: *Bracts* for *Brackets*.
 „ Para 2 line 1: *Normal* for *normol*.
 „ Para 2 line 8: *Rachillae* for *reachillae*.