

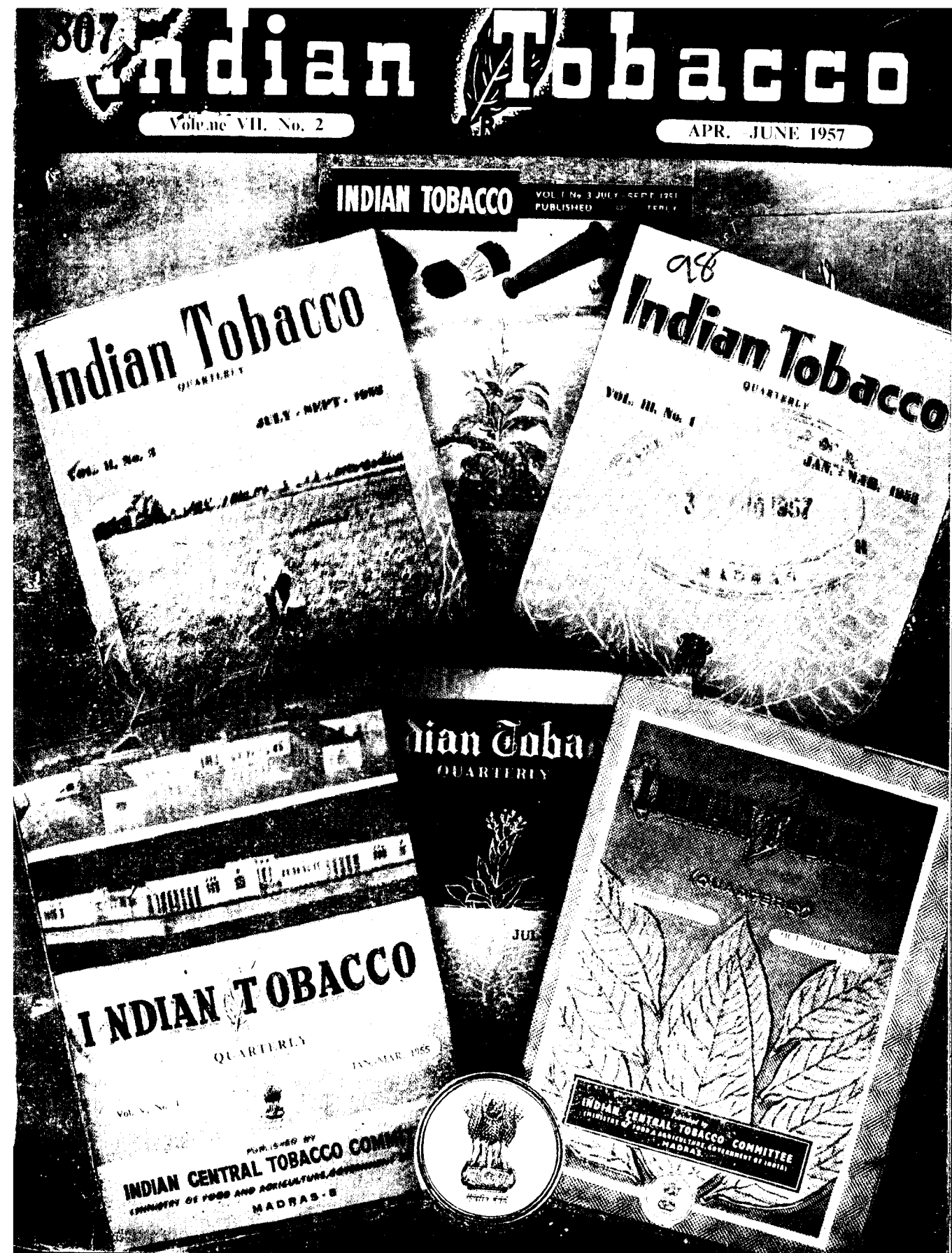
q8

Indian Tobacco

Apr-June 1957



JL
J452 m2, N51
N57.7.2
123843



Indian Tobacco

Volume VII, No. 2

APR. - JUNE 1957

INDIAN TOBACCO

VOL. I No. 3 JULY - SEPT. 1951
PUBLISHED BY THE GOVT. OF INDIA

Indian Tobacco
QUARTERLY
Vol. II, No. 3
JULY - SEPT. 1956

Indian Tobacco
QUARTERLY
Vol. III, No. 1
JAN. - MAR. 1957

INDIAN TOBACCO
QUARTERLY
Vol. V, No. 1
JAN. - MAR. 1958
PUBLISHED BY
INDIAN CENTRAL TOBACCO COMMITTEE
MINISTRY OF FOOD AND AGRICULTURE, GOVERNMENT OF INDIA
MADRAS-5

Indian Tobacco
QUARTERLY
Vol. IV, No. 2
JULY - SEPT. 1957
PUBLISHED BY
INDIAN CENTRAL TOBACCO COMMITTEE
MINISTRY OF FOOD AND AGRICULTURE, GOVERNMENT OF INDIA
MADRAS-5

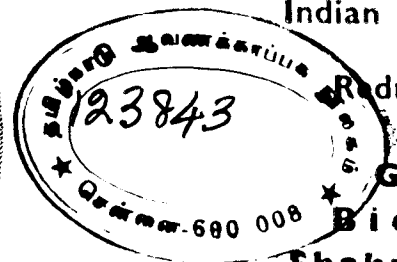


**NATIONAL TOBACCO
Co. OF INDIA LTD.,**

GUNTUR (S. India)

PACKERS & EXPORTERS

All types of
Indian Leaf Tobaccos



Redrying Plants
at
Guntur
Biccavole
Shahpur Patory

23 BUYING CENTRES in Tobacco Districts

REFRIGERATED WAREHOUSES

at
Guntur
Biccavole
Calcutta

Head Office: Norton Buildings,
1 & 2 Old Court House Corner.
CALCUTTA



MASCHINENFABRIK & EISENGIESSEREI

A. HEINEN G. M. B. H.

VAREL/Oldbg. W. GERMANY

1. Manufacturers for over 100 years—

TOBACCO REDRYING MACHINES Stick & Apron types

Improved Models made specially suitable for Indian Climate

2. Hydraulic Baling Presses of different types

3. Round Dial Weigh Bridge Scales for Lbs. & Kgs.

4. All kinds of special machines for tobacco processing for Cigarette, Cigar and pipe tobacco industries and tobacco cutting machines, a speciality.



VEB TABAK & INDUSTRIEMASCHINEN

ZWICKAUER STRASSE 40/58

DRESDEN, A. 3. / EAST GERMANY

Manufacturers of the famous Excelsior and other CIGARETTE & CIGAR Making & Packing Machines of high production capacity : Printing, Punching & Carton Making Machines etc.

For all details, please ask us or our Representative :

K. R. MALLADI

P. O. Box 125

GUNTUR-1

who can offer complete plants & machinery for Cigarette, Cigar and other tobacco industries including all other requirements used and rebuilt machinery. Detailed enquiries solicited.

make your own **rain** and harvest double



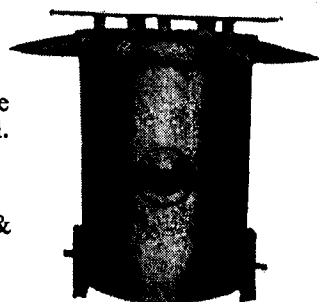
Watering Tea Gardens Irrigating Coffee Plantation Irrigating Tobacco Plantation

Perrot Rainer produces timely rain, economises water consumption, protects against drought, dust and pest, accelerates growth and yield of crops.

SOORAJMULL NAGARMULL
IMPORT DEPARTMENT
8, DALHOUSIE SQUARE EAST, CALCUTTA-1.

ANNOUNCEMENT

TO ALL TOBACCO FARMERS & BARN OWNERS
BUY THARRINGTON TOBACCO CURERS OF U.S.A.
AND CURE YOUR TOBACCO BY SCIENTIFIC METHODS
THARRINGTON Giant TOBACCO CURER



1. Gives better & More Weight of Tobacco cured.
2. Less attention required.
3. Less Labour charges & costs.
4. 100% Safety from Fire accidents.
5. Overall curing Cost less than conventional curers.
6. It takes less time and so more curings per season.

Contact Immediately for particulars :

RAJAN & SONS

19, Hamam Street, 4th Floor, Fort, BOMBAY 1

TELEGRAMS : "RAJANIX"

Sole Agents in India for J. A. THARRINGTON & SONS
NORTH CAROLINA (U.S.A.)

TELEPHONE : 25-5239

INDIAN CENTRAL TOBACCO COMMITTEE

38, MOUNT ROAD

MADRAS 6

Telegrams : "TABAC", MADRAS

Telephone : 86370

President : Dr. B. N. UPPAL, Ph. D. (Iowa), Agricultural Commissioner with the Government of India.

Vice-President : Sri. MOHANLAL A. PARIKH, B.A.

EDITORIAL BOARD

Dr. M. S. PATEL, M.Sc., Ph.D. (N. Carolina), Secretary.

Dr. N. R. BHAT, Ph.D. (Cantab), Director, Tobacco Research.

Sri. T. S. RAJAGOPALAN, B.A., Senior Assistant.

FOR CONTRIBUTORS' GUIDANCE

Articles should be as concise as possible and generally with appeal to the lay public. Titles of the articles should be short. Articles on scientific research need not contain the details of experiments conducted, and should avoid, as far as possible, scientific formulae and technical terms. Where technical terms are unavoidable, they should be explained in the text in simple language. Statistical tables should be restricted to the absolute minimum and should be typed on separate sheets with their positions marked in the text. Appropriate mention in the article of the economic value of the results of research and methodological studies will enhance its usefulness. Original articles should conclude with a short summary of the main facts and conclusions.

relating to TOBACCO are also received for publication.

4. Manuscript should be neatly typed with double spacing on one side of the paper only and with wide margin. Three copies should be sent. Drawings, diagrams, etc. should be done in Indian ink. Coloured illustrations are not required.

5. All papers should be carefully revised by the authors and should be absolutely in final form for printing.

6. In addition to one copy of the Journal, in which their articles appear, 25 complimentary copies of the reprints of only the original articles will be supplied to their respective authors free of cost on request. If there are more than one author, these 25 copies will be distributed among them. Authors should intimate, while sending their articles for publication, whether they require their reprints. Additional copies of reprints can be supplied on payment at printer's cost price if intimation is given while sending the articles for publication.

7. The Editorial Board reserves the right to suitably change, rewrite or reject the whole or any portion of the matter received for publication.

8. All articles and other materials for publication in "INDIAN TOBACCO" should be addressed to the Secretary, Indian Central Tobacco Committee, 38, Mount Road, Madras-6.

3. Information of a miscellaneous nature and of interest to the general public, facts, observations, etc.

(i) Name or name(s) of author(s).

(ii) Name of journal (abbreviation), with a single underline, year of publication, number of volume, page number.

The Indian Central Tobacco Committee takes no responsibility for opinion or statements contained in contributed articles in this journal. Articles appearing in this journal can be reproduced only on permission from the Secretary.

APRIL—JUNE 1957

TOBACCO DIRECTORY

Published by :

INDIAN CENTRAL TOBACCO COMMITTEE

38, MOUNT ROAD, MADRAS 6

PRICE PER COPY Rs. 10/-

(Postage Rs. 2/- extra)

For a bulk order of 10 copies

and above, 20% commission

Concessions to Book-sellers and Agents

For copies please write to the Secretary of the Committee

Copies are also available from the Director, Tobacco Research, Central Tobacco Research Institute, Rajahmundry, Plant Breeder, Cigarette Tobacco Research Sub-station, Brodiepet 1st Line, 14, Cross Road, Arundelpet P.O., Guntur and Director, Institute of Agriculture, Anand.

A Statistical Monograph on Tobacco Trade in India

Giving a detailed review of tobacco export and import trade in India with all statistical details

Price Re. 1/- per copy (Postage nP. 25 extra)

For copies write to :

THE SECRETARY

INDIAN CENTRAL TOBACCO COMMITTEE

38, MOUNT ROAD, MADRAS 6

Kandimalla Raghavaiah & Kandimalla Ramamurty Co.

LEAF TOBACCO REDRYERS, DEALERS AND EXPORTERS

★

RELIABLE INDIAN TOBACCO LEAF
SUPPLIERS OF ALL TYPES

Cables:

BONGRADES

CHILAKALURIPET

CHILAKALURIPET,

GUNTUR DT.

ANDHRA STATE, INDIA

★

Telephone:

GUNTUR 182

Telegrams & Cables

"CHEKRI"

CHEGU KRISHNAMURTHY

DEALERS AND EXPORTERS

All Types of Indian Tobaccos in Leaf and Strips
(for Cigarettes, Cigars, Pipe & Hookah)

POST BOX No. 32

GUNTUR (S. INDIA)



Vol. VII	APRIL—JUNE 1957	No. 2
CONTENTS		PAGE
First Conference of Tobacco Research Workers	...	57
Tobacco Industry in Southern Rhodesia—N. R. BHAT	...	69
First glimpses of the wayout of the impasse in the fertiliser uptake by flue-cured virginia tobacco grown in black cotton soils of Andhra Pradesh—N. R. BHAT	...	85
Important pests of tobacco and their control, with a field key for their identification—ANNAMMA PHILIP	...	97
Production of quality tobacco—Dialogue between a Farmer and an Expert	...	105
Preliminary Studies and Control of Cigarette beetle	...	108
Programme of Agricultural Operations for the Quarter July—September	...	111
Foreign Markets for Indian Tobacco	...	123
Single Copy nP. 75		Annual Subscription Rs. 3/00

APRIL—JUNE 1957



Dr. M. S. Patel, Secretary, Indian Central Tobacco Committee (fourth from left) with the members of the Sudanese Trade Delegation who visited the Committee's Secretariat recently. The leader of the Delegation Mr. Sayed Mohamed El Mekkawi Mustafa is second from right.

FOR THE FARMERS

As in the previous years, the Indian Central Tobacco Committee has arranged through its Central Tobacco Research Institute, Rajahmundry for the production of pure, processed seed of cigarette tobacco of the varieties Harrison Special and Chatham, for distribution to tobacco growers and nursery men.

About 3,200 lbs. of Harrison Special and 900 lbs. of Chatham seeds in all, produced at the Central Tobacco Research Institute, Rajahmundry in the 1956-57 season, will be distributed through the Assistant Tobacco Extension Officers, Guntur and Eluru; and Market Committees, East Godavari, Rajahmundry and West Godavari, Kovvur, with whom the seed will be kept for sale in packets of 1 lb. each, priced at Rs. 3.

Seed of improved strain of Lanka tobacco will be available from the Central Tobacco Research Institute, Rajahmundry itself in packets of 1 lb. priced at Rs. 7 each.

The seed will be available by the 15th of July 1957.



SRI MOHANLAL A. PARIKH, B.A.
Vice-President of the Committee
(1957-58)

CONGRATULATIONS



SRI K. RAGHURAMAIAH, M.A., LL.B., BAR-AT-LAW, M.P.
Vice-President of the Committee
(1956-57)

at present Dy. Minister for Defence, Govt. of India



Dr. P. S. DESHMUKH, Ph. D.
Union Minister for Agriculture
(now Minister for Co-operation)
who inaugurated the Conference.



Dr. B. N. UPPAL, Ph. D. (Iowa)
Agricultural Commissioner with the Govt. of India
and President, Indian Central Tobacco Committee
who presided over the Conference

FIRST CONFERENCE OF TOBACCO RESEARCH WORKERS

The First Conference of Tobacco Research Workers was held at Bangalore on 31st January and 1st February 1957, under the auspices of the Indian Central Tobacco Committee. Fifty-five delegates from the Committee's Central Research Institute, Research Stations and Schemes, State Agricultural Departments, and prominent firms dealing in Fertilisers, Chemicals, etc., attended the Conference. Dr. B. N. Uppal, the Agricultural Commissioner with the Government of India and President of the Committee, Sri Mohanlal A. Parikh, Vice-President of the Committee for 1957-58, Dr. M. D. Patel, Director, Institute of Agriculture, Anand, Dr. M. S. Patel, Secretary of the Committee and Dr. N. R. Bhat, the Committee's Director, Tobacco Research also took part in the Conference.

Dr. P. S. Deshmukh, Union Minister for Agriculture inaugurating the Conference on 31st January, 1957, addressed as follows :

LADIES AND GENTLEMEN,

"I am indeed very pleased to have been invited this afternoon for inaugurating the first Conference of Tobacco Research Workers in India. We have assembled in a beautiful city like Bangalore, the capital of the reorganised Mysore State, which has become second in importance in tobacco production to only Andhra Pradesh. From the point of conditions obtaining for the production of flue-cured Virginia, appropriately called the 'Queen of Tobaccos', which likes light soils and a mellow climate, the State may even be ranked as the first. To add to this, the city is reputed for its scientists, scientific institutions and a scientific atmosphere. Thus, we have met at an ideal place for this Conference.

"In my opinion the idea of the Conference has come none too soon, for tobacco is a cash crop sustaining the agricultural eco-

nomy in several parts of our country and providing employment to a very large number of workers in various aspects of the industry. Need has arisen in recent years for switching on from 'quantity' to 'quality' though larger production within a limited area is not a problem of lesser importance in view of the fact that more and more land is required to be diverted to food crops for satisfying the needs of the growing population. Quality has particularly assumed importance on account of the fact that the importing countries have either succeeded in getting tobacco of better quality without difficulty, or, are producing it themselves. In the case of Virginia tobacco which is an earner of considerable amount of foreign exchange, quality is the crux of the produce and needs special study in all its aspects. At least some of you might be aware that in recent years, the British purchaser is becoming more and more meticulous about quality in his purchases. As a result, a very large number of bales of last year's production have proved to be unacceptable. This is indeed a sorry state of affairs, which,

First Conference of Tobacco Research Workers

if left unattended to, is likely to affect the export trade to a considerable extent and disrupt the agricultural economy of the nation.

"In the case of cigar tobacco there appear to be possibilities of opening of new markets provided we improve substantially the quality of the cigar tobacco in the country.

"With regard to imports the problems confronting us are the production of good quality wrapper tobacco, genuine chewing tobacco, and high quality U.S. type Virginia tobacco. Though these are being imported only to a small extent, it should naturally be our ambition to become self-sufficient even in respect of these.

"Even for the consumption within the country we have to expect demand for better and better quality production as standards of living go on improving.

"As you might have read in papers, the Planning Commission has fixed a target of increasing the production of foodgrains as high as about 24 per cent, during the period of the Second Five-Year Plan. For attaining this high target, it will not only be necessary to intensify cultivation in lands which are already under such crops, but, if possible, draw upon areas under certain other crops like tobacco which might appear as luxury crops. From this point of view, it has become very essential to step up research in the production, curing and processing of this important cash crop.

"As you all know, the problems in tobacco are much more varied than in many other crops. The crop though called by a single name, consists of two different species and innumerable varieties under each. These varieties receive varied type of culture, curing and processing for different types of uses such as smoking cigarettes, cigars, cheroots, bidis, chuttas, pipe and hookah, chewing, snuffing and medicinal purposes; and because the use is for luxury purpose, even for the same use, the operations are to be done in diverse ways to suit the idiosyncrasies of the consumers. To cite only one example, that is of chewing tobacco, some consumers like it dark and strong as emerg-

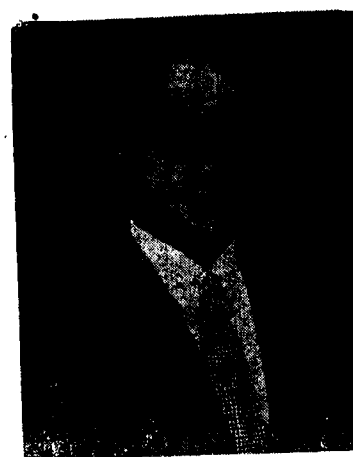
ing from pit curing, some others would like it toasted with smoke and brine, some others still with scents and perfumes, and yet some others as a weak air-cured product. These operations entail knowledge of raising the nurseries, soil management, field culture, evolution of varieties, crop protection and details of curing and processing require to be attended to with extraordinary care to bring about the right sort of physical and biochemical changes in the produce to the required tune. In addition, there are problems of storage and packing methods which also deserve attention of the research worker.

"The Indian Central Tobacco Committee under whose auspices this Conference has been organised, is a young body, and the institutions it has set up for research are in their infancy. Naturally, therefore, we have not to expect very much by way of achievements so far.

"I learn that about a score of papers have been submitted to the Conference on the findings made by various research workers working in different fields in different parts of the country. What I would like to emphasise is that, apart from whatever findings have been made, the utility of this Conference should be understood in a more important sense, i.e., in terms of the benefits arising from discussions on points made out in the papers, as well as suggestions thrown during the Conference.

"I am sure that this Conference will provide a common platform to all parties interested in the crop in general, and to research workers working in research institutions and Universities in particular, to express their views and opinions and get constructive criticism so valuable and necessary in research. I also feel confident that this and similar periodical conferences which will be held in future, will produce tangible results for the benefit of the tobacco grower and the industry as a whole in the country, and for the economic prosperity of our nation.

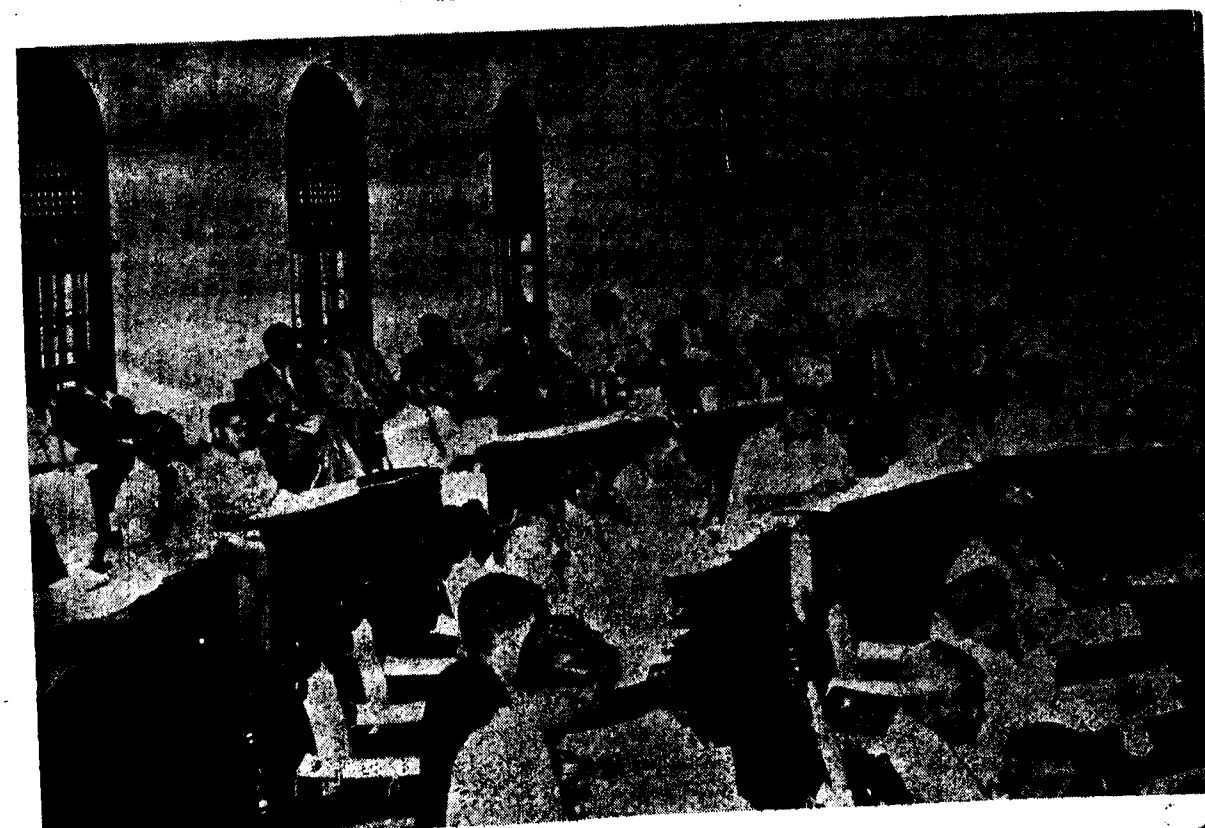
"In this connection I am to remind you that we have also initiated similar conferences for other crops, especially the millets. In fact even this Conference has its origin



Dr. M.S. PATEL, M.Sc., Ph. D. (N. Carolina)
Secretary, Indian Central Tobacco Committee
Member, Tobacco Export Promotion Council.



Dr. N. R. BHAT, Ph. D. (Cantab)
Director, Tobacco Research,
Indian Central Tobacco Committee.



A view of the Conference showing some of the delegates.

in our thinking that these conferences are most essential and we had not previously held them. As you know, jowar is a very important crop next to rice; and yet a conference of jowar workers and workers of other millets had not been held for nearly 25 years. Steps are being taken to hold conferences of technological organisations, such as sugar technicians, etc., there also combining the wisdom, sense and information of various people to the benefit of the grower. There are some growers of tobacco also in your midst, and they naturally bring to you problems which they have to face. So this is a combination of our effort to give an all-sided assumption, so that we develop the commodity in its entirety not only from the point of growing it, but processing, marketing, etc. I hope your discussions will be all sided.

"I thank you very much for the opportunity given to me for inaugurating this Conference, and wish it a grand success.

Dr. B. N. Uppal, who presided over the Conference then delivered his Presidential Address as follows :

"HON'BLE MINISTER, LADEIS AND
GENTLEMEN,

"I consider it a great privilege to have been invited to preside over this First Conference of Tobacco Research Workers in India. The importance of tobacco in the agricultural and commercial economy of the country and the need for intensifying research for the improvement of the crop have been emphasized by the Hon'ble Minister for Agriculture, who has referred to the complexity of the situation presented by different types of tobacco, each with its own requirements, grown in India. I now propose to deal briefly with the work already done on some of the major aspects of the amelioration of this crop and indicate some urgent problems which still remain to be investigated.

"Since its introduction into this country by the Portuguese in the beginning of the 17th century, tobacco has come to be cultivated over a very large area of almost a million acres with an annual production of 533 million lbs. of leaf. As is well known,

two species of tobacco are cultivated in India, viz., *Nicotiana rustica*, used mainly for hookah smoking and confined more or less to the cooler regions of North and North-Eastern India, and *N. tabacum*, the source of tobacco for cigarettes, cigars, chewing and snuff, etc., which is cultivated almost throughout the country. Most of the tobacco produced in the country is consumed internally in its various forms, but a considerable proportion of cigarette tobacco leaf is also exported. In a crop like tobacco, especially flue-cured Virginia tobacco, quality acceptable to the ultimate consumer is of paramount importance and this point has always to be kept in mind in making recommendations for the improvement of this crop.

"While sporadic studies of the crop may have been attempted earlier, it was only in 1905 that a systematic study of the variability existent in tobacco varieties collected from all over the country was undertaken at the Imperial (now Indian) Agricultural Research Institute at Pusa, by the Howards. As a result of their study, some outstanding commercial strains of *rustica* tobacco were isolated. This work has been continued till lately at the Indian Agricultural Research Institute, New Delhi, by Dr. Pal and his associates, and some new superior strains of *rustica* have been evolved as a result of hybridisation with some Canadian types. Considerable work has also been done in the Bombay State on the improvement of *bidi* tobacco, while as far back as 1906 improvement of wrapper tobacco was taken up at Burirhat in Bengal and resulted in the selection of well known Rangpur-Sumatra strain. On the whole, however, it can be said that only recently has the necessity for a co-ordinated effort been realised, and the Government of India, in view of the complicated nature of the problems to be tackled, decided to constitute a Commodity Committee known as the Indian Central Tobacco Committee charged, among other things, with the task of organizing and co-ordinating tobacco improvement work all over the country. Under the auspices of this Committee, a Central Research Institute has been established at Rajahmundry (Andhra Pradesh) for carrying out fundamental investigations,



Another view of the Conference.

aphids, nematodes, etc. Unfortunately, it must be confessed that recent attempts at the evolution of resistant varieties have met with a number of difficulties. First, in many cases, there is no organised knowledge of the mode of inheritance of such resistance; even where this knowledge is available, the characters have proved to be polygenically controlled or have been closely linked with undesirable genes affecting the quality of resistance to other diseases, or the genes concerned have been found to exhibit differential behaviour in new genomic or cytoplasmic milieu. Again, varieties of *tabacum* possessing any useful degree of resistance to most of the diseases are not available, and recourse has, therefore, to be had to attempts at transferring the desired genes across the species barrier from related wild species, with all the resultant complications of sterility, lowering of quality, selective elimination of segments of or entire chromosomes, leading to loss of some genes controlling important economic characters, etc. Sufficient work has, however, been done in other countries on interspecific hybridisation for this purpose, for example, transferring necrotic type of mosaic resistance from *N. glutinosa* to *N. tabacum* and *N. rustica* types by Holmes, and the transfer of nematode resistance from *N. megalosiphon* to *N. tabacum* by Clayton, to justify further intensive efforts in this direction. In India, Pal and Pushkarnath have made crosses between *N. plumbaginifolia* known to be resistant to leaf-curl with the cultivated species but no further use of this hybrid appears to have been made for breeding for resistance. Inter-varietal hybridisation has also been utilised in the breeding of resistant varieties, as in the United States for Fusarium wilt resistance, in the East Indies for resistance to powdery mildew and black shank and for resistance to bacterial wilt in Sumatra. In view of the considerable loss caused to the grower as well as the deterioration in quality brought about by pests and diseases and the unsuitability of chemical methods of control, it would appear that greater attention needs to be paid to this aspect of breeding.

"Attention also needs to be paid to the possibilities of utilising some of the plant

breeding techniques which have been successfully exploited in other crops, with such modifications as may be considered necessary by the nature of the tobacco crop. One such technique is the utilization of heterosis or hybrids vigour. It has been shown that some hybrids in tobacco exhibit a high degree of heterotic vigour and also that the production of seeds is economically feasible. While there is, no doubt, some substance in the objection that the exacting quality requirements of cigarette tobaccos do not permit of the utilisation of this method, it would appear that exploitation of heterosis should be feasible in the other less exacting types of tobacco. For instance, S.20, a *tabacum* strain bred in the Bombay State, has exhibited very high vigour in certain combinations, not only in the F_1 but also in the F_2 and F_3 and the possibility of commercial utilization of this character needs examination.

"Another technique, which, though only recently standardised, seems to be full of promise, is the induction of mutations. While spontaneous mutations which have been economically advantageous have been rather rare in this crop, the 'White Burley' and 'Mammoth' tobaccos being the only two instances known of such favourable mutations, it might be possible by the use of ionising radiations to obtain an alteration in particular characters in varieties otherwise quite desirable, or by extensive search obtain a combination of desirable properties brought about by radiation-induced chromosomal rearrangements in the progeny of irradiated inter-varietal or inter-specific hybrids. In a number of other crops, it has been possible to induce agronomically desirable mutations, such as earliness or disease resistance by exposure to ionising radiation from different sources and there is no *a priori* reason why this should not yield favourable results in this crop also. Recent work at the Indian Agricultural Research Institute has shown that very high dosages of X-ray required in tobacco may result in excessive extra-nuclear damage and has indicated that other sources of ionisation such as neutron sources or the B-radiation from absorbed radio-active isotopes

of some of the common plant nutrients like sulphur, phosphorus, etc., could be more profitably utilised. Little detailed information is, however, as yet available on such aspects as the best method of application of fertilisers their suitable dosages, etc., and it is imperative that work on such lines should be initiated and actively pursued.

"Before concluding my talk, I wish to refer to one more aspect of tobacco production, and this concerns the important attribute of commercial quality. Unlike in most other crops where no further processing is required once the produce has been harvested, in tobacco such post-harvest processing, known as curing, is very important and has a large bearing on the satisfactory quality of the finished product. Here again, there are differences in the requirements of the different types of tobacco. In the case of flue-cured tobacco, which is most exacting in its requirements, it has been found that a high ratio of carbohydrates (as starches and sugars) to nitrogen as also of potash to chlorine is necessary for good burning and ash qualities. It is also desirable that the leaf must be thin and yet bodied, have a golden yellow colour which does not change or darken during storage, and be elastic and have sufficient oiliness. While these qualities are to some extent varietal characters and as such under genetic control, the processes of curing (which consists essentially in the conversion of carbohydrates into sugars and the stoppage of the disintegration of proteins and organic acids, followed by drying) and that of bulking (where the desired degree of fermentation is induced), play a very large part in determining the quality of the finished product. It has been found that the successful carrying out of these processes in the 'flue-curing barns' depends to a large extent on the precise regulation of the temperature and humidity throughout the curing period. It is, therefore, very important that research on the biochemical and biophysical aspect of such processing should be completely understood so as to effect the necessary improvements in the process which would help to get the

best quality of leaf in the most economical way.

"In the case of other types of tobacco such a complex control of the process of curing is not considered essential. Even here, however, it has been shown that the quality of the product can be considerably improved by light changes in the methods of curing and fermentation commercially adopted. For instance, cigar tobacco produced in South India, is dried in the open and this has been held to result in stronger body that desired by the consumer in foreign countries. If the rate of fermentation could be slowed down by carrying out the drying under shade, it may be possible to improve the quality of the tobacco and expand the scope for export trade in cigars. Even though quality requirements in the tobacco consumed internally is not so pressing, it is desirable that the processes commonly adopted should be studied to effect any possible improvements. For instance, the practice of mixing lime, trash etc., in the case of hookah tobacco needs to be gone into both from the point of view of the quality of the tobacco produced, as well as the possible effects of such practices on the consumers' health. It might, perhaps, be appropriate to refer here to the suggestions that have recently been made regarding the possibility of a casual connection between smoking and cancer of the respiratory tract. If the hypothesis of the presence of carcinogenic substances in tobacco is confirmed, it appears to me that an attractive way out of this impasse would be to breed out, if possible, these carcinogenic substances and obtain varieties which would be free from them. In this connection I may perhaps cite the analogous case of the breeding of varieties free from or low in nicotine content through interspecific hybridization between *N. glauca* and *N. tabacum* by Pal and Ramanujam at the Indian Agricultural Research Institute.

"I have referred above to some of the major problems which appear to be of great importance in the production of tobacco possessing satisfactory quality. There are many other aspects on which much work

has been done and considerable knowledge has been accumulated by workers at the Central Institute and other stations. Much work has been done, for instance, in determining the optimum agronomical practices which can contribute to both high yield and high quality. Partly for reasons of space and time and partly because such aspects will be fully discussed in the papers relating to investigations in the fields of agronomy, botany, chemistry, soil science, pathology, entomology, etc., which will be presented at the Conference, I shall not deal with them here. I am confident, however, that the opportunity afforded by this Conference for a general exchange of experiences and views between research workers from different tobacco growing areas will provide a stimulus to tobacco research in the country.

"In conclusion, ladies and gentlemen, I have to thank you very much for the honour you have done me in inviting me to preside over your deliberations, and I wish this First Conference of Tobacco Research Workers in India, all success."

Shri Mohanlal A. Parikh, Vice President of the Committee, thanking the Hon'ble Minister for Agriculture and the President spoke as follows:

"HON'BLE MINISTER FOR AGRICULTURE, MR. PRESIDENT, LADIES AND GENTLEMEN,

"I am very happy to be here this afternoon for the inaugural function of the First Conference of Tobacco Research Workers in India. On account of very urgent work I was to leave yesterday evening, but knowing the special importance of of this Conference, I, as Vice-President of of the Committee, thought it an obligation on me to be present at this Conference which is being held for the first time under the auspices of the Committee. In doing so, my object is to try to understand the lines on which problems in tobacco are being tackled by research workers. We discuss in our Committee Meetings the tobacco problems as they occur to us in production, processing, manufacturing, trade etc., But,

since we are not technical men we do not have the benefit of knowing how they are being actually tackled. Our President, Dr. Uppal, is a man of high scientific repute, and Dr. Bhat, Dr. M. D. Patel, and Dr. M. S. Patel who are in technical and administrative control of the work are also men of high qualifications and experience. Therefore, we are very certain that the interests of research work are in very safe hands. I also know that most of you possess high academic qualifications in the various lines in which you are working and are doing your very best to help the interests of the tobacco industry in this country.

"From the list of papers submitted to the Conference, titles of which I have had a chance to go through, I can see that work is being done on various technical aspects dealing with tobacco culture in the field involving spacing, topping, manuring, etc.; control of pests and diseases, the chemical constituents of leaf, etc. With such type of work, I am sure, the different problems on tobacco can be solved to the benefit of the tobacco grower in particular and the tobacco industry in general.

"I would now do that pleasant duty of thanking Dr. Panjabrao Deshmukh, the Hon'ble Minister for Agriculture, who has been kind enough to inaugurate this Conference even in spite of pressing engagements and inconvenience. It shows how deeply he is interested in the solution of problems in agriculture through research. We are highly honoured by his presence amongst us this afternoon, and are extremely thankful to him for the same. We are also very thankful to our President, Dr. Uppal, for having made it convenient to preside over this Conference.

"I, therefore, propose a hearty vote of thanks on behalf of myself and on behalf of the Conference which I hope you will all carry with acclamation"

Twenty-four papers dealing with tobacco agronomy, plant breeding, plant physiology, plant pathology, chemistry, entomology and statistics were read at the Conference.

Just Published

FLOWERING TREES IN INDIA

BY

M. S. RANDHAWA, D.Sc, I.C.S.,

With a foreword by Shri S. K. Dey, Minister for Community Development.

This unique publication contains a delightful account of the beautiful flowering trees in India. The characteristics of these trees, their foliage and flowers, the beauty they create and the folklores inspired by them have all been included in the lavish treatment of some of the conspicuous ornamental trees of the country.

Lucidly written, authoritative and fascinating, the book is an important contribution to the enlargement of the field of tree planting and understanding of garden culture and will be useful as a handy work of reference to scientists, students, gardeners, town planners as well as administrators.

Eminently well produced, complete with index, blue rexine binding, the book measures 10" x 8½".

Magnificently Illustrated with 39 colour plates.

IMPOSING 4 COLOUR JACKET

Pages: 210

Price Rs. 15

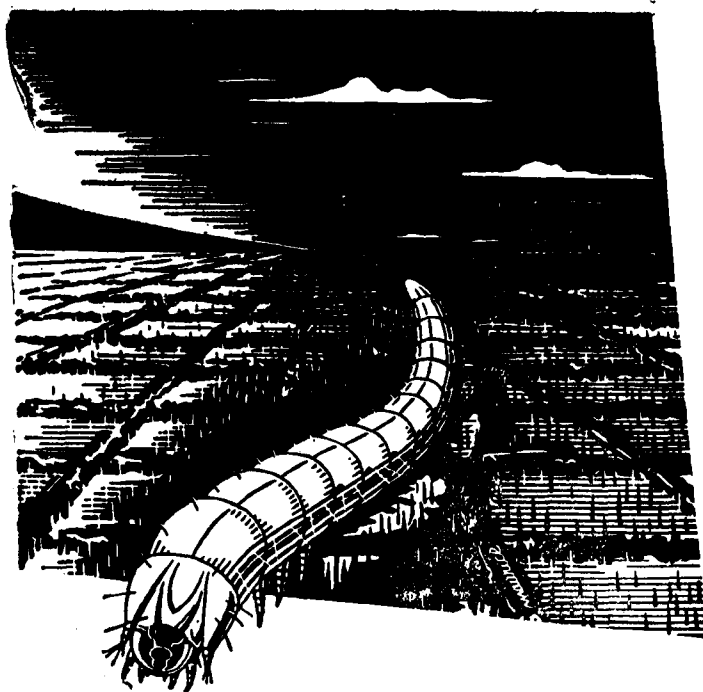
(Packing and forwarding charges Rs. 2/- extra)



Copies Available from

The Business Manager,

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
Queen Victoria Road
NEW DELHI



living off the fat of your land

Don't let pests feed on your crops and cut down your harvests. Endrex formulations, containing Shell's endrin, are capable of controlling a wide variety of pests.

These versatile sprays and dusts are outstanding in the control of Rice Stem

Borer. Cotton Bollworm. Mango Hopper. Sugarcane Pyrilla. Castor Semilooper and a host of other pests.

Although new in this country, official acceptance has already been won. Endrex has been used effectively on a large scale in India.

Endrex sprays and dusts are economical; they pay their way, many times over, with extra profits from greater yields and finer crops.

Your nearest Burmah-Shell Office can provide full details of the Endrex range

Endrex

the versatile insecticide

FOR PETROLEUM CHEMICALS IN AGRICULTURE

BURMAH-SHELL

ASP/ACG 3A

TOBACCO INDUSTRY IN SOUTHERN RHODESIA

BY

N. R. BHAT

[The measures suggested for improvement of the flue-cured tobacco by Dr. N. R. Bhat, Director, Tobacco Research, on his return from his tour in S. Rhodesia in Feb.-Mar. 1956 were published in "INDIAN TOBACCO," Vol. VII, No. 1. The first part of his detailed report on the studies on tobacco industry in Southern Rhodesia is reproduced below and the next and concluding part will appear in the following issue.]

Having landed at Salisbury, Southern Rhodesia, on the evening of 14th February 1956, I commenced studies from 15th February 1956. Shri N. J. Singh, Second Secretary in the Indian Commission for Rhodesia and Nyasaland, took me to the Kutsaga Research Station and introduced me to Dr. F. A. Stinson, Director, Tobacco Research Board of Rhodesia and Nyasaland. As previously arranged, I met Dr. W. E. Colwell, Assistant Director In-charge (Tobacco Research), North Carolina State College of Agriculture, Raleigh, N.C., who was a visitor to the Research Station. As he was to leave Salisbury the same afternoon and as it was not possible for me to meet Dr. Colwell during his proposed visit to India, an opportunity was taken to acquaint him in advance with problems connected with the Virginia tobacco industry in India, so that he could make his suggestions in the proper perspective when he visited India. Later, I was introduced to Mr. Neace, Officer In-charge of the Research Station, and Mr. C. Rose, the Chief Tobacco Extension Officer. Mr. Rose took me round

the farm of the Research Station to give me a general idea of the problems that are handled at that station. A tentative programme for my work and interviews for a week, was drawn up by Mr. Maedougal, Secretary, Tobacco Research Board, in consultation with Mr. Rose.

2. During the next two days I paid courtesy calls on the officers in the Federal Ministry of Foreign Affairs, Federal Minister of Agriculture and other officers in his Ministry. I also visited the research sections, viz., plant breeding, plant pathology and entomology, of the Federal Ministry of Agriculture, where I was explained the work being done, more particularly, on the botanical improvement of maize (*Zea mays*), munga *Pennisetum typhoides*, sorghams, groundnut, and fodder grasses, and on the control of their pests and diseases.

3. During the remaining period of my stay, the following institutions were visited for the study of various aspects of the tobacco industry. The aspects studied at the institutions are mentioned against them:

Tobacco Industry in Southern Rhodesia

INSTITUTIONS	ASPECTS STUDIED.
(1) <i>Tobacco Research Station, Kutsaga and its Sub-station at Trelawney :—</i>	Tobacco Research.
(2) <i>Tobacco growers' farms :</i> (i) Cadogan Farm of Mr. Dyjias, Shamva Dt. (ii) Donnington Farm of Mr. Kirkma. (iii) Doornfontein Farm of Mr. D. C. Lilford. (iv) Cigarao Farm of Mr. Patling. (v) Lord Graham's farm .	Farmers' method of tobacco production.
(3) <i>Commercial graders :—</i> (i) Gallaher Ltd. (ii) Vosterman's Ltd. (iii) Planters' Tobacco Grading Co.	Methods of commercial grading.
(4) <i>Packers :—</i> (i) Gallaher Ltd. (ii) Tobacco Packers Ltd.	Redrying, packing and storage methods.
(5) <i>Auction floors :—</i> (i) Tobacco Auctions Ltd. (ii) Producers' Tobacco Floor.	Auction sales.
(6) <i>Offices of :—</i> (i) Rhodesian Tobacco Association. (ii) Tobacco Marketing Board. (iii) Tobacco Traders' Association. (iv) Chief Tobacco Extension Officer.	Collection of information and literature.

INTRODUCTION

4. Southern Rhodesia is a British Colony forming part of the Federation of Southern Rhodesia, Northern Rhodesia and Nyasaland within the British Commonwealth. It is situated approximately between the latitudes 15.5° and 22.5° south and between the longitudes 25.5° and 33° East. Its total area is 1,50,354 sq. miles. A large part of this area is a plateau and the rest comprises hilly regions. The altitude varies from about 1,500 ft. to 5,000 ft. Tobacco production is concentrated in the north-eastern part of the plateau most of which has an elevation of over 3,000 ft.

5. Salisbury is situated at the latitude of 17°-48' S., and longitude of 31°-5' E., and at an elevation of 4,830 ft.

6. Out of a total population of about 30,00,000 the European population is about 2,00,000. In European owned areas, a district has generally 2 to 3 villages. Each village has a population of about 800—about 400 Europeans and 400 Africans. In addition to these villages, about 8,000 European farms are scattered over the area. Natives are settled in separate native reserves. The European settlers started settling since about 60 years ago. In European areas only about 28% of the arable land is under cultivation while in the native reserves not even 5% is said to be under cultivation.

N. R. Bhat

HOLDINGS.

7. A European farmer owns from a 1,000 to even 50,000 acres of land, a high proportion lying between 1,000 to 7,500 acres as will be seen from the statistics for 1953-54* given below:—

Size	% of total No. of holdings.	% of the total area under all holdings.
1,000 to 2,500 acres	.. 24.48	8.22
2,500 to 5,000 „	.. 28.19	18.32
5,000 to 7,500 „	.. 9.34	10.80

* Quoted from the 8th Report on the Agricultural and Pastoral production of European Farmers.

lands are being transferred at an average rate of 55 shillings an acre.

SOILS.

8. The soil types met with are sandy soils, sandy loams, heavy red or reddish soils. In the case of the former two types, one comes across at a depth of 4 to 8 inches from the surface heavier sub-soil derived from granite, extending to several feet below. The red or reddish soils are derived from Diorite or Dolorite.

The general characteristics of these soils will be understood from the following approximate data, kindly made available at the Kutsaga Research Station:—

	Proportion of sand (from the surface upto 12 to 18 inches depth).	Total exchangeable bases mean SQ/100 gms.)	pH
Sandy soil	.. 80-90	2.5	5.5
Sandy loams	.. 70-80	3.25	5.5 to 6.0
Red soil	.. 40-60	14.0	6.5

Flue-cured and Turkish tobaccos are grown mostly in sandy soils and sandy loams. Red soils are usually avoided as management is difficult and as their high pH renders phosphates and minor elements unavailable to the crop. In fact, most of the red soil districts do not grow Virginia and Turkish tobaccos at all. Such soils are usually devoted to the production of fire-cured tobacco.

October to April. Summer crops are planted from the beginning of rains upto about the early part of January. From May to September is a dry period during which winter crops are grown mainly under irrigation.

The total rainfall in Southern Rhodesia varies from about 20" to 45" a year. The average yearly rainfall at Salisbury which is situated in the heart of the main tobacco growing tract of Southern Rhodesia, is about 32". Its monthly distribution and the mean temperatures prevailing during the period of tobacco cultivation are given below :—

CLIMATE.

9. Southern Rhodesia is called a 'Summer rain area', the rainy season extending from

Month	Rainfall in inches	Temperature
October	 1.14	70.5°F.
November	 3.83	70.5°F.
December	 6.34	69.7°F.
January	 7.54	69.3°F.
February	 7.78	69.0°F.
March	 4.52	68.0°F.
April	 0.98	66.3°F.
Average for the season	 32.16	69.0°F.

CROPS.

10. The major summer crops are tobacco, maize, fodder grasses and legumes, and the minor ones are groundnut, potato, sweet potato, pumpkins, melons, green manure crops, e.g., sannhemp, sunflower, munga (bajri), legumes, e.g., velvet beans and cow peas, cotton, tea and coffee.

In winter, the major crops are wheat and potatoes, the minor ones being barley and oats.

AREA AND PRODUCTION

11. Tobacco plays the major role in the agricultural economy of the country. The estimated area for the 1955-56 season for all types of tobacco is roughly 194,000 acres and the production about 146.5 million pounds. This is expected to give a return of over £ 20,000,000.

As a cash crop, maize is next in importance to tobacco. The total area under this crop in 1953-54 was about 360,000 acres, yielding about 2,700,000 bags each of 160 lbs. per acre. The total value of the production was about £4,725,000.

Tobacco industry in Southern Rhodesia

12. The information collected about the various aspects of the tobacco industry in Southern Rhodesia is presented below under the following headings :—

- Types of tobacco and their concentrations.
- Varieties.
- General practices of tobacco production and marketing.

(d) Area, production and economics of flue-cured tobacco.

(e) Organisations working in the interest of the tobacco industry :—

- Rhodesian Tobacco Association.
- Tobacco Trade Association.
- (i) Tobacco Research Board of Rhodesia and Nyasaland.
(ii) Tobacco Extension Service.
- Tobacco Marketing Board.

(f) Present position and future prospects of flue-cured tobacco industry in Southern Rhodesia.

(a) Types of tobacco and their concentrations

13. The main types of tobacco grown in Southern Rhodesia are flue-cured tobacco, fire-cured and Turkish. Of these, flue-cured tobacco is by far the largest in production. The area under flue-cured tobacco is estimated to be about 193,000 acres during 1955-56 season and is expected to yield about 145,000,000 lbs. at an average rate of 750 lbs. per acre. A number of farmers get a yield of about a 1,000 lbs. Under very good conditions or under irrigation the yield goes even above 1,500 lbs. per acre. In passing, it might be mentioned that an additional quantity of 9,000,000 lbs. of flue-cured tobacco is expected to be produced in the North-Western and North-Eastern regions together in Northern Rhodesia which is a part of the Federation.

14. In 1954-55, the areas under fire-cured and Turkish tobaccos were only about 460 and 400 acres, and produced about 277,000

and 160,000 lbs. respectively. The position with regard to these two tobaccos may not alter appreciably during 1955-56. About 100,000 lbs. of Turkish tobacco is produced in Northern Rhodesia. Nyasaland specialises in dark fire-cured and, to some extent, dark sun-cured tobaccos, the total production being about 15 and 5 million pounds respectively.

15. As previously stated, most of the flue-cured crop is concentrated in the North-Eastern portion of the colony. Lomagundi and Salisbury districts are the largest producers : and Makoni, Marandellas, Hartley, Mazoe, Umtali, Urungwe and Mrewa districts come more or less in the descending order of their tobacco areas. Average yields are said to be high in Urungwe, Umtali and Lomagundi districts.

(b) Varieties

16. The most important flue-cured varieties under cultivation are Hicks and Delerest which were introduced about five years ago from Canada. They occupy about 40 and 20 per cent respectively of the total area under flue-cured tobacco. Other varieties under small scale cultivation are White Stem Orinoco, Bonanza, Jamaica Wrapper, Yellow Mammoth, White Mammoth and Virginia Gold, covering the remaining 40 per cent of the area.

17. For fire-cured tobacco the Western (Virginia) variety is grown. The popular varieties of Turkish tobacco are Selouk and Samsoun.

(c) General practices of flue-cured tobacco production and marketing

GENERAL.

18. Flue-cured tobacco production in Southern Rhodesia began as early as in 1911. In the earlier years, the chief market for Southern Rhodesian tobacco was South Africa. But, increased production in the latter country restricted the cultivation in Southern Rhodesia till about 1925. It continued to have a chequered career till 1932 when some impetus to production was provided by the duty preference in the United Kingdom for the Southern Rhodesian tobacco

which was stabilised for 10 years under the Ottawa agreement. The Tobacco Marketing Act passed in 1936 helped the industry to a certain extent. But the real stimulus came for the first time soon after the Second World War and more particularly during the period from 1949 to 1951, when, due to dollar shortage, the U.K. market purchased Southern Rhodesian leaf on a large scale. During this period, the acreage under tobacco rose to about 153,000 acres yielding nearly 93 million pounds. This was indeed a big leap in production.

The Tobacco Research Board of Rhodesia and Nyasaland was established in 1950 and the research findings advocated by this Board have gone a long way in bringing about substantial improvement in yield and quality.

19. At present, flue-cured tobacco is grown by over 2,700 growers. The area under cultivation is 207,000 acres producing about 160 million pounds. There is no control as to who should produce tobacco and to what extent, the production being left to adjust itself by its economics. But, the varieties to be grown are stipulated by the Tobacco Marketing Board.

EXTENT.

20. On most of the farms, tobacco area varies from 50 to 150 acres, the average area per farm for the whole colony being about 64 acres. In a holding of about 2,500 acres, which appears to be typical of farms growing tobacco, about one-third (800-900 acres) may be taken to be arable land. About half of the arable area is found to have been cleared of bush for cultivation, the other half remaining uncleared. Out of the cleared area, about a half would be under cultivation of crops, the other half being left as pasture land. The cropped area is occupied by tobacco, maize and other crops to the extent of about one-third each. A number of such farms maintain cattle for beef.

MECHANICAL POWER AND MAN POWER

21. Most of the important operations such as clearing of bush, stumping, disking, ridging, application of fertilisers, and inter-cultivation are done by mechanical means ;

the other operations are done by employing native labour. Mechanisation started on a large scale only since the Second World War. The minimum essential number of labourers is maintained on the farm throughout the year. The labourers are housed and supplied free rations and also a small area of land for raising any food crops. The monthly wages of an adult male, adult female and boy are about 2½, 2 and 1½ to 1½ pounds sterling respectively. Including rations, the gross labour charges per acre of tobacco farm would be about £45 to £50 a year. In general, an acre of tobacco farm requires a man year of labour for work not done by mechanical means.

CHOICE OF LAND.

22. Whenever bush is available for clearance the tobacco farmer clears and utilises a small area out of it for tobacco cultivation, the area cleared for the purpose being dependent on the availability of labour. Land for tobacco is chosen after seeing that it is free from certain salt-loving plants. Quite often the cleared land is about one-fourth the total area he proposes to put under tobacco, the remaining three-fourths of tobacco coming on lands which have been under rotational crops such as maize, munga, groundnut, and fodder crops, or left fallow, for some years. Sometimes this three-fourths area includes land which has been under tobacco during the previous season or the one prior to it after the clearance of bush.

Till about 1950, the practice was to grow tobacco in any particular plot only once in 5 to 7 years. Recently, however, on the recommendation of the Tobacco Research Board, rotation of tobacco with beneficial grasses such as Weeping love grass (*Eragrostis arenicola*) and Rhodes Grass (*Chloris gayana* Kunth) has come into vogue. In the new practice, tobacco can be grown successfully after a grass rotation of only 2 to 3 years.

Virgin land recovered from under the bush is stumped and tractor ploughed with either a mould-board plough or a disk plough, once or twice, to a depth of about 9" any time from February to July, preferably as

early as possible to allow nitrification over a longer period before planting. It is ploughed again in the month of September. After each ploughing the clods are broken by disking.

23. For nurseries, land with well drained soil, free from eel worm, is chosen within easy reach of irrigation facilities. The same land is utilised for nurseries year after year. In order to incorporate sufficient amount of organic matter into the soil for the nursery of the following season, a mixture of bajri and sunhemp is sown in the seedbed area after uprooting the tobacco seedlings during the previous season, and the green crop is buried into the soil in about February.

Seedlings are grown on raised beds of about 6 to 9 inches high. They are usually of the size of 100' x 3½' on which about one-tenth of an ounce of seed is sown. This seed rate is only about a fifth of that in India. On account of the fact that the nurseries are raised in the dry season, the incidence of 'damping off' is very small, and there is no problem of washing off of seedlings by heavy showers. Consequently, a bed of the above size is found adequate to supply seedlings for transplanting on an acre of land.

The beds are fertilised at the rate of 6 to 10 lbs. per 30 sq. yards with 4-14-4 fertiliser mixture. The fertiliser is applied by broadcasting.

The time of sowing is from the end of August to 15th of September. For evenness of sowing, farmers sow the seed through water sprays. The beds are covered with fine clean grass which is not removed as the seedlings can come up through the grass. Watering is done by hand by means of rose cans.

DAMPING OFF

24. The seedbeds are sprayed with D.D.T. against nursery pests. Damping off, as stated above, occurs only to a limited extent. The remedies adopted against it are cutting down water suitably and spraying either Perenox or Bordeaux mixture.

RIDGING.

25. Prior to planting, ridging is done with a disk ridger. The ridges are about 3'-6" wide at the bottom and about 15 to 18 inches wide at the top.

MANURES AND FERTILISERS

26. In general, there is no system of applying farmyard manure. Instead, green manuring is done either with grasses, munga or sunflower. When grass rotations are followed for green manuring, they are sown in the month of February when there is enough moisture in the soil for their growth and weed competition is dying out. They are left to grow continuously for a couple of seasons, during which they may either be mown for silage or left upto seedling when both seed and hay are harvested. When bajri is left upto seeding its seed is utilised by natives for liquor. Sometimes, sunflower is left to seed, the seed being utilised as poultry feed. Green manure crops are incorporated into the soil during ploughing from February onwards prior to the planting season.

The grasses usually grown are Weeping Love Grass (*Eragrostis arenicola*), Giant Rhodes Grass (*Chloris gayana* Kunth), Sudan Grass (*Andropogon schinzii* Hach), Paspalum, *Panicum bombatse*, and Green panicum. In recent days, Weeping Love Grass is being preferred to other green manure crops on the recommendation of the Tobacco Research Board, as it is said to check the multiplication of eel worm in the soil, give high yields of good fodder and seed, and promote good growth of the following crop of tobacco.

Fertilizers are applied in bands 8" apart on the top of ridges at the time of ridging. It is applied mechanically 4" deep. Some farmers prefer ring application round each plant, which is required to be done by hand. Usually, fertilisers are applied 4 to 5 days before planting. If there be heavy rain before planting they may be applied within a couple of days prior to planting. Fertilisers are applied only as mixtures of N, P and K. The different mixtures are prepared so as to ensure the supply of 100 lbs. of P₂O₅, 90 lbs. of K₂O and 20 lbs. of MgO

per acre. The nitrogen content in the mixtures is varied from 4 to 60 lbs. per acre according to the nature of the soil for which the mixtures are recommended.

The fertilisers are supplied to growers as mixtures as it would be difficult and uneconomic for them either to prepare the mixtures for themselves, or to apply the various ingredients separately. The mixtures are manufactured by two fertiliser companies which operate in perfect co-operation with the Government and the Tobacco Marketing Board. There is no Government supervision over the preparation of the fertiliser mixtures, but as the chemical composition is given on the bags, it is open to any one to challenge it if a mixture is found unsatisfactory. The nitrogen in the mixture is derived to the extent of 75% from ammonium sulphate and 25% from Chilean nitrate. Previous experiments had shown that mixing of ammonium sulphate and Chilean nitrate in the proportion of 50 : 50 gives the best results. But, as Chilean nitrate is not available in sufficient quantities, the proportion of 75 : 25 is being followed. The price of nitrogen is about a shilling per lb.

All fertilisers are imported—ammonium sulphate from South Africa, potash from Germany and France, and Phosphates from North Africa (Morocco).

MgO is incorporated into the fertiliser mixture in the form of Magnesite (which contains about 50% MgO), as in certain places, the leaf is found to suffer from deficiency of magnesium. The application of MgO is also said to increase the oil content of the leaf and make the leaf more stretchy.

PLANTING

27. Planting starts from the 1st. week of November and continues even upto the end of December. Some of the farmers do early planting from mid-October onwards as recommended by the Tobacco Research Board. In early planting, there is the advantage of having a dry period of about a fortnight immediately after planting which is conducive to the good establishment of the plants before the onset of rains.

About 6" long seedlings are chosen for planting. If they are too big in the nursery they are topped and the water is cut down before they are uprooted. One to three pints of water is applied per plant at the time of planting.

SPACING

28. The rows are spaced 42" apart and the spacing within the row is 22" to 24". This gives a stand of about 6,000 plants per acre.

IRRIGATION

29. Most of the growers grow tobacco under rainfed conditions. Only a per cent or two of the area is under either flow or spray irrigation. The source of irrigation water is either, a nearby river or nala, or bore wells constructed on the farms. Irrigated tobacco is planted early in the middle of September and is given an inch of spray irrigation once a week or so, starting from a fortnight after planting. The advantage in irrigated cultivation, whether spray or flow, is the considerable increase in yield which is about 500 lbs. per acre. No definite advantage is said to have been observed in spray irrigation over the flow irrigation either from the point of cost or yield. The leaf from irrigated field is found to be as good in quality as that from the dry tobacco. The cost of irrigating an early planted crop (including depreciation on machinery costing about £500) is about £20 per acre.

INTERCULTIVATION

30. Intercultivation is done 2 to 3 times at intervals of about 10 days. It is done by a tractor cultivator and, at later stages, by hand hoeing. Hand weeding is not done as it is costly.

TOPPING

31. Topping is done by hand when about one-tenth the number of flowers appear, leaving in all about 14 to 20 leaves (including the sand leaves) on the plant. The number of leaves to be left is decided according to the size and vigour of the plant, and condition of the field. If the plant is vigorous it is topped higher and,

if poor in growth, it is topped lower, but early enough in all cases. If the plot is one of high fertility or is comparatively dry, topping is done higher, and if it is poor or wet it is done lower. This sort of low topping is done at the recommendation of the Tobacco Research Board which advocates the practice for securing high yields of bodied leaf. On such topping, the leaves attain their full size and are filled in very well. In a number of cases, leaves from topped plants appeared rather coarse and slightly puckered in the field, but they are said to cure very well in the barn. It is not known whether this is the special characteristic of Hicks and Delerest, the varieties commonly grown in Southern Rhodesia.

SUCKERING

32. Suckering is done by supplying Bayol or suckerine (mineral oil emulsions put out in the market by the Standard Vacuum Oil Company) on a clear day. This is done on the recommendation of the Tobacco Research Board. The emulsion is mixed with equal quantity of water and applied to the buds in the top axils at rate of 2 c.c. per plant, by means of a dribbling oil can. Two buds are required to be treated per plant as the emulsion applied to the top bud reaches all others except the second one. The emulsion does not produce a burning effect on the stalk.

In addition to the application of emulsion, 2 to 3 suckering is done by hand at the stage when only the top leaves ('Tips') remain to be harvested. Suckers are left to grow at this stage to prevent the tips from growing coarse.

REMOVAL OF SAND LEAVES

33. Some of the farmers remove the sand leaves, but the Tobacco Research Board recommends their retention as the plant food manufactured by them is translocated to the upper leaves which benefit therefrom.

FIELD PARASITES, PESTS AND DISEASES

34. *Parasites*:—Eelworm causing both root-knot as well as brown root rot is the scourge

of the tobacco industry in Southern Rhodesia, and the grower has to fight very hard against this parasite.

Pests:—Common insect pests are cutworms, caterpillars and aphids.

Diseases:—On account of the sandy nature of the soil, existence of green pastures and grass lands and bush all round the tobacco plots, frequent showers and the humid climate in which the crop is growing, quite a number of diseases such as white mould (ash disease), frog eye, anthracnose, alternaria, mosaic, leaf curl, wild fire, rosette, and angular leaf spot prevail on tobacco. Of these, white mould and frog eye are the most serious. The others occur usually to a small extent and become serious only under favourable conditions.

The only effective remedy adopted against the eelworm is to follow rotations of crops which are least susceptible to the parasite. Munga and quite a number of other crops and grasses are susceptible to eelworm. Weeping Love Grass has been found to be least susceptible so far and is therefore recommended as a suitable rotation crop by the Tobacco Research Board. Early planting, which makes the plant vigorous enough before the large scale attack of eelworm, is another remedy adopted for the purpose.

Spraying of Dieldrin is done against cutworms and caterpillars. Parathion and Malathion are found to be effective against aphids. No adverse residual effects of these phosphatic compounds are reported so far by the buyers.

White mould:—The only practical remedy adopted against white mould is early topping as a result of which the leaf becomes thicker and does not permit easy spread of the disease.

Frog eye:—This is another serious disease which results in leaf spot either in the field itself or during the yellowing stage of curing. Wet weather which prevails in the latter part of the season is very favourable for the development of the disease. The Tobacco Research Board has recommended the following measures for the control of

this disease which are adopted by a number of farmers:—

- (i) Treating the late sown nurseries with Bordeaux mixture.
- (ii) Advancing the planting date so as to harvest before the wet weather.
- (iii) Application of more nitrogen, but in a balanced fertiliser mixture.

For preventing the frog eye spot turning into barn spot, steam curing is done by many of the farmers as advocated by the Tobacco Research Board.

Alternaria, anthracnose and angular leaf spot:—No particular control measure is adopted against these diseases. The application of a balanced fertiliser is supposed to reduce their incidence.

Mosaic:—Mosaic is observed to prevail to a very large extent. In a number of fields the incidence is found to be more than about 80 to 90 per cent. But, the disease appears on only the tender leaves of suckers and not on the leaf to be harvested as the latter grows fairly thick on account of topping and suckering. The precautionary measure adopted against the disease is washing of hands with soap and running water at every stage at which the seedlings or plants are handled.

Leaf curl:—This disease occurs to a small extent. Clearing of the stalks after harvest is found to limit the population of white flies and tobacco aphids which are the carriers of the disease. This operation is required to be done by each grower.

Rosette and wild fire:—These diseases occur to some extent, but no control measures are available.

HARVESTING

35. Harvesting is done by hand picking, at any time during the day; but is recommended to be done early in the morning till about 9 a.m. In all 7 to 8 pickings are primed. In each picking only mature pale green leaves are primed. The first harvest is of the first two leaves. The last picking consists always of not less than three leaves as when lesser number is left on the plant, the leaf turns coarse.

The harvested leaf is collected in open gunny cloth containers hanging loose within wooden frames of about the size of $3\frac{1}{2}' \times 2\frac{1}{2}' \times 2\frac{1}{2}'$. Several such frames are loaded in a truck and transported to the stringing shed. The stringing shed is a thatched frontage of about 20' wide along the length of the barn unit (which is about 64' long), its roof sloping from the front wall of the barn unit.

STRINGING

36. Stringing is done mostly by twine and the strung leaf is put on sticks and racked before being moved into the curing barn. Usually, a stick carries about 32 bunches (16 bunches on each side) of 3 leaves each.

BARNs

37. Flue-curing is done in barns similar to those in India. They are constructed with bricks plastered with mud and are usually of the size of $16' \times 16'$ and 8 tiers high. However, they are erected in units comprising 4 or more contiguous compartments separated by partition walls running up to the roof between them. Each barn has an independent heating unit of its own. The arrangement of funaces, flues, tiers and ventilators is almost similar to that of the barns in India. The cost of construction of a unit of 4 such barns is approximately £700.

BARN SPACE

38. In recent days the yield per acre has gone up, but barn construction has not kept pace with the increased production. For this reason, most of the farmers are found to overload their barns, as a result of which the time taken per charge is as much as 5 to 6 days. In many cases, the average turn over of cured leaf per charge is about 1,000 lbs.

STEAM-CURING AGAINST BARN SPOT

39. The method of loading and curing except during the yellowing stage is similar to that in India. In the yellowing stage many of the farmers introduce steam into the barn from steam boilers for maintaining a high wet bulb temperature (over 96° F.) and high humidity (100%) to prevent the develop-

ment of barn spot caused by 'frog eye' disease. This is done on the recommendation of the Tobacco Research Board. A steam boiler required for a unit of four barns would cost about £700 and the steam distributing unit to be located in each barn about £45.

FUEL

40. Fuel used for curing is mostly wood which is available in plenty from the farmer's own estate at a cheap rate. A farmer having 100 acres under tobacco has to maintain about 125 acres of Eucalyptus trees for use as fuel in barns. Usually, 3 to 5 cords of wood (a cord measuring $6' \times 4' \times 4'$) are required per acre and the cost per charge of 1,000 lbs. of cured leaf is about half a pound. Coal consumption is about $1\frac{1}{2}$ tons per charge. The price of coal is about £. 2 per ton which is supposed to be almost the cheapest rate in the world. Coal is required to be brought from mines situated about 600 miles away. On account of the availability of cheap wood, the annual coal consumption for barn curing in the whole Colony is only about 35,000 tons.

OIL BURNERS

41. Curing with oil burners is not in vogue as oil is costly in the Colony, and the cost of curing is over double as that of curing with coal.

CURED LEAF

42. As previously mentioned, the average yield of cured leaf per acre for the entire Colony is about 750 lbs. But a number of farmers get yields of about a thousand pounds; under very good conditions and under irrigation the yields go up to 1,500 lbs.

LEAF LENGTH AND BODY

43. The average leaf length to-day is said to be about 18 to 20 inches, while it was 16 to 18 inches only a few years ago. On account of good body only about 50 to 60 leaves make a pound.

BULKING

44. Cured tobacco is stick bulked upto 48 hours. Stick bulking is done to make the moisture run back into the midribs so

as to make them pliable. After this, the leaves are untied, and are rough baled or bulked, and kept ready for grading. Before grading, care is taken to see that the tobacco is in proper condition to prevent breakage. Quite often, the leaf is steamed for facilitating grading and, in addition, humidifiers are usually installed in the grading halls to maintain a minimum humidity during the handling of the leaf.

GRADING

45. Grading is done in grading sheds constructed for the purpose. The farmers do the grading themselves if they have the necessary facilities; otherwise, they send it to commercial graders for grading. In general, grading is done mostly by the African boys and is checked and supervised by Supervisors and Inspectors who are appointed in proportion to number of labourers employed. On an average, a worker grades about 30 lbs. of tobacco per pound. Rough bales being sent to commercial graders for grading should weigh less than 150 lbs. each. When grading is done by the farmer himself, the cost is about $1\frac{3}{4}$ to 2 pence per lb. while the commercial grader charges $4\frac{1}{2}$ pence per lb.

Grading is done firstly according to the main groups or leaf types such as wrappers (W), leaf (L) & (H), cutters (C), lugs (X), non-descript (N), strips (A), and scrap (B), the letters in brackets indicating the groups. Each such group is sub-divided on the basis of quality such as fine, good, fair, low and common, which is indicated by a number following the letter of the main group. Each sub-group is further graded according to colour such as lemon to light orange (L), orange (O), red (R), light mahogany (SL), dark mahogany (SD), dark walnut (D) and green (G). Thus the grade C110 would mean cutter of second quality and orange colour.

Special factors, if any, such as high condition (E), loose leaf (LL), mixed-quality and/or colour (M) are assigned to the grades mentioned above.

The number of grades thought possible by the Tobacco Marketing Board are as many as 105. But, in actual practice the

farmer or the grader finds the leaf falling in less grades but many more than 36 grades. Leaf from each of these grades is again classed as long, short and very short, the long leaf being over 14", the short from 8 to 14 inches, and the very short less than 8 inches long. The very short leaf is usually stripped and not tied into hands. Stripping is done leaving only about 30 to 35 per cent of the stem at the tip end of the leaf. The stripped leaf is laid straight not tangled in the bales. Some farmers tie even strips into hands, since by so doing the leaf fetches $1\frac{1}{2}$ to 2 pence more per pound. The number of leaves included in a hand is such as to give butts measuring from 1 to $1\frac{1}{8}$ inches in diameter. A medium sized leaf of the same grade is chosen for the binder. It is folded along the midrib, back to back. The binding starts at the extreme end of the butt and continues from $1\frac{1}{2}$ to $1\frac{3}{4}$ inches up the hand. After tying into hands, the leaf of the same grade and length is packed into a bale. According to the prescription of the Marketing Board there should not be a discrepancy of more than 5" in the case of hands of long leaves, and not more than 3" in hands of short leaves.

After grading, the leaf is baled, each bale being made of leaf of the same grade and length class. The bale for the auction floor should not weigh less than 50 lbs. and more than 224 lbs. The bales should measure 34" long and 24" wide, the thickness depending upon the weight of the bale. The prescribed thickness in inches is one-tenth the number of pounds that the bale weighs.

BALING

46. For baling, the hands or strips are loaded in a wooden frame, inside dimensions of which are 34" x 24". They are laid with their butts outside whenever possible and packed layer on layer exposing the leaf on two sides of the bale for examination. Then they are pressed by means of a hand operated screw presses to the thickness prescribed for the weight of the bale. The bale is then wrapped in bituminised water-proof paper and finally covered with hessian and stitched. Every farmer is registered with the

Federal Ministry of Agriculture which issues a register number to him. The number is stamped on each of his bales.

The farmer (or the commercial grader) is free to give any names that he chooses for the various grades but he has to see that the leaf in each bale is of the same grade and length. In one case the grade number was '2M', 'M' standing for the African word 'Mampara' meaning 'an idiot'. A label is attached to each bale in which the grower's registered number, the serial number of the bale, the actual weight, grade number, and date of grading are mentioned.

COMMERCIAL GRADERS

47. All commercial graders are licensed by the Tobacco Marketing Board on payment of a fee of £5 each. In the commercial grader's warehouse each farmer's produce is kept and graded separately. The produce is received in the form of bales each not exceeding 150 lbs. in weight. The bales are unpacked and the leaf taken out of the water proof paper and hessian. The unpacked tobacco is steamed by machine for avoiding breakage during grading. After steaming the tobacco is loosened by hand and small leaf and bits are separated. The small leaf and bits are passed through a machine which removes the sand, fragments, powder, etc., from them. Usually, the loss of this type is about 5%.

The cleaned leaf is then graded and tied into hands on the lines prescribed by the Tobacco Marketing Board in the same manner as is done by the farmer. The graded leaf is kept bulked for 24 hours for conditioning, and then repacked into bales weighing not more than 224 lbs. using the same bituminised water proof paper and hessian cloth which come from the farmer. A label bearing the commercial grader's name and other particulars mentioned in the case of a farmer's bale is attached to each bale. For the rough guidance of the auction floor and the buyer, the grader gives, in addition, the group number of the leaf in bold figures prominently written in red pencil on the right-hand side of the label. The leaf of any one group of one farmer, may not be similar to that of the correspond-

ing group of another farmer, as, irrespective of the grades of leaf, each farmer's bales are given group numbers starting from 1. This grouping system is followed only for the convenience of the auction floor which takes bales of the same group together for sale. The buyer does not attach any importance to the grades given by either the farmer or the commercial grader, but buys each bale on the merit of the leaf contained therein.

Even in the commercial graders' firms grading is done by trained African boys who are paid in all a monthly remuneration varying from 4 to 5 pounds sterling.

AUCTION FLOORS

48. Salisbury is the biggest tobacco market in the world. Sales at Salisbury are conducted by auction which system enables buyers to set up suitable establishments for redrying, packing and exporting tobacco to countries from which they may have obtained or hope to obtain orders.

There are at present only two auction floors at Salisbury for the auction sale of flue-cured and fire-cured tobaccos in the Federation. The two floors are: (1) Tobacco Auctions Ltd., and (2) Tobacco Producers' Floor Ltd. The auction floors are licensed on payment of a fee of £50 each. The buyers are also licensed on payment of a fee of £10. The auction floors are to be erected or altered only on the approval of the Tobacco Marketing Board, which also fixes their capacity for sales. Also, the owner of the floor has to provide sufficient storage accommodation for tobacco for such number of days as the Board may decide. Tobacco so stored cannot be stacked higher than the height of 4 normal sized bales except with the permission of the Sales Supervisor of the Board. The farmers or graders are at perfect liberty to send their bales to any one of the two auction floors as is convenient to them. To prevent congestion at the floors, a quota of maximum delivery at the auction floor is fixed on bi-weekly basis for each grower, the quota being fixed on the basis of the grower's production during the previous 5-year period. This quota is inclusive of the delivery from his commercial grader also.

Auctions commence in about the middle of March and continue upto September or October. The days and time of auctions are fixed by the Tobacco Marketing Board.

Auction floors sell only flue-cured and fire-cured tobaccos but not Turkish tobacco which is sold by the farmer locally to individual merchants either by himself or through co-operatives. Fire-cured tobacco being small in quantity is sold on any particular day allotted for it during each week.

As the consignment of bales are received, the owner or a responsible official of the auction floor enters in a receipt book, the name, the registered number of the grower or the commercial grader and the number of bales received from him. The owner of the auction floor has to sell the bales in the order in which they appear in the receipt book, whether the grower or commercial grader is or is not present.

For the auction sale, bales are arranged according to groups in long straight parallel rows along the auction floor, the rows being about 3' apart. To each bale the owner of the auction floor attaches a label of his own, which is called the Bale Ticket on which the name of the auction floor, grower's registered number and his bale number and the weight of the bale are recorded. Each bale is kept open to allow examination of the leaf by the buyers. The sales commence at quarter to eight in the morning and continue for 4½ to 5 hours.

At the time of auction the starter, the auctioneer, and the ticket marker take their positions in order in a line. The buyers take their positions on the opposite side in the order mutually agreed upon between them and the owner of the auction floor. The auctioneer stands opposite and adjacent to the bale which is being sold and does not move from the position until he declares the buyer. The auctions take place under the supervision of a Sales Supervisor appointed by the Board. He decides in general the time to be taken for the auctioning of bales. Actually, sales are done at a very quick rate of about 7 seconds per bale. The auction begins with the starter com-

mencing a minimum bid, after which the auctioneer goes on rising the price upto the final bid. On the striking of the bid, the ticket marker writes the name of the buyer and his code number on the bale ticket attached by the auction floor. A specimen bale ticket is of the following type:—

Grower's No.	Bale No.
	Weight.
Buyer's name.	Buyer's Code No.

Within a short time thereafter the auction particulars are entered by the staff of the auction floor in the registers maintained for the purpose. Before this is done, the seller or the buyer is at liberty to cancel his sale or bid by tearing off the right hand lower portion or the left hand lower portion respectively of the bale ticket. The bale is resewed before being removed from the auction sale.

Accounts are finalised in the afternoon with the help of calculating machines and the amount due to each farmer is paid to him or his nominee or remitted by the owner of the auction floor after deducting:

- (i) Levy at the rate of 1/3 penny per lb.
- (ii) Commission at 2% of the value of tobacco.
- (iii) Weighing and auction charges, each at the rate of 6 pence per bale.

The buyer inspects the bale carefully before it is removed from the auction floor and if he finds it is either a nested, mixed, mouldy or funky one, reports the matter to the Sales Supervisor who makes an investigation. Bales which are found to be nested are confiscated by the Board and resold as such, and the full amount of the purchase price is refunded to the buyer from the proceeds of the resale and the fine levied on the seller for nesting. Mixed bales are returned to the growers at his expense except when they have been repudiated as mixed on only one occasion, in which case they are resold unidentified on the following day. If again repudiated as mixed they are returned to the owners. Bales which

are repudiated as mouldy or funky are, at the owner's option, either returned to him or rehandled by the owner of the auction floor on his behalf, in which latter case, they are sold at a separate sale as "rehandled tobacco". The buyers are usually the agents of foreign manufacturers in U.K., Australia or the Continental countries. The code number on the bale ticket represents the blend as required by the principals of the

buyer. A buyer is prone to make mistakes in judging the correct grade of the leaf while bidding in the auction as he has to take his decision about the bid for each bale in less than 7 seconds; and if he finds that any of the bales do not satisfy the blend marked on the bale ticket, he regrades and mixes them suitably to suit the blends prescribed by his principals.

(To be continued)

PUBLICATIONS OF THE INDIAN CENTRAL SUGARCANE COMMITTEE

	Price (excluding postage)
1. Monograph on the Gur Industry in India by S. C. Roy.	Rs. 12/12/-
2. Report on the Survey of Sugarcane Research in India by N. L. Dutt	Rs. 8/-
3. Final Report of Sugarcane Research, Padegaon, Bombay 1932 to 1944 by R. D. Rege & J. K. Basu	Rs. 12/ 6/-
4. Scientific Monograph (Research on Technical Aspects relating to improvements of the Gur Industry in Bihar) by K. L. Khanna and A. S. Chakravathy	Rs. 10/ -/-
5. Coimbatore canes in cultivation (Second revised and enlarged edition) by N. L. Dutt and J. T. Rao	Rs. 25/ -/-
6. Papers presented at the Second Biennial Conference of Sugarcane Research and Development Workers, India, 1954	Rs. 24/ -/-
7. Indian Journal of Sugarcane Research and Development, Vol. 1 Part 1 (October-December 1956) and Vol. 1 Part 2 (January-March 1957)	per copy Rs. 1/ 8/-

The Secretary

INDIAN CENTRAL SUGARCANE COMMITTEE

19-20 Rohtak Road, NEW DELHI-5

TOBACCO PROCESSING MACHINERY

Designed to your needs by the

**WORLD'S FIRST BUILDERS OF
TOBACCO DRYING MACHINERY
PROCTOR & SCHWARTZ, INC.**

Philadelphia 20, Pa. U. S. A

Machinery Manufacturers for more than 100 years

Proctor engineers combine their long years of experience in building tobacco drying machinery with current engineering techniques to bring you the following equipment :

LEAF & STRIP DRYERS

for the drying cooling and ordering of tobacco in leaf or strip form. Proper application of air circulation results in fluffy uniformly dried tobacco.

STICK & APRON DRYERS

for drying, cooling and ordering tobacco in bundle form in preparation for storing over a long period of time.

DIPPED FILLER DRYERS

for drying, cooling and ordering tobacco that has been dipped in flavouring agents.

SOFTENERS

for equalizing the moisture in green tobacco or in tobacco that has been in storage and is to be threshed or stemmed.

AUTOMATIC FEEDS

including special types for blending, feeding to threshers, dipping tanks, redressers and all types of drying equipment.

For more complete information on Proctor equipment communicate with

Mr. RAMAMURTY KALLURI

Arundelpet, GUNTUR-2, (S. India)

OR

PROCTOR & SCHWARTZ, INC.

Philadelphia 20, Pennsylvania, U. S. A.

TOBACCO LEAF

MERCHANTS

AND IMPORTERS

SPECIALISING IN

ALL TYPES OF
INDIAN TOBACCO



SALOMON BROS.
TOBACCO CO. LTD.

IBEX HOUSE
MINORIES,
LONDON, E.C. 3

Cables:

AKSALBAK LONDON

Indian Representative:
K. S. SUBBAIAH PILLAI, GUNTUR



FIRST GLIMPSES OF THE WAY OUT OF THE IMPASSE IN THE FERTILISER UPTAKE BY FLUE-CURED VIRGINIA TOBACCO GROWN IN BLACK COTTON SOILS OF ANDHRA PRADESH*

BY

N. R. BHAT †

Experiments with fertilisers supplying the three major elements N, P and K have been carried out on flue-cured Virginia tobacco in Andhra Pradesh since as early as 1940-41. These experiments were conducted only at the Tobacco Research Station, Guntur, till 1948 when they were undertaken also at the Central Tobacco Research Institute, Rajahmundry. In some seasons, more than one experiment were carried out and, quite often, with fertilisers applied at different times and in different ways in combinations with other cultural treatments, e.g., maize green manuring, planting dates, spacings and toppings. The fertilisers were tried in doses varying from 0 to 40 lbs. of N, 0 to 100 lbs. of P_2O_5 and 0 to 100 lbs. of K_2O per acre. Except where broadcasting was a treatment, they were applied in furrows made by the country plough, about 8 to 10 days before planting was done on the covered furrows.

A general feature of these experiments has been non-significant response to fertiliser treatments except to nitrogen, in which case significant response of small magnitude has been observed in a few cases (*vide* Appendices). Neither were any visible differences observed in quality characters, e.g., size, body, elasticity, colour of the leaf, etc.

The experiments with the application of N were conducted in 13 seasons during the period from 1940-41 to 1955-56 at Guntur and in 8 seasons from 1948-49 to 1955-56 at Rajahmundry. The dose of N tried was, in most cases 20 lbs. per acre, though in a few experiments 40 lbs. per acre was also included. The application of the latter dose not having, in general, proved more beneficial than the former, it has been thought useful to discuss here the effect of only 20 lbs. N per acre. The summarised data are presented in Table 1 below:—

* This paper was read at the First Conference of the Tobacco Research Workers in India, held at Bangalore on 31-1-57 and 1-2-57.

† Director, Tobacco Research, Central Tobacco Research Institute, Rajahmundry.

TABLE 1 :—Summarised results* of experiments with nitrogen manuring

Place	No. of experiments	Kind of yield	Mean yields in lbs. per acre		Difference of $\bar{Y}$ from X per cent.
			No nitro-gen (X)	20 lbs. N (Y)	
Guntur	15	Green leaf	3,191	3,683	+ 15.4
	8	Cured leaf	739	749	+ 1.4
	11	Bright leaf	193	188	— 2.6
Rajahmundry	35	Green leaf	4,321	4,758	+ 10.1
	32	Cured leaf	699	772	+ 10.4
	32	Bright leaf	286	306	+ 7.0

* For detailed data vide Appendix II.

It will be seen that, at both the places, there has been over 10 per cent increase in green leaf yield, the increase having been significant in a few cases. The number of experiments at the two places being very different, the responses are not comparable. But, to speak in general, the favourable effect of the fertiliser is not reflected in the cured and bright leaf yields at Guntur, but, it has increased the two kinds of yield on an average by about 10 and 7 per cent respectively at Rajahmundry.

In Table 2 are set out the coefficients of correlations between yields from (i) 20 lbs. N p.a. and (ii) no nitrogen and also the regression equations.

TABLE 2 :—Correlation co-efficients and regression equations showing the relationships between yields from unmanured (X) and 20 lbs. N plots (Y)

Place	Kind of yield		Correlation coefficient	Regression equation
Guntur	Green leaf	...	0.79**	$Y' = 0.7307 \times + 1351$
	Cured leaf	...	0.98**	$Y' = 1.0046 \times + 6$
	Bright leaf	...	0.97**	$Y' = 0.9351 \times + 8$
Rajahmundry	Green leaf	...	0.97**	$Y' = 0.9848 \times + 503$
	Cured leaf	...	0.91**	$Y' = 0.9772 \times + 89$
	Bright leaf	...	0.88**	$Y' = 0.9886 \times + 23$

** Denotes 'Highly significant.'

It will first be seen that all the correlations are high and highly significant, which would mean that the increases resulting from fertiliser application are strongly related to the yields obtainable without fertiliser, i.e. to the natural fertility of soil. With the help of the regression equations it is possible to predict the probable response to 20 lbs. N p.a., at a place or in a field of which the average yields are roughly known. By such estimation, it will be seen that it is not at all economic to apply nitrogen at 20 lbs. p.a. at Guntur while the dose will pay a net extra income of about Rs. 30 p.a. in a field which yields on an average not more than 700 lbs. of cured leaf per acre at Rajahmundry.

To sum up the position revealed by the results of so many experiments carried out over a number of seasons, no fertiliser containing either N, P or K has, in general, proved useful to the crop at Guntur and only N at a limited dose of 20 lbs. p.a. has proved beneficial in some cases at Rajahmundry. The ceiling for remunerative production by fertilisation lay at about 772 lbs. of cured leaf per acre, corresponding to 700 lbs. for no nitrogen.

It has previously been stated that in several of the experiments the responses have been non-significant. However, it is interesting to observe that in experiment A. 7 in which 0, 20 lbs. and 40 lbs. N were tried in some plots in the four consecutive seasons of 1951-52, 1952-53, 1953-54 and 1954-55 and their residual effect tested in 1955-56, 20 lbs. N has given significant increases over no nitrogen in all the five seasons. The increase due to the residual effect of 20 lbs. N has been very substantial (about 43 per cent) even in Total Bright Leaf Equivalent. This would indicate, firstly, that a fraction of even the small dose of 20 lbs. N p.a. was remaining unutilised and, therefore, getting accumulated every year even in a 'needy' soil; secondly, that the fraction taken up by the crop was enough to bring about a significant increase in yield; and, thirdly, that the residual fraction accumulated over three seasons was substantial enough to cause a significant and high increase in yield in the fifth year, when no fertiliser was applied.

This would mean further that where differences in yield were not significant, either the initial yields were high or the conditions were such as not to permit the crop to consume even a "fairly good" fraction of the 20 lbs. of N which was applied.

On the whole, it would appear that the differences in nitrogen uptake with which we are dealing are of small magnitude. This is supported by the finding that in a fertiliser experiment, No. C. 10(ii) of 1954-55 the unmanured plots contained, throughout the season, 28 to 30 lbs. of available nitrogen per acre and the nitrogen manured (at 20 lbs. p.a.) plots from 37 to 58 lbs. Any transgression of these narrow limits adversely affects the 'good quality yield' of the crop, that on the upper side resulting in green, coarse leaf and that on the lower producing thin papery leaf. This is in contrast with the plant behaviour in sand culture experiments in which the plants benefit in growth and development of big sized leaf of the required pale green colour, even when nitrogen is applied at as high rates as 100 to 120 lbs. per acre and a high proportion of it is taken up by the plants. Here is an impasse in which one finds oneself in improving the yield and quality of flue-cured Virginia tobacco grown in black cotton soils.

Some clues to such a thoroughly negative behaviour of the crop have been becoming available from the peculiar happenings in experiments of the last and current seasons. During 1955-56, as many as 4 experiments involving the treatments of N and NP (and in some cases NPK) had been laid out on the Institute farm and, in addition, a 'placement' experiment in which fertilisers were applied 6 inches deep round the plants had been undertaken at the suggestion of Dr. R. D. Rege, Agricultural Adviser to Messrs. Parry & Co., Madras. In all the experiments except the last one in which planting had to be done late due to waterlogging in the area, crop growth in the NP and NPK plots was distinctly better than in the N plots upto about 1½ months after planting. This was supposed to be the first time when the application of P_2O_5 had resulted in a visible improvement in growth.

Fertiliser uptake by Flue-cured Virginia tobacco

In later stages of growth, the differences gradually dwindled down until they were no more discernible at harvest time. Also, the crop in the NP and NPK plots flowered earlier than in the N plots. Effects of the above kind were not clearly seen in the 'placement' experiment in which crop growth was very non-uniform. Yield data from two experiments at Rajahmundry which were conducted in fairly uniform fields and from the 'placement' experiment at Guntur are given in Table 3.

TABLE 3 :—Yield comparisons of N, NP and NPK treatments in 1955-56

Place	Experi- ment No.	Kind of yield		Yields in lbs. per acre in fertiliser treatments			
				Nil	N	NP	NPK
Rajahmundry.	A. 8.1	Green leaf	...	4,461	4,736	4,709	4,630
		Bright leaf	...	357	390	352	382
		T.B.L.E.*	...	481	508	479	504
	C. 9.1	Green leaf	...	4,130	5,371	4,740	4,860
		Bright leaf	...	341	392	391	416
		T.B.L.E.*	...	457	541	530	527
Guntur	... A. 16	Green leaf	...	2,418	3,704	3,368	Treatment not inclu- ded
		Bright leaf	...	194	260	320	„
		T.B.L.E.*	...	298	396	460	„

In the first two experiments, not only were the differences in yields non-significant but the yields even showed trends in the direction opposite to that observed in initial growth, the treatments involving phosphorus giving lower yields. Neither were any differences in size, body or texture of the leaf discernible between the treatments with P and without it. In the 'placement' experiment at Guntur, however, the N treatment

* Total Bright Leaf Equivalent.

N. R. Bhat

gave a significant increase of 98 lbs. Total Bright Leaf Equivalent over the no manure treatment and the NP treatment gave a further significant increase of 64 lbs. T.B.L.E. over the N treatment. Such trends were found even in the 'placement' experiment at Rajahmundry.

During the current season (1956-57), the initial growth differences between NP and NPK treatments in comparison with N appeared very similar to those of last year, but are again rapidly vanishing as will be seen from the data furnished in Table 4.

TABLE 4 :—Total leaf area per plant recorded in different treatments of experiment C. 9 (1) in 1956-57

Treatments			* Total leaf area per plant 30 days after trans- planting (SQUARE INCHES)	* Total leaf area per plant 50 days after trans- planting (SQUARE INCHES)
Nil	...	...	171.5	991.0
N	...	...	184.7	1,057.3
K	...	...	141.8	755.3
NK	...	...	191.7	1,010.9
P	...	...	160.8	954.5
NP	...	...	183.0	1,155.6
PK	...	...	169.8	834.7
NPK	...	...	248.7	1,033.9

* Average of 4 plants in a replication.

The process of vanishing of the differences has been somewhat slower in experiments wherein the fertilisers were applied slightly deeper through a coulter attached to the wooden plough.

In the 'placement' experiment which has been laid out also during the current season the visual differences in crop growth in favour of the NP and NPK treatments in comparison with the N treatment are small.

the N treatment itself having put up a far better growth than the control. But, marked differences are seen in favour of tractor ploughing as against normal ploughing for identical fertiliser treatments, inferentially due to the larger amount of nitrates formed in the tractor ploughed area prior to planting and, probably also due to better root development.

The above mentioned phenomena seem to suggest the following :—

- (1) The initial growth of the crop in the NP and NPK treatments in experiments in which they were applied only in the plough furrow was better than in N, probably because of the fact that the fertilisers were available in the zone in which the roots were feeding in the earlier stages. This was facilitated in both the 1955-56 and 1956-57 seasons by the abnormally heavy rains received just prior to planting. After about a month after planting, the root development was more in the lower soil on account of the rapid fall in moisture content in the surface soil. Therefore, the crop could not utilise during the grand period of its growth the fertilisers applied about 3" to 4" deep in the surface region. Consequently, the small initial advantages that the NP and NPK treatments gave were gradually lost. This may be expected to happen as the initial growth differences between the treatments are relatively very small as compared to the total growth of the plants in the later stages.

Two different causes may be attributed to the slight lowering of leaf yields in the NP and NPK treatments below that in the N treatment. Firstly, it is possible that the leaf development might have suffered on account of the better initial growth of the stalk which might have deprived the leaves of a part of their share of nutrients, during their development and maturity. Secondly, the earlier maturity in the former

treatments might have slightly reduced their yield :—

- (2) The high response to N in the placement experiment shows that much better yields can be realised even with 20 lbs. N alone, provided that the fertilisers are applied in the soil zone where roots would be feeding during the development and maturity of the leaf. Further, the crop is able to take up also P_2O_5 and benefit thereby, though in surface application it is unable to utilise it (P_2O_5) at all.

The possibility of both the above inferences being true, is indicated by the results obtained in experiment No. A. 2 (1955-56) on 'bidi' tobacco at Anand. In this experiment, the methods by which the fertiliser was applied were :—

- (i) Drilling 2" to 3" deep ; (ii) Plough-drilling 4" to 5" deep and (iii) Drilling and plough-drilling combined.

It is reported that the crop in the first treatment put up a better growth in the initial stages, while the later growth and leaf yield were better in the latter two methods.

The necessity of deep placement of fertilisers arises on account of the fact that, under cultivation with conserved moisture, the tobacco plant develops a deep root system. The self-same varieties, whether of flue-cured Virginia or 'bidi' or other types, develop fibrous roots in sand or pot culture in which water supply is assured or even under field conditions in sandy areas where the crop grows while it is raining or under partial irrigation. It may, therefore, be true to say that, under conditions of culture on conserved moisture, the crop is more anxious to quench its 'thirst' than to quell its 'hunger'.

Under conditions of culture in Andhra Pradesh the flue-cured Virginia crop usu-

ally faces a struggle for existence on account of stringency of soil moisture. No wonder, therefore, that responses are hardly realised even to N when applied in the plough furrow, leaving alone P_2O_5 and K_2O , and the crop as raised today is almost always subnormal.

It now need hardly be stressed that our major hope in the improvement of yield as well as quality, through better nutrition, of flue-cured Virginia tobacco in Andhra Pradesh lies in the direction of ensuring the supply of adequate moisture in the feeding zone in addition to applying fertilisers. There are then two major ways of doing this, viz., (1) to apply fertilisers in the lower zone of the soil where there usually is an adequate supply of natural moisture or (2) to supply moisture artificially through irrigation, applying the fertilisers in the plough furrow as usual. As crop production by the latter method is likely to be disfavoured by buyers, the practical measures to be adopted will have to be on the lines of devising implements and discovering methods to secure deep placement of fertilisers. In addition, measures, e.g., deep ploughing prior to setting in of the monsoon, incorporation of humus or mulching, either individually or two or more of them combined in the culture, will have to be adopted for conserving as much moisture as possible in the soil. Experiments with these objects in view, have been recently initiated at the Central Tobacco Research Institute, Rajahmundry, as well as at its sub-station at Guntur and their results are awaited with interest. Any success achieved in these directions, it would appear, will enable the crop to utilise not only nitrogen but also phosphoric acid and potash and will result in the improvement of both yield and quality of flue-cured tobacco raised in the black cotton soils of Andhra Pradesh. It is felt that, under modified cultural conditions, good responses will be obtained also to treatments like topping which, under present conditions are generally ineffective.

Summary

The results of numerous experiments with N, P, K fertilisers conducted on flue-cured Virginia tobacco at the Central Tobacco Research Institute, Rajahmundry, and its sub-station at Guntur, over a number of seasons have been discussed, and it has been shown that there has been no response to P_2O_5 and K_2O even when applied in the plough furrow at either of the places. At Guntur there has been no response even to nitrogen, but some response has been obtained at Rajahmundry. Neither has any difference in observable quality factors been noticed as due to any of the fertiliser treatments. Such a thoroughly negative behaviour of the flue-cured Virginia crop in Andhra Pradesh is attributed to severe stringency of soil moisture during the grand period of crop growth.

With the experience of 'placement' experiments and the happenings in other fertiliser experiments in progress during the last two seasons, it is inferred that the placement of the fertiliser 6 to 9 inches deep in the soil where there is adequate moisture and where the roots feed during the grand period of crop growth, is likely to give benefit both in yield and quality characters of the leaf. It is also pointed out that measures aimed at conserving more and more soil moisture would lead to beneficial results. It is felt that treatments such as topping which, at present, are more or less ineffective, may work very well under the modified cultural practices suggested above.

Acknowledgments

The author wishes to express his thanks to the several workers who were directly or indirectly responsible for the conduct of the experiments of which data have been discussed in this paper. He is also thankful to Shri V. N. Murthy, M.A., Statistician, Central Tobacco Research Institute, Rajahmundry, and his Assistant for having worked out the correlation coefficients and regression equations given in Table 2.

APPENDIX I

I. Yield data from P_2O_5 treatment in fertiliser experiment

Name of experi- ment	Year	Green leaf weight lbs.		Cured leaf weight lbs.		Bright grade leaf lbs.		
		0	50 lbs. P ₂ O ₅	0	50 lbs. P ₂ O ₅	0	50 lbs. P ₂ O ₅	
<i>Rajahmundry—</i>								
A5	...	1949-50	1,865	1,864	389	386	128	121
		1950-51	1,891	2,081	370	408	197	239
		1951-52	5,077	4,980	949	938	441	451
A. 9 (a)	...	1948-49	...	...	698	663	267	263
		1949-50	2,833	2,899	574	624	280	323
		1950-51	3,433	3,265	719	678	348	331
A. 8 (b)	...	1949-50	2,736	2,815	547	571	248	295
		1950-51	...	...	766	848	384	402
A. 8.8 (a)	...	1954-55	5,380	5,289	1,225	1,175	391	505
A. 8.8 (b)	...	1954-55	4,999	5,305	810	875	392	387
C. 9 (1)	...	1954-55	4,522	4,352	681	613	218	262
		1955-56	4,130	4,210	682	592	341	301
C. 9 (2)	...	1954-55	3,659	3,589	552	564	161	194
		1955-56	3,639	4,313	645	745	174	246
Mean	...	...	3,680	3,747	686	691	284	309
<i>Guntur—</i>								
Fertiliser	...	1950-51	3,872	3,968				
Experiment	...	1951-52	2,976	3,036	456	501		
Mean	...	...	3,424	3,502				
Manurial experi- ment.			0 lbs.	20 lbs.				
		1940-41	3,254	2,940				
		1941-42	3,423	3,156				
		1942-43	2,948	3,070				
		1943-44	2,893	3,125				
		1944-45	2,018	2,154				
		1945-46	4,530	4,639				
		1946-47	1,851	1,896				
Mean	...	...	2,988	2,997				
A. 12	...	1955-56	4,141	3,899	...	...	299	286

None of the differences is statistically significant.

II. Yield data from K_2O treatment in fertilizer experiment

Name of the ex- periment	Year	Green leaf yield		Cured leaf yield		Bright grade leaf	
		0	50 lbs. K ₂ O	0	50 lbs. K ₂ O	0	50 lbs. K ₂ O
<i>Rajahmundry—</i>							
A5 ...	1949-50	1,885	1,844	391	384		
	1950-51	2,094	1,877	411	364		
	1951-52	4,986	5,071	934	953		
A. 8(a)	1948-49	...	...	673	689		
	1949-50	2,899	2,834	610	588		
	1950-51	3,416	3,282	713	684		
C. 9 (1)	1954-55	4,522	5,344	681	590	218	278
	1955-56	4,130	4,486	682	816	341	348
C. 9 (2)	1954-55	3,659	4,692	552	618	161	201
	1955-56	3,639	2,846	645	458	174	138
A. 8 (1)	1955-56	4,461	4,468	640	649	357	396
Mean	...	3,569	3,614	630	618		
<i>Guntur—</i>							
K ₂ O Manurial	1940-41	3,254	3,052				
experiment.	1941-42	3,423	3,319				
	1942-43	2,948	3,144				
	1943-44	2,893	3,113				
	1944-45	2,018	2,058				
	1945-46	4,530	4,813				
	1946-47	1,851	1,882				
Mean	...	2,988	3,054				
		0	20	0	20	0	20
Fertilizer ex- periment.	1950-51	3,924	3,956				
	1951-52	3,099	2,899	476	501		
Mean	...	3,511	3,427				
A. 12	1955-56	4,141	3,910	...	...	299	279

None of the differences is statistically significant.

APPENDIX II

Yield data from Nitrogen treatments in fertiliser experiments

Name of the experiment	Year	Green leaf weight lbs. N/acre		Whether difference is substantially significant	Cured leaf weight lbs. N/acre		Whether difference is substantially significant	Bright leaf weight lbs. N/acre		Whether difference is substantially significant
		0	20		0	20		0	20	
		(3)	(4)		(6)	(7)		(9)	(10)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<i>Cigarette Tobacco Research Sub-station, Guntur</i>										
Manurial experiment	...	1940-41	3,254	4,458	Yes					
		1941-42	3,423	4,106	Yes					
		1942-43	2,948	3,629	Yes					
		1943-44	2,893	3,306	No					
		1944-45	2,018	2,855	Yes					
		1945-46	4,530	4,735	No					
		1946-47	1,851	2,321	Yes					
Topping experiment	...	1950-51	...	...	...	739	819	No	401	450
		1951-52	...	...	...	684	624	No	138	114
		1952-53	...	...	...	1,057	1,048	No	543	461
		1953-54	...	...	...	630	652	No	78	73
Fertiliser experiment	...	1950-51	3,893	3,988	No					
		1951-52	2,973	3,025	No	481	496	No	17	20
A. 9 Chilean nitrate experiment.		1952-53	2,884	4,883	No	970	1001	No	79	58
		1953-54	5,291	4,916	No	800	799	No	118	136
		1954-55	2,662	3,024	No	...	...	...	229	273
A. 4 Green manuring experiment.		1953-54	3,819	3,915	No	550	550	No	86	87
		1954-55	2,903	3,571	Yes	...	...	...	191	187
		1955-56	2,516	2,568	No	...	...	...	240	213
Mean	...		3,191	3,683	...	739	749	...	193	188

Name of the experiment	Year	Green leaf weight lbs. N/acre		Whether difference is sub- stantially signifi- cant	Cured leaf weight lbs. N/acre		Whether difference is sub- stantially signifi- cant	Bright leaf weight lbs. N/acre		Whether difference is sub- stantially signifi- cant
		0	20		0	20		0	20	
		(3)	(4)		(5)	(6)		(7)	(8)	
Central Tobacco Research Institute, Rajahmundry										
Date of planting	...	1948-49	...	...	563	583	No			
		1949-50	1,788	1,941	No	363	413	No	123	124
		1950-51	1,922	2,050	NA	381	396	NA	203	231
		1951-52	5,064	4,993	No	949	938	No	377	358
A. 8(a) Manurial experi- ment.		1948-49	...	...	661	681	No	260	263	
		1949-50	2,402	3,331	Yes	518	680	Yes		
		1950-51	3,215	3,483	NA	671	726	NA	332	348
A. 8 (b) Phosphatic ma- nuring.		1949-50	2,762	2,805	NA	568	573	No	290	285
		1950-51	...	...	...	754	850	Yes		
A. 8 (d) Irrigation experi- ment.		1949-50	3,999	4,756	NA	749	897	Yes	375	430
		1950-51	5,542	5,740	NA	961	560	NA	417	395
		1951-52	3,656	4,301	Yes	622	736	Yes	217	289
A. 8 (g). Green manuring experiment.		1952-53	8,120	8,429	No	1,173	1,199	No	344	341
		1953-54	4,209	5,042	No	757	903	No	239	318
A. 8 (e) Forms of nitro- gen.		1949-50	2,251	2,571	No	425	522	No		
		1950-51	4,979	4,868	NA	853	850	No	348	363
		1951-52	1,339	1,810	Yes	275	365	Yes	110	147
		1952-53	8,600	8,125	NA					
		1953-54	5,801	6,455	No	949	1,019	NA	360	334
		1954-55	3,422	4,215	No	600	710	...	163	180
A. 8 (b) Method of ap- plication.		1951-52	4,929	5,238	No	992	1,050	No	440	481
		1952-53	5,811	6,121	No	798	915	No		
A. 7. Nitrogen experiment.	spacing	1951-52	925	1,377	Yes	...	...	...	75	117
		1952-53	8,411	8,807	Yes	...	...	...	376	204
		1953-54	4,100	5,295	Yes	...	...	...	245	281
		1954-55	4,015	5,134	Yes	666	924	...	311	341
		1955-56	2,937	3,280	Yes	536	743	...	186	226
										Yes
										Yes

Fertiliser uptake by the Flue-cured Virginia tobacco

Name of the experiment	Year	Green leaf weight lbs. N/acre		Whether difference is substantially significant	Cured leaf weight lbs. N/acre		Whether difference is substantially significant	Bright leaf weight lbs. N/acre		Whether difference is substantially significant
		0	20		0	20		0	20	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. 8. 8 (a) Application of sulphur.	1953-54	7,372	7,992	No	...	...	...	530	579	No
	1954-55	5,380	7,098	Yes	977	1 247	...	391	573	No
A. 8. 7. Waterlogging and green manuring with maize.	1954-55	4,334	4,855	Yes	717	820	...	334	326	No
	1955-56	3,950	4,594	Yes	784	834	...	237	277	Yes
A. 8. 9 Time of application of manure.	1954-55	3,631	4,139	No	583	689	...	248	313	No
A. 6. Wide row spacing.	1955-56	5,082	5,501	No	901	876	...	277	244	No
A. 8. 1 Permanent manurial.	1955-56	4,461	4,736	No	640	643	...	357	390	No
A. 8. 3 Urea, Amm. Sulph. at different rates.	1955-56	3,010	2,053	No	611	416	...	153	96	
A. 8. 7 (b)	1955-56	5,170	5,385	...	...	...	...	284	309	
C. 9 (1)	1954-55	4,522	4,650	No	681	828	...	218	227	
	1955-56	4,130	5,371	Yes	682	726	...	341	392	
Mean	...	4,321	4,758	...	772	699	...	286	306	

NA = Not available.

IMPORTANT PESTS OF TOBACCO
AND THEIR CONTROL, WITH A
FIELD KEY FOR THEIR
IDENTIFICATION*

By
ANNAMMA PHILIP†

For the last three years, working on various insect pests of tobacco at the Central Tobacco Research Institute, Rajahmundry the author had chances to meet many tobacco nursery men and tobacco cultivators and to discuss with them some of their insect pest problems. During all such discussions, it was felt that many of the growers had no means of identifying the more important pests before they could take up a satisfactory programme of control measure. The only consolidated paper published on tobacco pests in India is by Ramakrishna Iyer (1941) in which all the important ones of recent years were not dealt with and some were treated as of lesser importance. This paper is intended to bring uptodate the more important details regarding the pests and their control and is supplemented with a key for their identification in the field.

Two species of cutworms are found to injure tobacco nurseries, namely *Prodenia litura* and *Laphygma exigua*, of which the former are generally found in the East and the West Godavari districts. The cutworms of the above species are caterpillars of a greyish brown moth, with wavy markings on the upper wings. The eggs are laid in clusters generally on the lower side of the leaves. Very often the clusters are covered with small brown hairs. The eggs hatch into tiny caterpillars within 4 days under normal conditions. These caterpillars undergo various changes in colour as they pass through several instars and grow bigger in size. At the 5th instar stage, the caterpillars are fully grown with a dirty grey or black colour and appears to be sluggish in preparation to pupating. The caterpillar period varies from 28-30 days after which they pupate inside a pupal case made out of soil. The pupal or hibernation period varies from 8-12 days during the season. The freshly hatched moths after 2 to 3 days start laying eggs. It has been found that a single female can lay as many as 400 eggs in 2-4 clusters.

(Fig. 1)—**Tobacco cutworm**
SPECIES:—1. *Prodenia litura* (Fabr.)
2. *Laphygma exigua*
Hubner.

FAMILY:—Noctuidae.
ORDER:—Lepidoptera.

* This paper was read at the First Conference of the Tobacco Research Workers in India, held at Bangalore on 31-1-57 and 1-2-57.

† Entomologist, Central Tobacco Research Institute, Rajahmundry.



Fig. 2. Bulbous swelling produced by the stem borer cut open to show the caterpillar inside.



Fig. 1. The Tobacco Cutworm *Prodenia litura* (Fabr.)

Nature of injury:—The cutworms are voracious feeders. They generally feed at night on the leaves and even tender stems of small seedlings. They can cause heavy damage in a matter of few days by defoliating the whole nursery.

Control:—D.D.T. 50% W.P. when sprayed at the rate of 2 lbs. per 100 gallons of water and at the dosage of 7-10 gallons per 100 square yards will control them. Cultural practices such as ploughing and destruction of egg masses may also help to control them to some extent.

(Fig. 2)—**Stem borer**

SPECIES:—*Gnorimoschema heliopa* (Low)

FAMILY:—Gelechiidae

ORDER:—Lepidoptera

The stem borer is the larva of a tiny brown moth of the above species. The eggs are laid singly in the midribs or stems. The eggs hatch into tiny caterpillars which bore their way through the stem and feed on the inner tissues. They pupate inside the stem or midribs.

Nature of injury:—The borer feeds on the tissues inside the stem or midrib and a small cavity is formed inside surrounded by a swelling outside. The larva pupates inside the cavity and when hatched the moth escapes to the outside through a tiny hole, made in the centre of the swelling by the larvae before pupation. As a result, wilting occurs on the leaf above the infested portion. Unusual branching of the seedlings and stunting of growth, may also occur due to the presence of this pest.

Control:—These caterpillars are difficult to control as the pest is inside the stem. Injecting D.D.T. or BHC into each gall by means of a syringe is recommended by Tirumala Rao and Raghavarao (1956).

(Fig. 3)—**Ground Beetle**

SPECIES:—1. *Mesomorphus villiger* (Blanc)

2. *Scleron latipes* (Guen)

3. *Opatroides frater* (Fairm)

FAMILY:—Tenebrionidae

ORDER:—Coleoptera

Ground beetles are small dirty gray or black insects found in the soil. Generally, they are found under heaps or inside bark of trees where there is shade and moisture.

Nature of injury:—These insects attack newly transplanted seedlings and gnaw and cut the seedlings down the stems. When the cut is deep, the plant fails to recover. This causes gaps in the field soon after transplanting.

Control:—Ground beetles can be successfully controlled by application of Dieldrin either in transplanting water, or by spraying the soil just before transplanting. The former method is more economical since using transplanting water is generally practised among farmers. A dosage of 1-2 lbs. of 50% W.P., in 100 gals. of water will give a good control.

(Fig. 4)—**Aphids**

SPECIES:—*Myzus persicae* (Sulz)

FAMILY:—Aphididae

ORDER:—Homoptera

Aphids are small louse-like insects which feed on the leaves by sucking the sap through their beaks. In the case of heavy infestation thousands of them can be seen on the leaves. Reproduction is very fast in these insects and the females at some part of its life cycle are able to reproduce young ones, which are all females even without an egg stage. This results in continuous heavy infestations.

Nature of injury:—By constant feeding on the sap of the leaves, they look sickly and become unfit for curing. In addition to this direct injury, the aphids secrete a sugary juice called 'honey dew' which attracts ants and also by whose presence a black mould develops which is generally known as 'Sooty mould'. The presence of this mould on the tobacco leaf makes it unfit for curing.

Control:—Aphids can be effectively controlled by spraying Endrine E.C. or

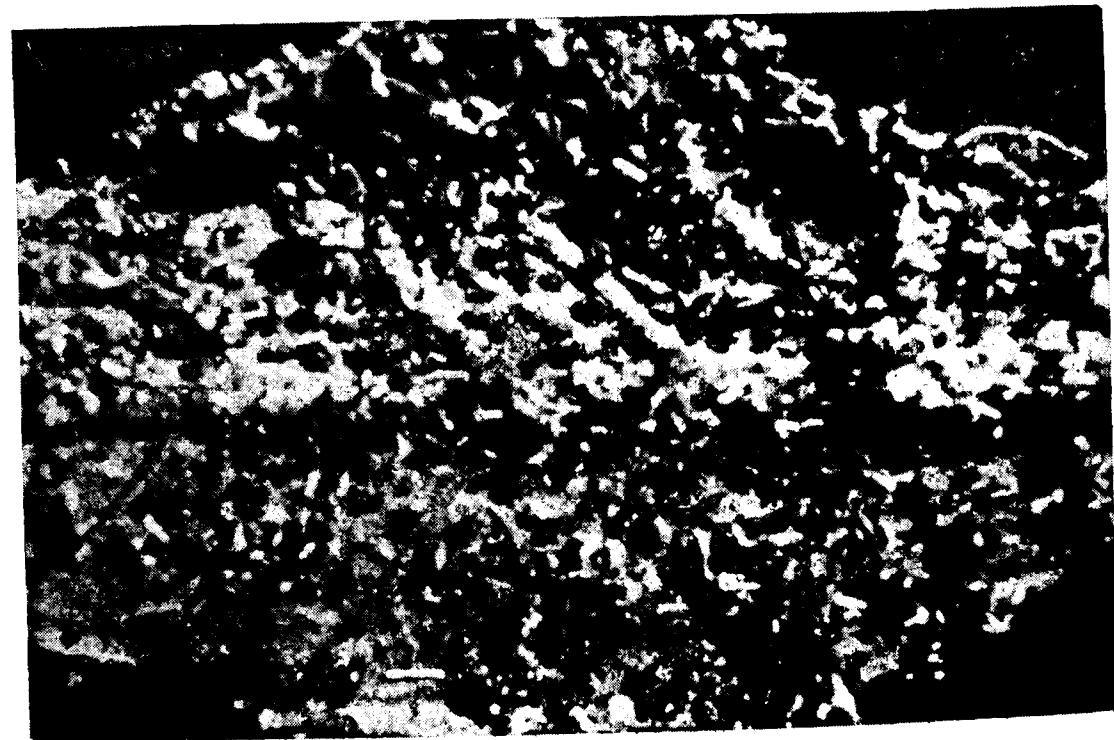


Fig. 4. Aphids infesting tobacco leaf



Fig. 3. Ground beetles attacking freshly transplanted seedling.

Basudin E.C. on the plants. Ten to 20 ozs. mixed in 100 gallons of water will be sufficient to spray one acre. When the infestation is heavy, two to three sprayings at weekly intervals will give a good control.

Root Knot Nematode

SPECIES:—*Meloidogyne* Spp. (*Heterodera marioni* Goodey)

FAMILY:—Heteroderinae

ORDER:—Anguillulata

CLASS:—Nematoda

These are minute worms commonly known as eelworms and are found in the soil. The females (Fig. 5) of the species are obligate parasites living inside the root tissues, thus causing galls (Fig. 6) or root knots and hence known as root-knot nematode.

Nature of injury:—When the plants are attacked by nematodes, they become stunted or turn yellow or wilt, causing the death of the plant.

Control:—Shell D.D. is recently used in certain countries, as a soil fumigant to control them. Since this method of fumigating the soil is very expensive, cultural practices like keeping the field fallow and rotation with crops which are resistant to nematode attack are generally practised. Discarding seedlings found to be attacked with these nematodes also helps to prevent further infection.

Grasshoppers

SPECIES:—*Acrida exultata* (Walker) and *Cyrtacanthacris tartarica* (Linn)

FAMILY:—Acridiidae

ORDER:—Orthoptera

The grasshoppers of the above two species are generally found in the tobacco nurseries and field. Ramakrishna Iyer (1941) reported the species *Atractomorpha crenulata* also as injurious to tobacco.

Nature of injury:—The grasshoppers feed on the leaves of seedlings, making numerous holes (Fig. 7). When the seedlings are very small, these insects cut the slender stem causing the death of the plant.

Control:—Certain cultural practices like maintaining a clean cultivation, removal of grass and weeds, around the nurseries and fields, etc., would check them to a great extent. Scattering poison bait between and around the nursery beds and fields, also would control them. A poisonous bait made of 70 lbs. of rice bran and 2 lbs. of lead arsenate well mixed and moistened with a little water may be scattered between the nursery beds and on the bunds. Care should be taken so that the bait may not fall on the leaves as lead arsenate might injure them.

Cigarette Beetles

SPECIES:—*Lasioderma serricorne* (Fabr.)

FAMILY:—Ptinidae

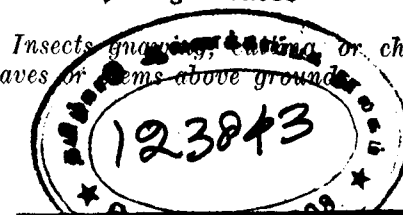
ORDER:—Coleoptera

Storage tobacco is damaged by the cigarette beetle larvæ which feed on the cured tobacco leaves. The larva (Fig. 8) has a black head, with hairs all over the body and are often seen rolled in tobacco dust. The larva after feeding for some-time pupate free or inside a case which it makes of tobacco dust. The pupae turn into adult beetles, which make small holes on the leaves and emerge out of tobacco. The cigarette beetles attack all types of tobacco. Parasites and predators are generally found along with these insects, but none of these reduce the beetle population to a great extent. The larvæ of the predator beetles *Tenebroides mauritanicus* have been found to feed on the pupae of the cigarette beetles. Certain mites are found to feed on the eggs of cigarette beetles.

Control:—These pests are controlled in other countries by spraying as well as by fumigation of the storages. Fumigation has been found to be more effective than spraying, as the fumigant easily penetrates into the cases and kills all the stages of the beetles.

A field key for the identification of insect and nematode pests injuring tobacco

A. Insects gnawing, eating or chewing the leaves or stems above ground.



3452002, N51



Fig. 5. Adult female of the rootknot nematode living inside the root.



Fig. 6. Galls produced by the rootknot nematodes.



Fig. 7. Tobacco Seedling showing grasshopper damage.



Fig. 8. The larva of the cigarette beetle.

1. Green, grey, brown or black, sometimes dotted striped caterpillars, devouring many small seedlings or creating large holes in the leaves, leaving only the midribs or veins during heavy infestations, feeding mainly at night and lying curled up in the soil during day time.

..Cutworms (Page 97)

2. Green or greyish jumping insects, cutting numerous holes on the leaves and hiding among grass and weeds surrounding the nurseries and fields.

..Grasshoppers (Page 101)

3. Grey or black, hard bodied insects crawling or burrowing on the soil, gnawing or cutting the tender shoots of newly transplanted seedlings, causing gaps in the field.

..Ground beetles (Page 99)

B. Insects piercing and sucking sap from leaves or stems causing bleached spots or sickly-looking due to desapping or causing black mould on the surface of the leaves.

1. Very slender, very small black bodied bristly winged adults, commonly found on the underside of the leaves of big plants causing the veins to become outlined and leaves spoiled by the presence of minute black spots.

..Thrips

2. Pinkish to brown or green bodied louse-like insects appearing in great numbers generally found on the underside of the top leaves but may occur in all the leaves and causing 'sooty mould' to develop on the leaves during heavy infestations.

..Aphids (Page 99)

3. Almost microscopic white specks of flies generally attached to the underside of the leaves can be seen flying when the leaves are shaken, or disturbed, acting as vectors of leaf curl disease of tobacco.

..White flies (*Bemisea tabaci*)

4. Large, flattened, shield shaped, bright green stinking bugs, about 2/3" long and various sized nymphs with reddish markings sucking sap from the leaves with their long beaks folded along the abdomen.

..Pumpkin bug (*Nezara viridula*)

C. Insects boring in buds, capsules, midribs or stems where bulbous swellings appear, causing wilting, stunting or branching.

1. Tiny caterpillars of small moths, living inside the midribs or stems, where bulbous swellings appear, causing wilting, stunting or branching of the seedlings or plants.

..Stem borer (Page 99)

2. Green, brown or black sometime spotted with yellow or red caterpillars boring and feeding into the capsules or buds making holes and damaging them.

..Capsule borer (*Heliothes armigera*)

D. Insects attacking tobacco and tobacco products in storage.

1. Cigars, cigarettes, bidi, Turkish and package tobacco infested with white hairy grubs and very small brown beetles which created holes through the packages, infest, and damage leaves inside cases, bales, and hogsheads. The beetles have soft forewings and antennae not enlarged at end.

..Cigarette beetles (Page 101)

E. Nematode parasites attacking tobacco roots under ground.

1. Parasites living inside tobacco roots under the soil as a result of which, root knot galls are produced, causing wilting, stunting, and death of the plant.

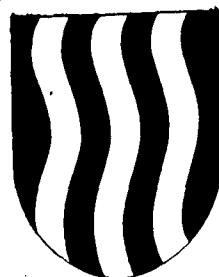
..Root knot nematode (Page 101)

REFERENCES

1. RAMAKRISHNA IYER (1941). A hand book of Entomology for South India. Supdt., Govt. Press, Madras.
2. TIRUMALA RAO & RAGHAVA RAO (1956). The tobacco stem borer (*P. heliopa* Low) in the Northern Circars and its control. *Ind. J. Ent.* 18 (1), 49-56.

TRIBENI TISSUES

PRIVATE LIMITED



Manufacturers in India of

High Grade Cigarette Paper

One of the largest and most modern
mills of its kind in the world.

The only Cigarette Tissue Mill
in India.

Managing Agents :

Balmer Lawrie & Co., Ltd.

21, NETAJI SUBHAS ROAD, CALCUTTA I, INDIA

Production of Quality Tobacco

Dialogue between A Farmer and an Expert

Farmer:—These days we note that everyone is talking of the necessity for production of quality tobacco. We have been under the impression that all that is required is to produce lemon yellow colour in Flue Cured Tobacco. Can you enlighten us what is meant by quality tobacco?

Expert:—No doubt there has been a considerable emphasis on colour as it is a basic requirement of Flue Cured Tobacco and is to an extent associated with quality. But colour is not everything. Tobacco leaf should be elastic with good body and size. The leaf should also burn well with desirable smoking qualities. In the course of buying, it is not possible to appraise all these factors but that does not mean qualities other than colour are of no importance. Even in respect of production of coloury tobacco our production of top grades is not anywhere near what it should be.

Farmer:—What you say is interesting but why should we bother with all this as long as we can sell our produce?

Expert:—In our Andhra Pradesh, we produce over one hundred million pounds of Flue Cured Tobacco of which less than 25% is consumed within our country. The balance has to be exported to foreign countries. During the war and immediately after the war, many of the foreign countries

accepted even inferior tobaccos because of shortage but now many countries have started production and some countries are expanding production. So there is no real shortage. All importing countries naturally look now for quality tobacco. You will realise that unless we can produce better quality tobacco, other countries may lose interest in our tobacco. Cigarette manufacturers are constantly appraising leaf for quality and show no interest in poor quality leaf.

Farmer:—We never looked at the problem from this angle. Do please advise us how can we produce quality tobacco.

Expert:—By adopting the following practices we can not only improve our yields but also progress towards production of quality tobacco.

1. Selection of suitable soils.
2. Crop rotation.
3. Growing only approved varieties and using pure seed.
4. Raising healthy seedlings.
5. Judicious use of fertilisers.
6. Keep down plant population to 6,000 or less per acre.
7. Prompt removal of Orobanche.
8. Removal of useless sand leaves.

APRIL—JUNE 1957

Production of Quality Tobacco

9. Topping wherever possible.
10. Correct harvesting, stringing, loading of barns and curing of leaf.

Farmer:—You have enumerated a whole list of items. Can you advise us in greater detail in respect of each item?

Expert:—Taking for instance suitable soils for growing F. C. Tobacco ryots should avoid, over-rich soils, soils known not to produce coloury tobacco, tank beds, saline soils and paddy lands.

Farmer:—Most of us try to avoid over-rich soils and soils that do not produce coloury tobacco; but why should tobacco not be grown on other types of soil as we are now successfully cultivating Flue Cured Tobacco on such soils?

Expert:—You will be interested to know that one of the serious complaints against our Flue Cured Tobacco is the rapid deterioration of colour in storage and it has definitely been proved that the tobacco grown on saline soils goes brown in a very short while and tobacco grown on paddy lands and tank beds becomes bleached. Buyers even if they buy in one season are bound to avoid thereafter scrupulously such tobacco. You will also agree that such tobacco exported abroad brings a bad name to our tobacco.

Farmer:—Can you tell us something about rotation?

Expert:—Taking the question of crop rotation, in some parts of our State Flue Cured Tobacco has been grown continuously for 15 years without any rotation. This cannot but lead to production of poor quality tobacco. Such soils become depleted of humus, because unlike other crops, in the case of tobacco no green material is returned to the soil. When humus is lacking, the crop suffers in yield, is subject to the vagaries of the weather and generally quality also suffers. There is also the possibility of increased infestation by diseases and definite increase of damage by Orobanche. So tobacco should always be rotated and never

grown on the same plot of land in consecutive years.

Farmer:—Of late a number of ryots in our area seem to be switching over to varieties like Putehavittanam and Karredu. Do you think that this is going to adversely affect the quality of leaf produced?

Expert:—Most of the buying firms desire to purchase only tobacco produced from standard varieties. Such varieties are recommended by Government or Commercial Agencies. Varieties like Putehavittanam and Karredu are of hybrid origin whose smoking qualities will not appeal to the buyer. Incidentally we might mention here that both these varieties are susceptible to Ash Disease and Aphid damage to a greater degree than the standard varieties. Whether you grow the variety recommended by trade or by Government, you must only use pure seed of the strain supplied by reputed agencies.

Farmer:—This is all very interesting but how about seedlings?

Expert:—Healthy seedlings are the foundation of a good crop and therefore proper seed-bed management should be adopted to produce healthy seedlings. Only hardened and healthy seedlings should be planted out.

Farmer:—Can you enlighten us on the use of fertilisers?

Expert:—There is a fallacious impression that tobacco depletes the soil rapidly. In fact tobacco does not remove from the soil any more plant foods than a normal paddy crop but where tobacco is grown year after year since no green material is returned to the soil, the soil texture deteriorates rapidly. All crops remove Nitrogen, Phosphate and Potash from the soil in fairly large quantities and that applies to tobacco also. If you want to maintain the fertility of the soil, it would be safe to apply a good fertilizer mixture.

Farmer:—What in your opinion is the ideal plant population per acre?

Expert:—When tobacco was first introduced, tobacco used to be planted out one yard each way giving 4,840 plants per acre. Of late there has been a tendency to plant even as close as 28" apart. Close spacing has been found to result in small sized leaf and trashy tobacco and also increases susceptibility of crop to Ash Disease and Leaf Spot. It would be wise for farmers to adopt 34" X 34" spacing to give 5,426 plants per acre and in any case never exceed 6,000 plants per acre.

Farmer:—You mentioned certain diseases and pests, how can we overcome Orobanche?

Expert:—Orobanche is one of our most serious problems. Year after year it is resulting in greater damage to our tobacco crop. The difficulty is that our farmers do not realise that Orobanche produces fine seed which looks like dust which in contact with tobacco root produces a plant which saps nutrition and moisture from the tobacco plant, thus affecting both yield and quality of tobacco. Even one shoot in a field is enough to produce sufficient seed to contaminate the whole field. Every farmer should remove Orobanche as soon as it appears before there is any possibility of seed formation and continue removing all new shoots till the stalks are finally pulled from the field. All such Orobanche shoots should either be buried or burnt. If this is carried out by every farmer within 3 years we should be able to reduce Orobanche to negligible proportions.

Farmer:—Some people advocate topping and others do not. Can you give us sound advice on this point?

Expert:—Topping is regularly carried out in countries which produce quality tobacco. Topping aids in production of better sized, better bodied gummy leaf in addition to increasing yields. Topping, however, should not be carried out universally. Where crop is light green in colour on the field and easily cured, topping will definitely be advantageous and should be carried out. In some fields even if topping cannot be carried out, the top 4 to 5 leaves can be removed with advantage. Topping should never be carried out in fields of rank growth, in areas

known to produce poor curing as this would further deteriorate production of top grade tobacco.

Farmer:—What else is defective in our cultural operations?

Expert:—Most farmers do not bother to remove the bottom sand leaves. These aid in increasing diseases like Ash and Leaf Spot. Sand leaves are also very trashy and are of inferior quality and it is uneconomic to cure them. Farmers will be well advised to remove the bottom 2 or 3 leaves once when the plants are a foot high and again when the plants are 2' high.

Farmer:—What about harvesting and curing?

Expert:—The present method of harvesting by contract labour while saving a considerable amount of bother to the farmer, is responsible for production of high percentage of low grades. It is not uncommon to see in some barns over 25% of unripe or overripe leaf. Such leaf can never be cured properly, however skilful the curer may be. Only leaves that are mature should be harvested.

Green leaf should be handled carefully and should not be trampled upon or otherwise damaged because damaged leaf will never cure to first grade leaf. In stringing, not more than 30 bunches should be strung and leaf in each bunch should be strung back to back. A single furnace barn should never be loaded with more than 750 sticks. Curing should be carried out on scientific lines as advised by experts from time to time. The cured leaf should be bulked in right moisture content and should be graded out to correct standards.

Farmer:—Thank you very much for your advice.

Expert:—If you follow the above advice, you would have done your little bit for production of quality tobacco and for the future prosperity of tobacco industry in our State and Country.

(Talk by Dr. N. S. Reddy of M/s I. L. T. D. Co. Ltd. on 9-3-1957)

—(Courtesy—All India Radio, Vijayawada)

PRELIMINARY STUDIES AND CONTROL OF CIGARETTE BEETLE

SEMINAR AT THE

CENTRAL TOBACCO RESEARCH INSTITUTE, RAJAHMUNDRY

A seminar on Preliminary Studies and Control of Cigarette Beetle, *Lasioderma serricornis* L., was held on 29th March, 1957. Dr. N. R. Bhat, Director, Tobacco Research presided. Shri D. P. Parkhe, Research Assistant in Entomology gave an account of the life history of the cigarette beetle and methods employed in studies under the scheme for preliminary studies of the pest in the warehouses which, with working facilities had been kindly provided by Messrs. I. L. T. D. Co., Ltd., at Anaparty. Dr. N. S. Reddy and his associates of the I. L. T. D. Co., Ltd., attended the meeting by invitation.

Introducing the subject, Shri Parkhe explained how the cigarette beetle was causing heavy damages to cured tobacco and tobacco products and consequently loss in foreign exchange, which was estimated as about ten lakhs of rupees in 1950-51. Out of the two common pests, *Lasioderma serricornis* L. and *Ephestia ellutella* Hbn. the former was the most common in India. The beetles enter the bales or cases of tobacco kept for aging in warehouses. In a year, the beetle can complete six generations, each lasting for about 41 to 53 days. Heavy damage was found to be caused by the larvæ, which eat into the leaf forming galleries and shreds. In breeding experiments it was found that the number of eggs laid was reduced when the number of pairs of beetles were increased in a limited amount of space, probably due to overcrowding. In cold storage, although the beetles continued to live, they were inactive.

The seasonal activity of the beetle was studied and it was found that the activity

was at the peak during July to December. In the experiments with bulbs of different colours the beetles were attracted more towards white bulbs. Sixty-watt bulbs were better than 40-watt bulbs for the catch. Maximum catch was obtained between 7 P.M. and 11 P.M.

Supplementing, Dr. Annamma Philip, the Entomologist said that while in India, the beetles could complete six generations a year, in America it was not more than three. Mortality of about 32% was found in eggs before hatching, about 53—59% in the larval stage and about 11—17% in pupal stage. Dr. Philip suggested that as the beetles emerged in large numbers after about 6 P.M., insecticides could be used with advantage during that period.

Dr. Reddy of I. L. T. D. Co., Ltd., expressed the opinion that there was something in tobacco that attracted the beetles. The flue-cured leaves attracted them more than country tobacco. He observed that spraying insecticides on bales drove the beetles inside rather than killing them and was doubtful about the efficacy of spraying insecticides on the bales. Dr. Reddy further said that in the tobacco sold by some of the growers the beetles were already there. It was for this reason that packages of redried tobacco were immediately moved to cold storage. Lindane, according to him appeared to be effective in killing the beetles but had less residual effect.

With a vote of thanks to the speaker the seminar concluded.

Telegrams & Cables :
"NICOTINE" GUNTUR

Telephone :
GUNTUR : 310

THE GUNTUR TOBACCOS LTD. GUNTUR (SOUTH INDIA)

(Registered 1937)

SPECIALISTS IN HANDLING,
REDRYING (PROCTOR DRYED)
AND PACKING INDIAN FLUE-
CURED AND SUN-CURED
VIRGINIA AND SUN-CURED
COUNTRY ("NATU") TOBACCOS
OF ALL VARIETIES

FOR ALL YOUR REQUIREMENTS, PLEASE CONTACT
THE MANAGING AGENTS:

CHARI & CHARI (PRIVATE) LTD.

2/6, Second Line Beach
MADRAS 1

Telegrams : "FALCO" MADRAS

Telephone : 2859 Madras

Telephone: No. 4852

Telegrams: "MYSTOBACCO"

THE MYSORE TOBACCO CO., LTD.

KEMPEGOWDA ROAD, BANGALORE 2

FIELD STATION at
GORIBIDNUR
Kolar District

GRADING STATION at
WHITEFIELD
Bangalore District

**DEALERS, CURERS AND PACKERS OF
FINEST QUALITY VIRGINIA LEAF TOBACCO**

The Company provides facilities for Tobacco
cultivation, curing and sale and has installed
a most up-to-date plant for—Redrying and
Packing of leaf at Whitefield

For further particulars address the Secretary

JUST RELEASED

Rice in India

Published by

**THE INDIAN COUNCIL OF AGRICULTURAL RESEARCH
NEW DELHI**

A very comprehensive and new monograph compiled by eminent authorities, "Rice in India" summarises all the research work done in this country on rice cultivation. This monumental volume is probably the first published work of its kind in India presenting detailed information on the general aspects of agriculture, research, extension, marketing as well as technology of rice. Beautifully printed on superior offset paper, bound with stiff straw board with attractive two-colour jacket, the book contains a large number of admirable colour plates, halftone illustrations and line drawing.

It will be highly useful to scientists, extension workers students and laymen as a standard book for study and reference.

Size: 6" x 9½"

pp. 507 plus 2 colour Plates, 47 Half tone
illustrations and 8 line drawings.

Price: Rs. 21.00 net.

With postage & packing Rs. 24.00
(V. P. Ps not sent.)

Copies Available from: The Business Manager
**INDIAN COUNCIL OF AGRICULTURAL RESEARCH
QUEEN VICTORIA ROAD
NEW DELHI**

PROGRAMME OF AGRICULTURAL OPERATIONS FOR THE QUARTER

JULY—SEPTEMBER

FOR FLUE-CURED TOBACCO

Received from

*Central Tobacco Research Institute,
Rajahmundry*

*Nursery:—*During this quarter the nursery area is selected, prepared and sown.

The area selected for the nursery should be of a high level with gentle slope. The soil should be light and porous to permit good drainage. Since during the quarter it is likely that about 25 to 30 inches rainfall will be received and as the heavy rainfall coupled with the warmth will enhance the occurrence of "damping off" the worst disease of the seed-beds, every effort should be made to drain off all the rain water as early as possible and prevent the beds from getting water-logged. It is highly essential

that the following points are observed in the selection of site for seed-beds:—

(1) The soil should be light preferably sandy loam with good drainage facilities. In case nurseries are to be raised on heavy black soils, to improve the structure of the soil it is advisable to apply about 50 tons of sand per acre and incorporate it with the top layer by ploughing. (2) Select sites with a gentle slope to facilitate quick drainage. (3) The site selected should be near a good source of water supply since regular and adequate watering of seed-beds in the early part of the growth of the seedling is highly essential. (4) The nursery site should not generally be located in the open windy plains as normally one or two cyclonic storms are received during the nursery season. If by force nurseries are to be raised in the plains it is better to provide temporary windbrakes either with Hibiscus or Sesbania.

*Preparation of seed-beds:—*With the commencement of the monsoon rains, the site selected for the nursery should be given frequent ploughings to remove the weeds, etc., and to give a fine tilth. Bed formation is to be taken up in the beginning of August. The length of the beds may be of convenient size along the slope, if any. The width of the bed should be 3½ feet.

APRIL—JUNE 1957

111

Between two rows of beds, space of $1\frac{1}{2}'$ is to be left to serve as drainage channel during rains, and convenient space during watering and weeding. The beds should preferably be raised 4 to 6 inches high from the ground level to facilitate drainage. After the beds are formed the surface of the bed is to be brought into fine tilth removing all the stones and clods. Unless the top surface is in fine tilth at the time of sowing the tobacco seed which is tiny may go deep and may not germinate.

Basal Manuring:—After the beds are brought into fine tilth, manuring should be taken up. Groundnut cake and F.Y.M. are very good basal manures for tobacco nurseries. For supply of nitrogen, apply groundnut cake at the rate of 1,200 lbs. per acre. In case groundnut cake is applied, it should be applied in a powdered form two or three weeks before sowing mixed well with the soil. This will make it readily available to the young seedlings. The quantity to be applied is about 8 ozs. for every length of 5 feet. F.Y.M. should be applied at the rate of 80 C.L. per acre prior to sowing and preferably after powdering and sieving. The F.Y.M. should be treated with Bordeaux mixture or Perenox to prevent it from being a source of 'damping off'. It has been found to give large number of healthy and vigorous transplants if it is applied as 1 inch layer on top of the nursery beds.

Preventive dose:—Two or three days before sowing, spray Perenox (2 in 10) or Bordeaux mixture (2-2-50) as a preventive dose against 'damping off'. The usual rate of spray is about a gallon for 10 square yards.

After the spraying the surface of the bed is to be gently raked to bring them back to fine tilth, taking care to see that the lower layers of unsterilized soil are not disturbed and brought to surface.

Seeding:—The normal seed rate should be about $3\frac{1}{2}$ lbs. per acre or $1\frac{1}{4}$ tolas per cent. Heavier seed rate will result in thick stand giving scope for the spread of diseases and pests or producing thin lanky seedlings.

Mix the seed with fine sand to make up to a large quantity and to ensure even distribution of seed over the beds.

After sowing, stir the surface very gently with tips of the fingers and then roll a cement pipe $3\frac{1}{2}' \times 1'$ twice to press the seed against the soil and to even out the surface.

The farmers are advised to use always pure certified seed. Pure seed processed, packed in the same way as was done in previous years, produced at the Central Tobacco Research Institute, is kept for sale with the Secretary of East and West Godavari Market Committees and with the Asst. Tobacco Extension Officers, Guntur and Eluru (West Godavary). The seed will be available for sale from the middle of July.* The approximate quantities that will be deposited for sale with the various organisations will be:—

H.S. Chatham			
Assistant Tobacco Extension Officer, Guntur	..	1,500 lbs.	500 lbs.
Assistant Tobacco Extension Officer, Eluru	..	700 lbs.	200 lbs.
Chairman, East Godavary Market Committee, Rajahmundry	..	700 lbs.	200 lbs.
Chairman, West Godavary Market Committee, Kovvuru	..	400 lbs.	10 lbs.

Pure seed will save the growers from undesirable mixtures which will include bad quality leaf in their harvest.

It is not desirable to sow the entire nursery area at one time, since all the seedlings will come to planting at the same time. To ensure uniform supply of seedlings throughout the planting period, it will be essential to sow the beds in stages from the middle of August to the first week of September.

Watering:—Within 5 to 7 days from the date of sowing the seeds germinate; watering

is one of the most important operation in raising a successful nursery. The beds should be watered from the time of sowing, care being taken to see that the beds are kept moist and not wet. Rose cans with fine holes are preferable for watering the nursery as pot with watering is likely to displace and collect the germinating seeds in patches. Excess watering is also harmful as very damp beds promote 'damping off'. In sandy soils where surface dessication is too much, it can be prevented by spreading paddy straw as a thin layer on the beds or casuarina twigs immediately after sowing. The paddy straw is to be removed immediately after germination and cover provided with cholan straw over the beds while casuarina twigs may be removed after about three weeks.

Weeding of the beds is to be attended to as and when found necessary. Before weeding it is better the labourers wash their hands with soap and water with a view to prevent them from passing on the mosaic disease.

Top-dressing about the fifth week after sowing:—In case due to some reason or other the growth of the seedlings is retarded, to force growth, apply ammonium sulphate at the rate of $1\frac{1}{4}$ tola per square yard in half the quantity of water required for one watering followed by the remaining half quantity to wash off sulphate of ammonia from the leaves. Application of ammonium sulphate should be followed by copious watering.

In spite of careful handling and management of seed-beds diseases and pests are bound to occur. The following remedial measures should be followed for some of the more important diseases and pests.

Control of damping off:—Cultivators should remember that they are to prevent 'damping off' from appearing rather than think of taking remedial measures after the disease has appeared. If the weather is clear, spraying may be done once in 5 to 7 days from the time the germination is complete up to about a month. Spraying (2 in 10) perenox or fytolan, or (2-2-50) Bordeaux

mixture at the rate of a gallon for 10 square yards may be undertaken. Under prolonged or recurring wet conditions the application should be repeated frequently, preferably once in every third or fourth day. The object in such sprayings is to maintain some quantity of the fungicide in the soil so that 'damping off' will not set in.

Cutworms and Caterpillars:—As soon as any tiny caterpillar is seen in the seed-bed the growers should spray with rose can DDT 50 per cent W.P. Five tolas of DDT in one kerosene tin of water should be enough for 30 square yards of nursery. Second spraying may not be necessary.

Sanitation:—The nursery area and the surroundings should be kept as tidy as possible. Smoking or chewing of tobacco by the labourers while at work should be prohibited. The workers should wash their hands with soap before entering for work. Diseased seedlings removed from seed-beds should be collected in some containers having a little fungicide and deported to a far off place. They should under no circumstances be thrown in the nursery areas. Detailed particulars regarding seed-bed management, application of fungicides etc., can always be had from the Central Tobacco Research Institute, Rajahmundry.

Main Field:—The tobacco field should receive bulk organic manures like F.Y.M. or compost. They should be carted in time to the fields. To a field of average fertility about 6 to 8 C.L. of F.Y.M. or 8 to 10 C.L. of compost per acre are sufficient. Before the onset of heavy rains, the F.Y.M. or compost is spread over in the fields and incorporated with the 1st and 2nd ploughings.

Since during the quarter the rainfall will be heavy the fields are to be ploughed as and when they are in condition with a view to conserve as much moisture as possible and to keep the fields free from weeds. If the fields are too weedy, periodical hand weeding should be resorted to.

* Please see the announcement on page 54 of this issue.

FOR CIGARETTE TOBACCO

Received from
Cigarette Tobacco Research
Sub-station, Guntur

By the month of July, a few rains of South-West Monsoon would have been received and consequently the field operations commenced.

Groundnut which is the first crop in the two-year rotation (Groundnut-Sorghum-Fallow-Tobacco) practised in the locality is sown now. The field is harrowed once or twice with a three-tined harrow ("gorru"). Normally the crop is not manured; but in a few cases few cartloads of farmyard manure may be applied. In addition, fertiliser mixtures in varying quantities may also be given. It is better that the crop is sown as early as possible with the receipt of rains. The crop will be on the field till about the end of September.

Preparatory Cultivation:—Some fields are kept fallow for raising tobacco. The fields are ploughed at frequent intervals whenever circumstances and soil conditions are suitable for the operation. Generally by the end of the quarter, six or even more ploughings

would have been given. Normally it would be so programmed that all ploughings are completed by September so as to permit the planting of tobacco as early as possible in October. Trials conducted at the Cigarette Tobacco Research Sub-station, Guntur have however shown that it would not be advantageous to plough the land more than 3 or 4 times, as more number of ploughings decrease the yield of tobacco (Cigarette tobacco).

Manuring:—The crop is manured in different ways. Organic manures either alone or in combination with fertilisers are applied. The organic manure given is generally the farmyard manure applied at the rate of 3 to even 30 cartloads per acre depending upon the nature of the fields and the availability of the manure. Groundnut cake at the rate of 100 to 300 lbs. per acre also is given in some instances. The use of groundnut cake, however, was going out of practice in recent times. The above manures are applied to the fields and ploughed into the soil at any time from the onset of rains (in June to July) to about the month of September. It may be noted here that it would be proper and advantageous to apply these manures as early as possible in the season so that there would be sufficient time for the disintegration of the manures as otherwise the tobacco crop is likely to produce leaf of inferior quality. The practice of keeping the farmyard manure in heaps on the fields itself even from the summer months, pending the spreading and ploughing of the same later on in June to July or thereafter, is not a healthy one, as

the Nitrogen and other constituents of the manure are likely to be wasted. To avoid this wastage the manure should be carted freshly from the manure-pit direct and applied to the fields. The quantity of farmyard manure to be applied should depend on the nature of the field. If it is known that the field gives a darkish crop it would be a good policy to apply the manure at reduced rates. The manure may be applied every year if the tobacco crop does not show darkened leaf; otherwise, application of the manures in alternate years may be adopted. A fertile field should always be manured less and vice versa.

Green manuring the tobacco crop by greengram raised in June-August is also occasionally met with. Normally the use of a leguminous crop like the greengram may add more nitrogen to the soil than the optimal requirement of the tobacco crop. And therefore this practice may have to be observed with caution. Fertilising the greengram crop with heavy doses of phosphoric acid and potash might be beneficial to some extent.

Application of fertilisers to the tobacco crop is widely practised, the quantity applied per acre being about 2 to 4 bags (fertiliser mixture). The fertilisers may be applied with advantage about a fortnight before the crop is planted. The fertilisers should not be broadcasted as the crop will not fully be benefited by this method of application. They are best applied about 6" deep in a furrow. After placing the fertiliser in the furrow the same should immediately be covered by the surrounding earth by working a plank or any other suitable implement.

Nurseries:—Having seed-beds near about the fields on which the crop is planted is useful and advantageous. Seed-beds can be raised successfully on the black cotton soils. The site selected for the seed-beds should be higher in level than the surroundings. There should be a field pond, well or some other source of assured water supply. The water should not be brackish. After working the soil to a fine tilth, raised beds about 5" to 6" height of convenient size should be formed. There should be footpaths of about 1' to 1½' between the beds. These paths will serve also as drainage channels during the rains. It is preferable that the beds have a slight gradient. Fine sand at the rate of about a ton per cent of seed-beds should be applied and worked in well. The beds may be burnt if facilities are available. Sieved and powdered farmyard manure should be applied over the bed in a layer about 1" thick. Bordeaux mixture of moderate strength may be applied to soak the beds well about a fortnight before sowing. Sowings may be commenced from about the middle of August and continued at weekly intervals so as to make the seedlings available later on for planting throughout the planting season (October to December). A seed rate of 2½ to 3 lbs. per acre of seed-beds may be used. Good quality seed should be obtained from reliable sources. The seed should be mixed with sufficient quantity of sand and sown over the beds. After sowing, the beds should be well compacted by rolling over the bed a cement pipe of proper dimensions and weight. The bed should be kept always moist by watering with rose cans at proper intervals. A fortnight from the date of germination, either Bordeaux mixture or perenox or any other approved copper

fungicide should be sprayed over the seedlings in recommended doses. The sprayings of the fungicide may be done at weekly intervals irrespective of the occurrence of fungal diseases. Insecticidal dusts or sprays like, D.D.T, Endrin etc., should also be used in proper strengths to avoid or control insect

attacks. As the seedlings are growing and depending upon weather conditions, waterings of beds should be adjusted. The usual operations such as thinning, sanitary precautions, clipping of leaves, etc., should be very thoroughly observed.

Cable : JONAS, LONDON
Telegrams : JONAS, STOCK, LONDON

Telephone : MANSION HOUSE 0121
Code : BENTLEY'S PHRASE

JONAS, ELLIOTT & CO. LTD.

(SUCCESSORS TO E. JONAS & BROS.)

EST. 1792

LEAF TOBACCO MERCHANTS

Import-Export: Empire and Foreign Tobaccos

Rhodesian Branch :

JONAS, ELLIOTT (Rhodesia) LTD.

P. O. Box No. 1987

Salisbury, S. Rhodesia

Cables: JONAS, SALISBURY, RHODESIA

23 LIME STREET
LONDON, E. C. 3

FOR

MOTIHARI &

JATI VARIETIES

OF

HOOKAH TOBACCO &

WRAPPER TOBACCO

Received from
Wrapper & Hookah
Tobacco Research
Station, Dinahata

hands well shaken to dislodge and destroy any adult beetles or grubs.

For the purpose of raising nursery a fertile, well drained site near the farmstead should be selected. Ploughing and planking of the nursery land may be commenced in early September. Nursery requirements of this tobacco are much the same as of jati tobacco described under Hookah Tobacco. Sowing of nursery should be done in the 3rd week of September so that 5-6 weeks old seedlings are available for planting by the end of October or early November at the latest.

(ii) MOTIHARI (N. RUSTICA)

So far as this crop is concerned there are no field operations to be performed during the month of July and August. However, if the produce is not yet sold out, due care may be taken of the produce under storage. Since during this period there would be heavy rainfall, it should be seen that the produce is stored at a safe place so as to save it from deterioration by direct or indirect entry of moisture in the bulk heaps. The bulk heaps should be given periodic turnings at the interval of 3 to 4 weeks depending upon the heat generated inside them. The bulk heaps should be given turnings before they get too hot inside.

During September, selection of nursery sites, the preparatory cultivation, manuring and other preliminaries may be arranged so that the beds are ready for sowing in the first week of October.

(i) WRAPPER TOBACCO

Wrapper leaf in storage is susceptible to serious damage by Cigarette beetle and extreme vigilance need to be exercised to guard against this pest. The produce must be stored in a cool, dry place and well protected from the damp air during rainy weather. The heaps should be kept well covered with tarpaulins. Periodical turnings of heaps should be done to check the abnormal rise of temperature and prevent beetle infestation. Bunks should be turned as far as possible in fair weather and the

(iii) JATI (N. TABACUM)

July and August:—During July and till late August looking after the bulk heaps, if the produce is not yet sold out would be the only major operation. Periodic turnings at the interval of 3 to 4 weeks may be given. It is necessary to store the produce at a safe place so that excessive moisture does not enter into the bulk heaps directly or indirectly. Entry of excessive moisture would damage the produce and deteriorate the quality.

September:—Selection of the site for raising nursery and its preparatory cultivation should be taken up at the end of August. Beds should be ready for sowing in the 3rd week of September. The success or failure of the crop much depends upon the availability of good sized healthy seedlings, 5-6 weeks old at the end of October.

Selection of nursery site:—Select the site for raising nursery at a high location having good drainage. The site should not be surrounded by such low lying plots, which would overflow and threaten submergence of the nursery area during the heavy rain-fall period. Thus adequate quick drainage of such plots needs to be considered.

Preparation of Nursery land:—If the nursery site is cropped in early kharif season, it should be made free of stubbles etc. in late August or early September and ploughing should be commenced. Ploughings followed by laddering should be continued till a fine tilth is obtained. Thorough laddering after each ploughing would pull out and collect grass, stubbles, etc., which should be removed before going over the land a second time. In all about 10-12 ploughings with as many or more laddering should be adequate to produce a desirable tilth. After about 5 to 6 ploughings and 15-20 days prior to the sowing time well rotten farmyard manure should be applied at the rate of 20 to 25 cartloads per acre.

Lay out of the nursery:—The nursery land when ready for sowing may be laid out into convenient sized raised beds with

drainage channels all round. 6" raised beds measuring 3' to 4' in width and 10' in length should be suitable for North Bengal region. The edges and sides of the bed should be made firm before sowing. If the nursery land is sandy the sides of the raised beds may be protected by putting paddy straw or thatch grass with support of bamboo pegs. This would prevent washing of the beds during heavy showers.

Sowing of nursery beds:—During the 3rd week of September the sowing of nursery beds at the rate of 3 to 4 lbs. per acre should be done. The sowing should be as uniform as possible. In order to ensure uniformity in sowing the required small quantity of seeds may be mixed with dry sand or powdered soil to make up bulk and sprinkled on the beds uniformly. The seeds need to be lightly mixed with soil and the bed surface makes firm by light hand pressing or by drawing a small, light plank. The beds are then left undisturbed and no watering is needed immediately after sowing. The seeds would germinate within a week. In order to ensure safety of the beds against heavy rainfall, they may be covered thinly with thatch grass or paddy straw which can be removed after the germination is over. If G.C.I. sheets are available, it is desirable to cover the beds with G.C.I. sheets supported on bamboo peg about 6" high. The height of the bamboo pegs should be so adjusted that the sheet has a gentle slope to one side along its length. The sheet covers should be removed during clear weather. Waterings and weedings should be given as and when required.

PROGRAMME OF AGRICULTURAL OPERATIONS FOR THE QUARTER JULY—SEPTEMBER.

Received from Hookah & Chewing Tobacco Research Station, Pusa

The preparatory cultivation of the main field and nursery areas is to be continued as and when weather conditions permit if no green manuring crop is taken. Manuring of fields with farmyard manure should also be taken up before the end of July.

In the nursery area, beds are to be prepared by the beginning of July. The beds should preferably be 4 feet in width and at least 6" raised above the ground level. The beds can be of any convenient length according to requirements. About one foot space between the beds is provided for the removal of excess of rain water and also as a pathway. Well powdered mustard cake at the rate of 25 lbs. N. per acre should be applied to the beds by the middle of July. Tobacco seed mixed with sand and fine earth should now be evenly broadcasted at the rate of about 5 lbs. per acre of nursery by the end of July. Heavy seed rate which results in overcrowding of seedlings may also favour the spread of "damping off". After sowing the beds are lightly worked with fingers to mix the seed and the pressed by hand hoe (khurpi). The beds are judiciously watered by means of rose cans with fine holes. Watering should be continued to keep the surface always damp but not too wet. Weeding of the beds is to be done whenever necessary. Preparatory cultivation for the field intended for transplanting the crop should be continued. Well composted farmyard manure at the rate 40-50 cartloads is thoroughly incorporated in the land. Where sannhemp crop is taken for green

manuring, it should be buried by the end of July or beginning of August and the ploughing of land continued to bring the soil into a fine tilth. The green manure should in no case be allowed to flower before burying.

Prophylactic spraying of bordeaux mixture or perenox is to be done in the seed-beds against "damping off". The preparation of the fungicides is as follows:—

Bordeaux mixture:—One pound of copper sulphate is dissolved in 20 gallons of water in an earthen pot. In another earthen pot lime solution is prepared by adding one pound of fresh quick lime to 5 gallons of water. The copper sulphate solution is added slowly to the lime solution stirring well with a wooden piece. The mixture has to be stirred continuously till no copper deposit is obtained if a knife blade is put in the mixture for about half a minute.

Perenox:—The fungicide is made into a paste by mixing half pound of the chemical with a small quantity of water. Then enough water is added to make up the volume to 20 gallons.

Doses:—On an average about 6 gallons of solution is required per 100 sq. ft. of nursery. Generally as much fungicide as the beds can take without overflowing can be applied each time.

The application may be repeated at the interval of a week or 10 days as per necessity to control the spread of the disease in the month of August and September. If the growth of seedlings in nursery is not satisfactory apply ammonium sulphate to accelerate the growth. Immediately after the application of the fertiliser the beds are to be watered to wash off the deposits of ammonium sulphate from the leaves.

By the beginning of September, manuring of the main field is attended. 25 lbs. N. in the form of mustard cake is applied 7 to 10 days before planting. Rest 25 lbs. N. in the form of ammonium sulphate is to be applied after one month of transplanting.

By the middle of September, the seedlings are ready for transplanting. For planting,

only robust and vigorous seedlings with 6—8 leaves with good root system should be selected. The planting of tobacco crop is started by the middle of September and continued up to the middle of October. The planting is to be done in the afternoons. If the weather is cloudy and drizzling it may however commence in the morning also. For rustica tobacco the planting is delayed by about one fortnight. Spacing of 3' x 2' has been found to be optimum in N. tabacum species. Two or three pot waterings after planting are given to help in the establishment of seedlings. The gap filling should be completed within 10 days after planting because plants gap filled later rarely put on good growth and their yield is considerably reduced.

FOR HOOKAH TOBACCO

Received from Hookah Tobacco Research Sub-Station, Ferozepur

July.

Generally the crop is harvested by this time. In some years (Desi Tobacco N. Tabacum) may go upto the middle of July. Efforts should be made to harvest the crop before the monsoons set in. If the harvesting is delayed, the crop will be rendered over-ripe and it will not cure properly.

Harvesting and Curing.

The harvesting is usually done in the early part of the day by cutting the whole plants and the cut plants are allowed to remain in the fields after spreading them, for partially drying for 2 to 3 days. The plants are turned upside down next morning and are brought nearer. The operation is repeated for 2 to 3 days till the harvested crop is in a proper condition for burying. This is very essential as, if the crop becomes overdry, the leaves will break and if it is wet it will rot in the pit and not produce good stuff. After proper drying, the plants are collected early in the morning when dew is on, in bundles of convenient size and buried in a pit dug in the ground. The size of pits may be of 5' x 4' x 2½'. The walls of the pits are lined with Sarkanda or weeds in order to prevent mixing of earth and the partially dried plants are arranged in layers in it. After this top

layer is covered with Sarkanda or tops or suckers of the tobacco of hessian sheets and then heaped over with earth. The top of the pit should be raised above the ground level and levelled smooth so that rain water may not get into the pit. The plants are allowed to remain in the pit for 7 to 13 days depending upon the condition of the stuff at the time of burying. If the harvested plants are wet at the time of burying, its duration of pitting should not be more than a week as due to excessive fermentation, there will be deterioration in the quality of tobacco. On the other hand, if leaves are overdried, the fermentation will be slow and hence will remain for more number of days in the pit so as to develop the desired aroma. Curing is an art in tobacco cultivation and a great care is to be exercised in this operation. After this period the plants are dug out, leaves are separated from the stalks and twisted into ropes. The ropes should be dried for couple of days and then the material is ready for marketing.

August.

The stored crop should be properly looked after and it will be better if the heaps are re-arranged after sometime to avoid over-heating of the stuff.

TAMBAKU

(A HINDI QUARTERLY)

POGAKU

(A TELUGU QUARTERLY)

Containing interesting & valuable articles in popular language on tobacco cultivation and marketing and important tobacco statistics.

Single Copy nP. 38 Annual Subscription Rs. 1.50

Advertisement Tariff for both "TAMBAKU" & "POGAKU"

(Strictly payable in advance)

Cover pages (except front outer cover)

per page per insertion Rs. 30/-

Inside full page " Rs. 25/-

Inside half page " Rs. 15/-

Inside quarter page " Rs. 10/-

In the case of advertisements involving 3 or more continuous insertions booked in advance a rebate of 20% will be allowed. Other terms as applicable to the English Quarterlies.

Rates for colour advertisements on application

INDISPENSABLE MEDIA TO REACH THE INDIVIDUAL GROWER, TRADER & CONSUMER

Subscribers and advertisers may please contact

THE SECRETARY,

INDIAN CENTRAL TOBACCO COMMITTEE

38, MOUNT ROAD, MADRAS 6

FOR BIDI TOBACCO

Received from Agricultural Research Station, Nipani

As soon as first showers of rain are received the land is given one good ploughing following with 2 or 3 harrowings. About 10 cartloads of farmyard manure is uniformly spread and harrowed well to mix it with soil. All stubbles and sticks remaining from previous harvest are removed.

Seed-bed Nursery:—The preparation of seed-bed started in last week of June is continued in July month also. Raised beds are prepared to a height of 6 inches and well packed with farmyard manure to provide a good bed. Tobacco seeds are thickly sprinkled over the bed and well mixed with soil and covered and compacted. Watering is given regularly looking to rainfall received. Whenever "Damping off" disease of seedlings is observed the beds are given spraying of 2-2-50 Bordeaux mixture to control "Damping off". The bed is greatly affected by caterpillars and regularly the caterpillars are hand picked and destroyed. The seedlings will be ready by 1st week of August for first pull.

San green manuring:—As soon as enough rains are received and when the soil moisture content is sufficient by about last week of May or early June the sannhemp sowing operation starts. About 40 lbs. of sannhemp seed is drilled by means of 12" drill and the seed covered and compacted. One interculturing is given to control weeds and loosen soil. About the 3rd or 4th week of July the San crop is ready for burying. Furrows are prepared by running an iron

plough and the crop is uprooted and placed in the opened furrow and while opening the second furrow it is well buried.

Transplanting of seedlings:—The seedlings are ready for transplanting in the 1st week of August. Early transplanting is done in the 1st week of August and further transplanting continued up to 1st week of September, looking to the soil and rainfall conditions of the year. Few hundred seedlings are pulled at a time and taken for transplanting and fields are marked $3\frac{1}{2}' \times 3\frac{1}{2}'$ and at each point some little quantity of water is poured and one seedling is transplanted at each place.

Insect pests and diseases:—At the time when the seedlings are establishing, caterpillars cause damage of leaves and cut worms burrow the main stem and damage the shoots. Early in the morning the caterpillars and cutworms are hand picked and destroyed. The gaps are filled by retransplanting now and then.

Interculturings:—Looking to soil condition and rainfall light interculturings are given to control weeds and to loosen soil.

Lowering of leaves:—As the plants establish well the lower leaves are removed upto 6" from the soil. About 6-8 weeks from transplanting the tobacco crop will be ready for nipping and nipping is done keeping 12 to 14 leaves.

FOREIGN MARKETS

FOR

INDIAN TOBACCO

A Good Year for Tobacco Exports.

During 1956, India exported 39,985,871 lbs. of tobacco to the U.K. which was about 3.6 million lbs. more than in 1955. The value of the exports for this period amounted to £8,177,900 which was nearly £1.0 million over the 1955 total. Considering that the total U.K. imports during 1956 were 25.2 million lbs. below the imports during 1955, India's performance can be viewed with some satisfaction. In this period, however, the Rhodesian exports to this market increased by nearly 12 million lbs. Exports from the U.S.A. were lower by nearly 18 million lbs. as compared with 1955.

—(Extract from the Report of the Minister (Economic) to the High Commission for India, London)

Effects of Export Promotion on Tobacco.

Indian tobacco was not imported by France in any mentionable quantities till a few years back, mainly because the Tobacco Regie thought that it did not burn well. We, therefore, arranged for supply of samples of various grades of our tobacco for testing and now S.E.I.T.A.—the monopoly organisation for tobacco import and manufacture—was importing some quantities of tobacco from India for filling and also for smoking. Since S.E.I.T.A. has commenced manufacturing cigarettes with filter—which is gaining popularity as they are said to be less harmful than cigarettes without filters—it will be importing more low grade tobaccos for filling and we may hope to supply these varieties of tobacco to France in larger quantities than before.

—(Extract from the Report of the First Secretary (Commercial) to the Indian Embassy in Paris.)

Scope for Tobacco.

Japan's imports of tobacco which in 1955 stood at 10,472 tons declined in 1956. During the first ten months of 1956 only 5,180 tons were imported. India supplied 2,640 metric tons in 1955, but only 601 tons in January-October, 1956. Although the Japanese hold the view that Indian leaf is very much similar to their home grown leaf, it is felt that with concerted efforts to improve quality, grading and trading methods, Indian exports can be stepped up. The other main supplying countries are the U.S.A., Indonesia, Turkey, Singapore and the Philippines.

—(Extract from the Report of the Commercial Attache, Embassy of India, Tokyo)

Prospects for Tobacco Encouraging.

The arrival of 4,331 tons of tobacco in January-September, 1956 was in quantity higher than for the whole of 1955. In value, as the virginia tobacco supplied was of a much lower variety, it amounted to only Rs. 12.5 million, as against Rs. 22.8 million for the year 1955. Indonesia entered into a surplus agreement with the U.S.A. for the supply of \$15 million worth of tobacco before June, 1957. All arrival of tobacco from India in 1956 was the result of liberal licensing between October 1955 and February, 1956.

Foreign Markets for Indian Tobacco

Stocks of low variety Indian virginia tobacco for blending with American and local virginia were reported to be practically exhausted. It is, therefore, likely that import of tobacco from India would be resumed soon. The year 1957 may turn out

to be a good one for Indian exports of tobacco to this country.

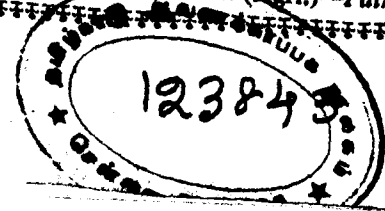
(Extract from the Report of the
Commercial Secretary, Embassy of
India, D'Jakarta)

DL —
452 or 2, 1, 2, 1

N57.72

OFFICERS UNDER THE INDIAN CENTRAL TOBACCO COMMITTEE

- (a) *Secretariat, Madras.*
Dr. M. S. Patel, M.Sc., Ph.D.(N. Carolina)—*Secretary.*
- (b) *Central Tobacco Research Institute, Rajahmundry (S. India).*
Dr. N. R. Bhat, Ph. D. (Cantab)—*Director, Tobacco Research.*
Dr. N. L. Pal, D.Sc., F.N.A.Sc., F.B.S.—*Plant Physiologist.*
Sri H. T. Khemchandani, M.S. (N. Carolina)—*Agronomist.*
Dr. (Miss) Annamma Phillip, M.Sc., Ph.D.—*Entomologist.*
Sri D. I. Mathrani, M.S. (N. Carolina)—*Plant Pathologist.*
Sri V. N. Murty, M.A.—*Statistician.*
Dr. K. V. Krishnamurthy, M.A., Ph.D.—*Cytogeneticist.*
Sri K. Kameswara Rao—*Engineer.*
Sri K. P. S. Nair, B.A.,—*Assistant Administrative Officer.*
- (c) *Cigar and Cheroot Tobacco Research Station, Vadasandur (via.) Dindigul (S. India).*
Sri T. Krishnamoorthy, B.Sc. (Agri.)—*Agronomist.*
Dr. D. M. Gopinath, M.Sc., Ph.D. (Minnesota)—*Botanist.*
Sri A. Sambasiva Sastry, M.Sc. A. R. I. C.—*Chemist.*
- (d) *Hookah and Chewing Tobacco Research Station, Pusa (Bihar).*
Sri B. T. Sajani, B.Ag.—*Agronomist.*
- (e) *Wrapper and Hookah Tobacco Research Station, Dinhata (W. Bengal).*
Sri G. C. Patel, M.S. (N. Carolina)—*Agronomist.*
- (f) *Cigarette Tobacco Research Sub-Station, Guntur (S. India).*
Sri S. Viswanadham, M.Sc.—*Plant Breeder.*
- (g) *Tobacco Research Station, Hunsur (Mysore).*
Sri N. A. Elias, M.Sc. (Agri.)—*Pathologist.*



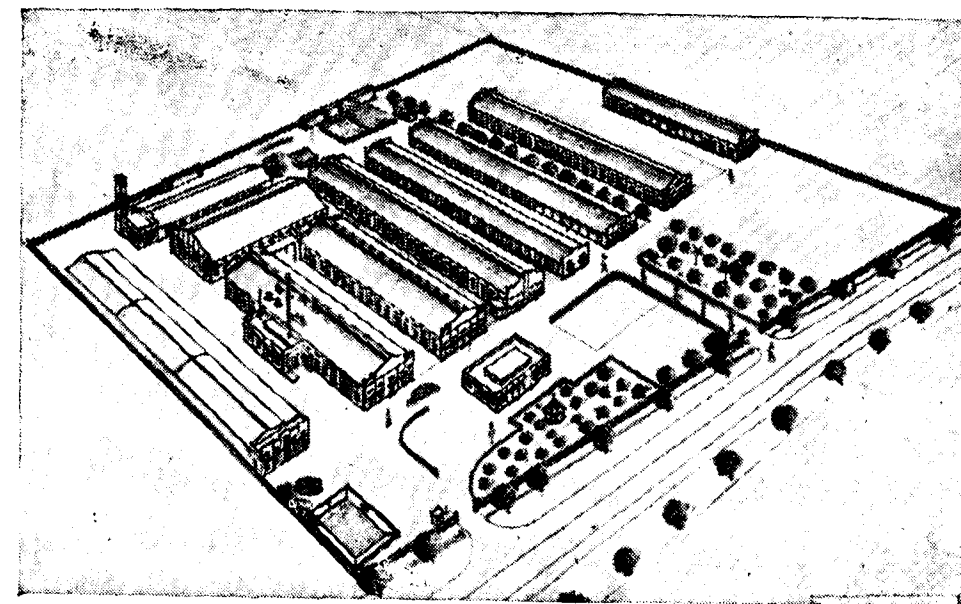
INDIAN TOBACCO

Telegrams & Cables :
BITCORP, GUNTUR

Telephone :
GUNTUR : 57

BRITISH INDIA TOBACCO CORPORATION LIMITED

GUNTUR, SOUTH INDIA



Specialists in:
HANDLING : REDRYING : PACKING
ALL GRADES
INDIAN LEAF AND STRIPPED TOBACCOS

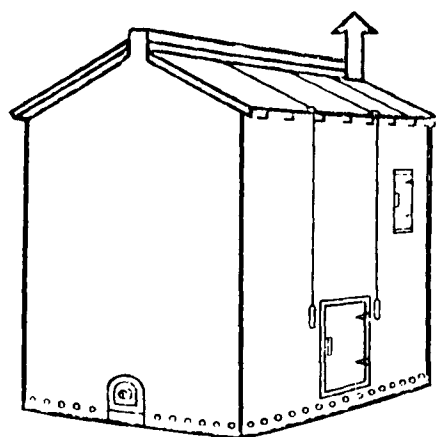
★
Registered Office :
IBEX HOUSE, MINORIES
LONDON, E. C. 3

Telegrams & Cables :
BITCORP, LONDON

Telephones :
LONDON, ROYAL 5432

Printed by Mr. M. G. Daniel, at Thompson & Co Private Ltd at (Minerva Press) 33 Broadway Madras 1
Edited and Published by Dr. M. S. PATEL, M.Sc., Ph.D.(N. Carolina), Secretary,
Indian Central Tobacco Committee, Madras 6

NEW TYPE FLUE CURING BARN



Production of yellow tobacco commenced almost a hundred years ago in America. Though from time to time certain refinements have been incorporated into the flue curing barns, it is only during the past 20 years that Scientists and Engineers have spent their energies in redesigning barns.

In one such improved design, the ridge ventilation runs along the whole length of the barn unlike in the present one. The bottom ventilation is provided by means of 3" dia. holes at the plinth level.

The improved design will aid in getting a better cure and cut down fuel consumption per curing.

If you are about to build a new barn and interested in the new design, please contact the Experimental Department, Indian Leaf Tobacco Development Company Limited, Rajahmundry, or any one of the branches of Indian Leaf Tobacco Development Company Limited.

At the Service of Andhra's Tobacco Growers

INDIAN LEAF TOBACCO DEVELOPMENT COMPANY LIMITED

(Incorporated in the British Isles)

QUALITY PAYS; AIM AT QUALITY, NOT QUANTITY