



TRANSFER OF TECHNOLOGY APPROACHES - A SAGA OF ICAR - CTRI



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ICAR - CENTRAL TOBACCO RESEARCH INSTITUTE
(ICAR-NATIONAL INSTITUTE FOR RESEARCH ON COMMERCIAL AGRICULTURE)

(An ISO 9001 : 2015 Certified Institute)

RAJAHMUNDRY - 533 105, ANDHRA PRADESH, INDIA





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Preface

Agricultural extension bridges the technological gap between research labs and farmers fields. The right information at the right time and place through proper channels is crucial for the farming community to take informed decisions so as the role of agricultural extension is crucial in transfer real farm situations.



ICAR-Central Tobacco Research Institute has a vibrant extension and outreach system in tobacco and the synergism between research and extension has been well recognized since inception in 1947. The institute is in forefront in adopting extension approaches *viz.*, on farm trials, demonstrations, diagnostic visits, farmers days, model project area, quality circles, field friends programmes, information and communication technologies *viz.*, mobile apps, agridaksh, expert system, decision support system softwares and social media. Over a period of 75 years of institute existence, the extension services have seen huge transformation from demonstration assistant-based system to ICT-enabled mobile-based service for effective dissemination of information to the farming community. Similarly, the focus on increasing production via technology transfer, has adopted decentralized, participatory, and demand driven approaches in which accountability is geared toward the users.

Presently, agricultural extension is taking a new dimension in view of institute transition towards ICAR-NIRCA (National Institute for Research on Commercial Agriculture) with four additional crops *viz.*, chillies, turmeric, castor, ashwagandha along with existing tobacco. In this context, this technical bulletin titled **“Transfer of Technology Approaches: A Saga of ICAR-CTRI”** is compiled at this crucial juncture of institute transformation towards commercial agriculture. The relook into the approaches and methodologies adopted during past, go a long way to prepare a road map for attaining enhanced efficiency and to make extension more of diversified, technology intensive, knowledge oriented and more demand driven. Further, the scaling up of farmer producer organizations, entrepreneurship promoting startups, focus on secondary agriculture have attained prominence.

Finally, I compliment the authors for their sincere efforts in bringing out this publication embodying all relevant information about the extension approaches adopted and future extension perspectives in the year of platinum jubilee.

Date: 08.12.2023


(M. SHESHU MADHAV)
DIRECTOR

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TRANSFER OF TECHNOLOGY APPROACHES: A SAGA OF ICAR-CTRI

INTRODUCTION

Agricultural extension is a system that facilitates access of farmers and grass root level extension workers to new information, knowledge and technologies and promotes interaction with research to assist them in developing their technical and management skills. Effective extension enables farmers to make better choices that can increase productivity and net returns, leading to better agricultural performance with improved livelihood.

Tobacco, a high-value commercial crop, growing in an area of 0.43 M ha. and producing 758 M kg of cured leaf, makes a significant contribution to national economy of Rs 32,516 crores (2021-22) by way of annual export earnings and excise revenue, besides providing employment and livelihood security to an estimated 45.7 million people in the country. ICAR-Central Tobacco Research Institute (ICAR-CTRI) has shouldered the responsibility of research and extension in the mandated crop tobacco (Flue-Cured Virginia and non-FCV tobacco types) since its inception in 1947. The role of dissemination technologies in a cash crop like tobacco is entirely different from other field crops where the emphasis is on quality rather than quantity. In the journey of technology transfer, ICAR-CTRI has adopted various need-based extension approaches. In the long journey of 75 years of glorious service, the different milestones adopted in agricultural extension were broadly divided into three phases with 25 years interval were detailed.

Category	Period	Approaches
Centralized Extension	Early phase 1947-1971	Individual contacts Group methods Mass approaches
Transformative Extension	Middle phase 1972-1996	Technology evaluation National programmes Participatory approach
Pluralistic Extension	Current phase 1997-2023	Technology assessment and refinement Convergence approach ICT technologies

CENTRALIZED EXTENSION (EARLY PHASE 1947-1971)

The early phase of transfer of technology approach was centralized and top-down. Emphasis was given on individual, group and mass approaches of dissemination. Farmers' awareness level and ambitions were very low due to poor literacy rate and farming was primarily for survival. The dissemination activities conducted during the first 25 years period (1947-1971) were given below.

I. Individual contacts

- In 1950, demonstration centers to impart techniques and methods of practical value to the cultivators were sanctioned and manned by a 'Demonstration Assistant' to look after the activities of rapport building, distribution of seed and frequent visits to the cultivators.
- 'Agricultural Assistant' was sanctioned in 1952 to disseminate the technologies to the farmers, literature compilation, demonstrations and advisory visits.



II. Group methods

a. Tobacco crop contests

During 1953, tobacco crop contests in concentrated zones of tobacco production were conceptualized. The objective was to promote healthy competition and incentives to tobacco cultivators for production of quality tobacco.

b. Training programmes

- Training in Flue Cured Virginia (FCV) tobacco commenced in 1949-50 on cultivation methods. During 1955-56, short term courses of training on post-harvest operations *viz.*, barn construction and curing were started.
- The 'scheme for training on improved methods in tobacco' during 1956-61 was sanctioned with 3-6 months duration with an incentive of Rs 40/ month/trainee.

- With the creation of the extension department under State Department of Agriculture, training was imparted to 'Assistant Tobacco Extension officers' on various aspects of tobacco.



c. Incentive based trial plots

- Trials were introduced in 1959-60 in the fields of progressive cultivators. Improved methods of tobacco production recommended by the institute with the assistance of Tobacco Extension staff of Andhra Pradesh agriculture department. Material assistance in the form of free supply of seeds, seedlings, insecticides, manures and fungicides along with technical assistance were given for conduct of trials.

d. Farmers week

- Farmers' weeks were organized to acquaint the tobacco cultivators with the progress of research work carried out and the improved methods of tobacco production adopted on the farm. During the crop season, visits were periodically organized by the institute to



the farmers' fields at different stages of tobacco production and advisory services were rendered to the growers. Request visits from the cultivators were duly attended on need basis.

III. Mass approaches

a. Publications

- The publication of the package of practices started with leaflets. Pamphlets and brochures were introduced gradually and were freely distributed to growers.
- Tobacco directory was maintained for easy and instant access of information on tobacco stakeholders across the country.

- Indian Tobacco, a quarterly journal was started during 1950s and was the first of its kind in the country aimed to serve as a link between the stakeholders.
- Tobacco Bulletin with statistics on Indian tobacco, price forecast, market conditions and statistics of the major tobacco growing countries were initiated in 1950.
- A publicity folder was brought in 1952 with information on institute activities.

b. Promotional activities

- Exhibitions were initiated during 1951-52 to provide visual information to tobacco stakeholders. Different tobacco types cultivated across the country with literature and photographs were displayed.
- Film on tobacco entitled 'My lady nicotine' was compiled and copies in different versions viz. , English, Hindi, Bengali, Telugu and Tamil were supplied.
- Despatch of free samples of different varieties of Indian tobacco with agmark punch were sent to abroad to popularize Indian tobacco in overseas markets.
- Participated in World Tobacco Congress and International fairs and Indian tobacco grades were distributed to visitors for wide publicity.

During the first phase, the focus was on establishment of contacts and rapport building with the farmers. However, technology dissemination activities were carried out with the limited man power and facilities available in the demonstration section of the institute. After two decades of institute establishment, a separate extension wing has been proposed in the scheme in 1969, for strengthening the institute under the fourth five-year plan. As the services progressed to the next period, the roles were re-defined, and efforts were strengthened accordingly.

TRANSFORMATIVE EXTENSION (MIDDLE PHASE 1972-1996)

During this period, the major milestone was the establishment of separate division for Agricultural Extension in 1978. Human resource development in extension services kicked up after 1980 and national extension programmes were launched and implemented. The duality in extension *viz.*, extension research and extension activities were witnessed in this period. The various extension activities conducted during the twenty-five years of period (1972-1996) were given below.

I. Technology evaluation

a. Observation trials/district trials

- This was the first stage which any new improved variety or practice must pass through, before it is taken to the stage of demonstration and before advocating its large-scale adoption. These trials were started in 1976 in the institute



and the promising pre-released varieties of tobacco were tried on farmers' fields to test their suitability in the actual field conditions. After the varieties were continuously grown for 3 years and found suitable, these were released to the farmers. CTRI Special, Jayashri, CTRI Special (MR) and Godavari Special were some prominent varieties released through this method.

b. On farm trials

- The promising technologies and improved varieties of the institute were evolved from time to time to suit the changing demand from the consumers and trade. In connection with this, varietal trials were conducted in



different agro-climatic regions to assess the performance and adaptability. Material assistance in the form of free seedlings and monetary assistance to conduct the varietal trials were provided.

c. National demonstration trials

- During the season, National demonstration trials (1971-72) were conducted on multiple cropping with paddy in *kharif* season followed by FCV tobacco in *rabi* season. The research conducted on triple cropping pattern (Aus paddy-Aman paddy-Motihari tobacco) at CTRI Research Station, Dinhata, West Bengal were tried in farmers' fields and the improved technology was recommended to the farmers

d. Technology package trials

- These trails were incorporated with all the recommendations made by the institute in tobacco cultivation and were laid during the season at different centers. Purpose of these trails was to popularize the recommendations viz., deep summer ploughing, application of farmyard manure, selection of improved varieties, application of fertilizers, topping, pest and disease management etc.



II. National programmes

To make the system farmer-driven and livelihood improvement, various National Extension Programmes were launched. The programmes implemented by the institute were given below.

a. Training and Visit System (T&V)

- A professional approach to extension was initiated with the introduction of Training and Visit system during this period. The institute T&V system which was initiated in 1974 imparted training to the State Department of Agriculture in 1987. Apart from this, core training was imparted to the newly recruited ARS Scientists.

b. Lab to Land programme

- This programme launched to mark the celebration of the Golden Jubilee of Indian Council of Agricultural Research (ICAR). It was a National Extension Programme aimed at raising the income level of small and marginal farmers and landless labour of rural India by providing technical know-how and critical inputs. The 'Lab to Land Programme' of ICAR-CTRI was inaugurated by Sri Y. Venkatarao, Former Minister for Agriculture and Civil Supplies, Andhra Pradesh on 28.05.1979 at tribal centre, Rajavommangi block.
- During its first phase (June 1979 to May 1982) and second (June 1982 to May 1985) phases, ICAR-CTRI was allotted 200 and 300 families respectively.
- Tobacco extension fortnight was celebrated in collaboration with Andhra Pradesh Agricultural University as a part of Lab to Land Programme. Since the inception, the Lab to Land programme was a great success in transfer of improved technology.
- ICAR-CTRI implemented the Lab to Land Programme with the following specific activities.
 - Demonstrations were conducted on the improved package of practices
 - Recommendation of neem kernel suspension against tobacco caterpillar
 - Cultivation of pest and disease resistant varieties to get high profits
 - Demonstration on advantages of FCV tobacco curing in low profile barns
 - Publication of leaflets in local language on improved techniques



c. Operational Research Project (ORP)

- The ORP of ICAR was initiated by the institute during 1979-80. The basic aim of ORP was to demonstrate the technologies to the farmers and the extension workers to evoke community action and participation. The socio-economic development of farmers with an integrated approach was focused. Under this project, the institute adopted villages and after analysis of the existing situation of the villages, farmers were educated on scientific methods of cultivation through extension approaches.



d. Institution Village Linkage Programme (IVLP)

- Technology assessment and refinement initiated in the institute after the introduction of Institution village linkage programme (IVLP). ICAR-CTRI was one of the 42 centers identified for implementation of pilot project on Technology assessment and refinement through Institution village linkage programme initiated by ICAR. The project duration was from 1995-96 to 98-99 at a total cost of Rs 23.4 lakhs for each implementation centre. Cluster of villages were selected, and document-cum-action plan was prepared through PRA tools.
- A cluster of villages viz., Kotikesavaram, Raghavapuram, Cheepurupalli in Korukonda mandal of East Godavari district, Andhra Pradesh (AP) were selected for this programme. Participatory Rural Appraisal (PRA) tools (transect analysis, matrix ranking, flow analysis, problem prioritization and resource mapping) were employed for Agro eco-system analysis.



- Technology modules related to the improvement in paddy, blackgram and green gram, mango, cashew, animal husbandry were assessed and refined.
- Scientist-farmer interactions, field visits and trainings were arranged to appraise the farmers about the latest technologies.
- Later, the project was changed to 'Technology Assessment and Refinement through Institute Village Linkage Programme (TAR-IVLP) from 1999-2003. In addition to the villages under Korukonda mandal, Mukkamala village cluster in Peravali mandal, West Godavari of AP were selected for implementation. Important crops were banana, coconut, paddy, tuber crops and animal husbandry.

III. Participatory Approach

This approach focused on the expressed needs of farmers' groups and its goal was increased production and farmers well-being. Implementation was decentralized and flexible. Success was measured by the number of farmers actively participated. There were several methods used in participatory approach.

a. Farm and home visits

- It was direct, face to face contact by the extension worker with the farmer or the members of the family at his home/farm to obtain first hand information related to farm and home, to advise and assist in solving specific problems, teach skills and to sustain the growers interest. During farm and home visits by the institute, the tobacco growers were contacted and recommended the plant protection measures. The farmers were also supplied with the relevant information material.

b. Personal letter advisory system

- Personal letters were written by the extension worker to a farmer in connection with extension work. This approach was used to create awareness in literate tobacco growing farmers to deliberate their problems through letters.
- During 1987, this system was adopted by the institute and initially there was 20% response from the farmers and in 1988, the response was 54% in Andhra Pradesh. In this way, tobacco growing region

wise response percentage was analyzed and farmers were grouped into different adopter categories viz., early adopters, late adopters and laggards.

c. Farmers days/ Farmers meet/Field days

- Farmers' day was an annual observance day to celebrate the contributions of farmers in agriculture. The institute regularly conducted farmers days to motivate their adoption levels and increase the contact with the experts.
- Tobacco farmers/Traders meet programmes were regularly conducted to discuss and share the common issues of the farmers. It was like creating a platform for group discussions among farmers and sorting out the issues.
- Field days were arranged to demonstrate new technologies to a large group of interested farmers. Through this activity, Tobacco Board field staff and progressive farmers were exposed to the technology to promote adoption.



Farmers' day



Farmers/Traders Meet



Field day

d. Demonstrations

(i) Frontline demonstrations (FLD)

FLDs were initiated in the institute in 1995. These were conducted in farmers' fields under the close supervision of scientists for the first time on significant cultivation technologies of tobacco such as improved varieties, good agricultural practices, nutrient management etc.



(ii) Method demonstrations

These were initiated in 1990 by the institute basically to show farmers the method to do something, and the farmer was shown step by step procedure. Pesticide mixing and method of application was mostly explained to the farmers.



(iii) Result demonstrations

Initiated in 1984 in tobacco to show the value or worth of an improved practice whose success has already been established on the research station. The important recommendations of the institute viz., Plant row plough furrow (PRPF) fertilizer application and important tobacco varieties were tried against the farmers standard practices.



e. Inter-agency approach

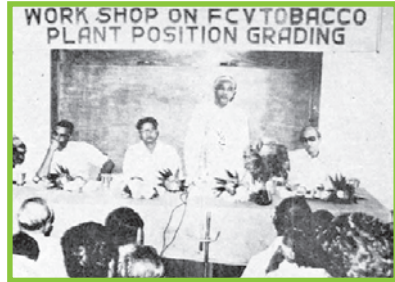
ICAR-CTRI and Tobacco Board initiated collaborative programmes during this period. Recognizing the need to regulate production, promote overseas marketing and control recurring instances of imbalances in supply and demand, which lead to market problems, the Government of India under the Tobacco Board Act of 1975, established the Tobacco Board. The collective activities were initiated from 1976 and were briefed below.

(i) Crop yield competitions

- To encourage farmers to attain high yields, ICAR-CTRI and Tobacco Board organized crop yield competitions for the FCV tobacco growing farmers. The farmers enrollment as competitors was encouraged. Based on the yields obtained, the farmers with highest yield record were selected and monetary rewards with memento were distributed.

(ii) Workshops

- The Institute regularly conducted workshops for the benefit of farmers in collaboration with Tobacco Board. These were arranged for knowledge sharing and to reach the best practices to the farmers.



(iii) Research and development programmes

- An inter-agency implementation programme was taken up by ICAR-CTRI, Tobacco Board, Directorate of Tobacco Development and ILTD for its transfer of improved methods of tobacco production technology to the farmers fields to improve the quality and increase the yields of FCV tobacco.
- The R&D programme was implemented in 10,500 ha and 6600 ha in 1986-87 and 1987-88 respectively. The average yield was increased by 13% after its implementation.
- At each auction floor of the Tobacco Board, 'Training at Trainees Home' was organized at different stages of tobacco production.



f. Promotional activities

- Training programmes were further intensified during this period. Since mass media has significant potential to reach large number of farmers in cost-effective manner, various modes through promotion of community nurseries, audio-visual aids, films, radio and television broadcast, print media etc were vigorously used.



Videos on FCV tobacco production technology launched

- The other promotional activities of the institute were museum display for visitors, organization and participation in Kisan mela/ Rythu Ghoshti/ Exhibition stalls and other interactive programmes.



Kisan Mela



Museum visit



Farmers visit



Students visit

- Due to intensive publicity and propaganda activities of the institute; farmers, Tobacco Board officials, trade representatives and foreigners from different countries visited the institute.



During this period, extension services have progressed, and efforts were made to make them participatory, democratic, and beneficiary led besides continuation of few of the early phase adopted approaches. Research studies in extension were initiated with the evaluation of desired changes in knowledge, attitude and skill of farmers. Dissemination services have created a positive impact on farm productivity and also the collective activities initiated during this period gave a pathway for pluralistic extension services for further efficacy.

PLURALISTIC EXTENSION (CURRENT PHASE 1997-2023)

Reorientation of extension was witnessed, and this period marked the change with innovative extension methodologies in addition to the continuation of the previously adopted approaches. The On Farm Trials (OFT), Front Line Demonstrations (FLD) of improved technologies gained momentum. Capacity building programmes (trainings, farmers/field days, diagnostic field visits, awareness programmes etc.) to tobacco stakeholders were regularly conducted for sharpening the skills. Stakeholder training is the major activity of the institute, and it is imparted to tobacco farmers, Tobacco Board officials, trade representatives and the other tobacco stakeholders in order to bridge the technology adoption gap in the real farm situation and to ensure economic sustainability. The institute also conducts customized training programmes on selected topics on request from farmers and organizations. Besides, the training programmes were also conducted under Scheduled Castes Sub Plan (SCSP) and Tribal Sub-Plan (TSP) to the farmers and the inputs were distributed. Field Friends Programmes (FFP) introduced in this period created greater impact among the farming community. Radio talks and TV shows gradually declined in this period and added focus was given to convergence mode of operation, pluralistic extension activities, and Information & Communication Technologies. The number of extension programmes conducted for the period 1998-2022 is depicted below.

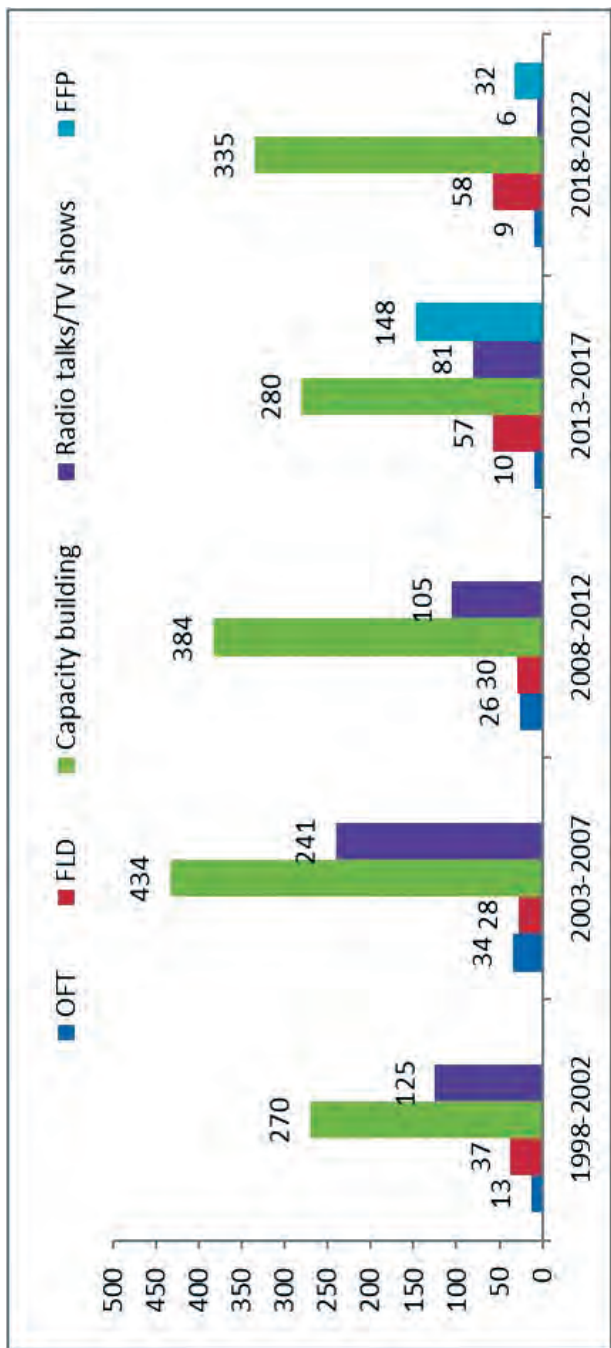


Training programme



Institute exhibition stalls

Number of extension programmes conducted from 1998-2022



I. Technology Assessment and Refinement (TAR)

The IVLP initiated in 1995 changed to Technology Assessment and Refinement -Institute Village Linkage Programme(TAR-IVLP) from 1999-2003. To attain this objective, on farm trails were vigorously conducted by the institute to assess the technology for further refinement. As the concept was based on participatory modes ensuring greater linkage between scientist and farmer in a bottom-up approach, farmers were participated actively in the trials. The methodology was also developed as a check list for TAR.



Methodology in planning and implementation of TAR

- Situational analysis through Participatory Rural Appraisal techniques
- Problem identification and prioritization
- Problem analysis based on ranking and prioritization
- Identification of recommended technology to resolve the specific problem in a given situation
- Consultation with source of technology for refinement
- If technology is available, but not possible to refine, hence needs further research
- Problem continue to exists, resolve the problem
- Technology is available under NARS
- Assessment along with recommended and farmers practice
- Technology refinement for enhanced output, quality and profitability
- Minimum of three treatments for TAR
- Statistical analysis
- Technology evaluation
- Implementation of on farm testing for confirmation of the proven research results under real farm situation and to fine tune the technology for wider adaptability

INNOVATIVE EXTENSION APPROACHES (1997-2023)

II. Convergence approach

A unique coordinated effort was taken up by the representatives from ICAR-CTRI scientists, Tobacco Board officials, Trade members and farmers in addressing the issues in participatory mode: ICAR-CTRI: FARMERS: TOBACCO BOARD: TRADE. As ICAR-CTRI is the only technology provider for tobacco in the country, this mode of operation combines strengths, minimizes duplication of efforts and ultimately better outreach of activities is attained. The approach is adopted every season in all the regions of tobacco cultivation. Village level awareness programmes, crop phase-wise trainings, visits etc are being conducted during crop season.

a. Quality circles

- The idea was initiated in 1997. Farmers are the best educators of other farmers. So, farmer to farmer extension visits can greatly help in information exchange and dissemination.
- The approach facilitated effective action, observation and feedback. Achiever farmers were identified in different agro-climatic micro zones. Two-three achiever farmers share their success/experience with other farmers during group meetings and field visits.

b. Model project area

- The model project area concept was evolved in 2002 by ICAR-CTRI and Tobacco Board. Low productive areas are selected for implementation of model project area approach under various FCV tobacco micro-zones in Andhra Pradesh and Karnataka.
- The Tobacco Board conduct demonstrations on latest technologies on FCV tobacco cultivation in collaboration with ICAR-CTRI in the identified areas. This provides an opportunity to implement



recommended technological interventions and to evaluate technology performance. The model project area served as nerve centre in assessing and demonstrate technology potential and also helped in up-scaling the technology demonstrated.

c. Diagnostic visits

- Considering the ever-dynamic nature of climate and the evolving challenges, farmers require constant and robust knowledge backup from different sources and related support to integrate all the knowledge in their production context.
- In the heavy weather fluctuation regions, a team of scientists from the institute along with officials from Tobacco Board and Trade inspect the tobacco fields and advise the tobacco farmers on in-season contingency measures.



d. Field friends programmes

- The demand-driven extension service delivery model is preferred by the farmers as it is more effective in giving solutions to the problems. Keeping this in mind, the Tobacco Board has conceptualized Field Friends Programmes and the teams were constituted with scientists from ICAR-CTRI, field executives of major tobacco companies and Board's technical Officers.
- During the crop season, the teams visit the tobacco fields together, identify the major problems and extend timely advice to the growers on different aspects of tobacco cultivation if farmer is readily present. If a farmer is not available, display the remedy on suitable paper and keep it as a flag in the field.



III. Information and Communication Technology (ICT)

ICTs in agriculture technology comprise those networks, mobiles, devices, services, and applications that aid the processing, management, and exchange of data, information, or knowledge with a target audience. ICTs are key in availing and upscaling innovations for extension service delivery; however, measures are needed to mitigate the risk of a digital divide further entrenching disparities in access to extension services, especially in rural areas.

a. Farmers portal

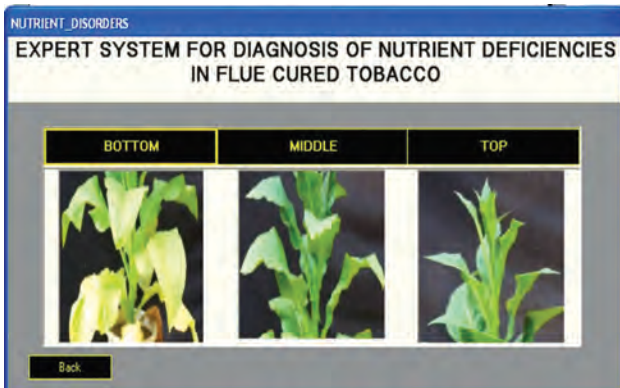
During 2002-03, CTRI has stepped up activities on transfer of technology and the technical know-how on various production practices was taken to the doorsteps of the farming community by developing farmers portal in collaboration with Tobacco Board and ITC for online interaction with the FCV tobacco farmers of Andhra Pradesh and Karnataka in local languages.

- The Farmers' Portal, www.pogakuedika.com served as a platform for solving the problems faced by them instantly. Two kiosks, one each at CTRI, Rajahmundry and CTRI Research Station, Hunsur were set up for online interaction with the farmers. During 2003-07, the response from the farmers was high but gradually as it is not interactive mode, the number of queries from the farmers slowly decreased and usage was stopped.



b. Software systems

- Softwares developed for instant access of information to tobacco stakeholders were given below.
 - Online expert systems for Good Agricultural Practices (AGRIDAKSH)
 - Knowledge base system for tobacco weed management
 - Expert systems for- diagnosis and management of plant nutrient disorders in Flue-Cured Tobacco, Agricultural pests & diseases, Identification of Abiotic stresses in FCV tobacco
 - Decision Support System on soil fertility evaluation and recommendation to FCV tobacco crop
 - Metrological Database Management System
 - Tobacco Germplasm Information System
 - Information system for Production and Marketing trends of FCV tobacco



c. Mobile app

- The availability of ICT tools made it easy for the transmission of information with text, pictures, interactive softwares for instant advisories. Among which, technology dissemination strategies through mobile app will go a long way in transmitting latest agro-techniques and contingency measures at a faster rate and instantly. Now-a-days farmers are using smart phones, hence technology dissemination strategies through phones will be an effective tool in real time information.
- In this context, ICAR-CTRI has developed a bilingual (English and Telugu) android based static mobile application on good agricultural practices for FCV tobacco with title as 'CTRI-FCV TOBACCO' and hosted in Google play store for the benefit of the farmers in 2019. Till now, it has 1000+ installs and it has the capability to transfer location specific technology and advice to the farmers efficiently and effectively.
- Mobile Application on Good Agricultural Practices for Indian Non-FCV Tobacco was developed in Android studio using Java and XML programming. This app has 50+ installs now and it provides complete information about types of non FCV tobacco, package of practices and research infrastructure available at each place. Copyrights were obtained for these softwares.



d. Social media

- Connectivity with farmers has long been cited as a serious lacunae of extension services. Social media is a highly relevant and beneficial platform for extension personnel to engage with farmers. The institute regularly updates the information on institute website, facebook, youtube and twitter.
- E advisories are provided through whatsapp groups created region wise for the benefit of tobacco growers and information is provided on timely basis to the farmers. It is an excellent platform to develop and disseminate localized advisories to farmers.

Impact of Extension approaches

Agricultural extension approaches of ICAR-CTRI has been bridging the gap between research labs and farmers fields. The adoption of ICAR-CTRI recommended technologies has resulted in desired outcomes in terms of production efficiency, yield and increased price at farmers level. Due to adoption of institute recommended technologies, there was multifold increase in tobacco production from 286 M kg with productivity 737kg/ha during 1952-61 to 767 M kg with productivity 1720 kg/ha during 2012-2021. Pesticide residue levels in tobacco gradually decreased, comes to near GRL and as a result of this, the value of tobacco exports increased from Rs 6093 crore to Rs 9739 crores from 2013-2022. The extent of adoption of promising varieties and technologies by the farmers in different tobacco growing areas were given below.

Variety	Extent and area of adoption
CH -3	95% in NLS of Andhra Pradesh, 49% of KLS
Siri	82% in SLS, SBS and NBS of Andhra Pradesh
Abirami CR	100% in chewing tobacco area of Tamil Nadu
Kanchan	50% in KLS
FCH-222	100% in Fusarium wilt endemic areas of KLS
FCR 15	40% in SLS and SBS of Andhra Pradesh
A 119	70% area in AP, 50% in Karnataka and 50% in Gujarat
GT 7	40% area of Gujarat
NBD-209	36% in Karnataka
Nandyala Pogaku-1	30% area in Andhra Pradesh
GCT 3 (Rustica)	42% area of Gujarat
DCT 4 (Rustica)	33% area of Gujarat

Note: NLS- Northern Light Soils area of Andhra Pradesh; SLS- Southern Light Soils area of Andhra Pradesh; NBS-Northern Black Soils of Andhra Pradesh; SBS- Southern Black Soils area of Andhra Pradesh; KLS-Karnataka Light Soils of Karnataka

Technology	Extent and area of adoption
Tray nursery technology	90% in NLS area of Andhra Pradesh and KLS
Fatty alcohol based suckercides	100% in FCV tobacco growing areas
Modified Fertilizer schedule for replacing CAN	100% in NLS area of Andhra Pradesh
Updated package of practices in FCV	92% in NLS area of AP 80% in SBS & NBS areas AP 72% in SLS area of AP
Pest control measures with new generation pesticides	100% in NLS area of AP and KLS 88% in SLS & SBS areas of AP
Farm pond technology	40% in SLS and SBS regions of AP
Drip Irrigation	80% in NLS area of AP
Drip fertigation	25% in NLS area of AP
Micro sprinklers in nursery	80% in NLS area of AP
Turbo fan	25% in NLS area of AP & KLS
Alternative fuels	18% in KLS
Drip irrigation in chewing tobacco	50% chewing tobacco area in Tamil Nadu
Maize-tobacco	25% in NBS area of AP

This period (1997-2023) witnessed the visibility of viable decentralized, democratic, farmer centric, demand driven, vibrant and participatory institutional measures. The institute is continuously laying emphasis on knowledge management, information and communication, press and social media for successfully extending the outreach programmes to farmers. Mobile based advisory services are provided to farmers for quick delivery of information in local language through ‘Whatsapp’ groups created for FCV tobacco growing areas viz., NLS, NBS, SLS and SBS of Andhra Pradesh. To address weather aberrations, timely contingency measures are also provided to the farmers. The institute scientists clarify the queries of the farmers by two-way interaction through mobile phones. Besides, the institute regularly updates the activities and crop related information through press, social media and its website.

WAY FORWARD

ICAR-CTRI has experience of 75 years in making tobacco farming profitable and sustainable. It is the exclusive institute working on tobacco and serving as vital link between research and farmers. Over the decades, research and extension worked hand in hand and resulted in high technology adoption rate by the farmers. However, in a commercial crop like tobacco, area fixation is a major challenge to the farmers and India has to abide with World Health Organization-Framework Convention on Tobacco Control (2005) agreement, which imposed restriction in tobacco sector. Although attempts to substitution of tobacco to other crops were made, farmers are not willing to switch over for replacement as tobacco is fetching high earnings. Convergence efforts of ICAR-CTRI-Tobacco Board-Trade are operating effectively, but considering heterogeneity among farmers, there is a need to continue capacity building by extension scientists. To exploit the complete production potential of improved technologies, there is a need for re-orientation of present extension system. ICT tools developed by the institute such as mobile apps; social media platforms are good initiatives to disseminate information to farmers but a scalable intervention leveraging ICT with real time tools has yet to emerge. Location specific, participatory, gender sensitive and customized extension materials and methodologies need to be vigorously promoted. Presently, the institute is in transformation to ICAR-NIRCA (National Institute for Research on Commercial Agriculture), with the inclusion of additional crops *viz.*, turmeric, chillies, castor, ashwagandha along with tobacco. Therefore, there is a need to create an enabling environment for this new transition towards commercial agriculture through novel approaches in the areas of secondary agriculture, encouraging Farmer Producer Organizations (FPOs), entrepreneurship development through startups. Social media platforms can be effectively used for improving the extension services. To achieve this, further strengthening of convergence efforts have a major role in shaping the path for commercial agriculture.

“SAGA CONTINUES...TO REACH THE UNREACH”



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