



Technical Bulletin No. 01/2023



# CENTRAL TOBACCO RESEARCH INSTITUTE



**भारत अनुप - केन्द्रीय तम्बाकू अनुसंधान संस्थान**  
**ICAR - CENTRAL TOBACCO RESEARCH INSTITUTE**  
(An ISO 9001 : 2015 Certified Institute)  
RAJAHMUNDRY - 533 105, ANDHRA PRADESH, INDIA



Technical Bulletin No. 01/2023

**CENTRAL TOBACCO RESEARCH INSTITUTE**  
**@ 75 Years**



**ICAR-CENTRAL TOBACCO RESEARCH INSTITUTE**  
**(ISO-9001:2015 CERTIFIED INSTITUTE)**  
**RAJAHMUNDRY-533 105, ANDHRA PRADESH**

# Central Tobacco Research Institute @75

2022

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## Preface

In India, organized tobacco research has its origin in the mid-1930s with the establishment of the Cigarette Tobacco Research Station at Guntur under the patronage of the formerly Imperial Agricultural Research Institute (IARI), New Delhi. With the growing importance of tobacco in the national economy, the Government of India constituted the **Indian Central Tobacco Committee (ICTC)** to establish the present-day **Central Tobacco Research Institute (CTRI)** in 1947, which coincided with the year of India's independence. The Institute was brought under the aegis of the Indian Council of Agricultural Research (ICAR) in the year 1965. Presently, the **Institute is rejoicing 75 years of its glorious history** commensurating with **India's Azadi Ka Amrit Mahotsav** celebrations and commemorations. Since its origin, the Institute has been commanding national tobacco research and has made an outstanding contribution to the growth and development of tobacco science in India. Through its long voyage of 75 years, the Institute has evolved into a tobacco research network system with six research stations, one All India Network Project on Tobacco, and two Krishi Vigyan Kendras catering to the research needs of varied tobacco types grown across the country.



The Institute has released/identified 103 tobacco varieties/hybrids, and published more than 2500 research and other technical articles during the past 75 years. The improved varieties and agro-technologies have led to an incredible improvement in productivity, quality, exports, and farmers' income. The Institute has brought several prestigious awards, recognitions, patents, and copyrights. Presently, the Institute is sandwiched between the glorious past with a proven track record of research service and an uncertain future of the mandated crop as well as dwindling human resources in general and scientists in particular. These uncertainties stem primarily from the serious public health risks and environmental issues associated with the tobacco supply chain and stringent tobacco-related policy regimes (global and national).

This booklet titled "**ICAR-Central Tobacco Research Institute @75 Years**" is being published at a juncture when India is celebrating **Azadi Ka Amrit Mahotsav**. The impressive past of the Institute, epitomizing the pioneering research achievements and a galaxy of visionary research leaders in the past 75 years is summarized in this booklet. Accordingly, the institute needs to showcase its impact and research accomplishments. The Institute is grateful to the present and past DGs, DDGs(CS), and ADGs(CC) of ICAR for their critical intellectual inputs and support rendered to tobacco research and shaping tobacco science in the country over the past 75 years. This document reflects and embodies the untiring efforts and invaluable contributions of scientists, technical, administrative, and supporting staff towards the development of varieties and technologies which is highly commendable and acknowledged with thanks. Finally, I compliment the authors for their sincere efforts in bringing out the publication.

Date: 21-01-2023

  
(M. SHESHU MADHAV)  
DIRECTOR  
ICAR-CTRI, RAJAHMUNDRY

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## I. INDIAN TOBACCO RESEARCH HISTORY: TIMELINE

Tobacco cultivation in India has a long history of more than 400 years. Initially, tobacco was grown in Kaira and Mehsana districts of Gujarat and later spread to other regions of the country. An endeavour to improve Indian tobacco has begun with the establishment of the Calcutta Botanical Gardens at Howrah in 1787. *Nicotiana* species (seven) were imported from America and were cultivated in the botanical gardens of Calcutta in 1814. In 1875, a model farm was established at Pusa, Bihar for growing and curing tobacco.

The Imperial Agricultural Research Institute, established in 1903, carried out botanical and genetic studies on tobacco. The first Director of Imperial Agricultural Research Institute, Dr. Howard isolated 52 tobacco lines. Later on, Shaw and Kashiram added 18 more lines in the series. Among those lines NP-28, NP-58 and NP-63 were found most promising. In 1940, B.P. Paul, the Royal Economic Botanist identified a selection NP-70, which became very popular among the tobacco growing areas of North Bihar due to its superior quality, and the said variety is popular among the farmers till 1960s. The Virginia tobacco cultivation and experiments were initiated at Pusa and Ghazipur in UP and commercial cultivation of Virginia tobacco in India in black soils was commenced in the year 1920.

The Flue-curing of tobacco was first successfully done at Guntur, Andhra Pradesh in the year 1928. The then Imperial Agricultural Research Institute established a Cigarette Tobacco Research Station at Guntur in 1936. During 1943-44, the excise duty on tobacco was introduced and since then tobacco remained an important source of excise revenue. Realizing the importance of tobacco in the national economy, the Govt. of India constituted Indian Central Tobacco Committee (ICTC) in 1945 to look after tobacco cultivation especially the technical and economic aspects of tobacco production in India. Indian Central Tobacco Committee (ICTC) established the Central Tobacco Research Institute in 1947 to conduct research on myriad aspects of different tobacco types grown in India. Subsequently, the institute was brought under the aegis of the Indian Council of Agricultural Research (ICAR) in the year 1965.

## II. INDIAN TOBACCO PRODUCTION MATRIX

Globally, India ranks second in area and production after China and fifth in productivity. China, India, Brazil, Zimbabwe and USA are the top five tobacco producers in the World. Currently, India grows tobacco in an area of 0.45 M ha and produces 761 M kg cured leaf at a productivity level of 1699 kg/ha (Table-1).

**Table 1: Major tobacco producing countries**

Parameter	Brazil	China	India	Zimbabwe	USA	World
Area(M ha)	0.35 (III) (10%)	0.94 (I) (29%)	0.45 (II) (14%)	0.10	0.08	3.24
Production (M kg)	702 (III)	2135 (I) (12%)	761 (II) (36%)	203 (13%)	177	5886
Productivity (kg/ha)	1986 (III)	2274(I)	1699 (V)	1942 (IV)	2204(II)	1819

Source: FAOSTAT, 2022, Note: Figures in parenthesis indicate position and per cent share in the World

### Dynamics of Indian Tobacco in the past 7 decades

- In India, the area under tobacco cultivation has slightly increased from 0.37 million ha to 0.45 million ha during the last seven decades, while tobacco production has increased by nearly 2.8 times during the same period i.e. from 275 million kg to 761 million kg, which is primarily attributed to increase in productivity during the corresponding period (Table-2)
- Tobacco productivity has gradually increased by 2.3 times during the past seven decades period i.e. from 732 kg/ ha during 1950-60 to 1720 kg/ha during 2010-2020
- Productivity enhancement is mainly attributed to technological interventions in terms of high-yielding varieties, timely supply of quality seeds, sustainable production, and protection practices

**Table 2: Tobacco area, production and productivity in India in the past seven decades**

Period	Area (M ha)	Production (M kg)	Global production (M kg)	Share in global production (%)	Productivity (kg/ha)
1950-60	0.37	275	NA*	-	732
1960-70	0.42	341	4438	7.68	819
1970-80	0.43	413	5316	7.77	955
1980-90	0.42	488	6575	7.42	1172
1990-2K	0.42	592	7339	8.07	1394
2000-10	0.36	535	6522	8.21	1478
2010-20	0.45	767	6772	11.32	1720

Source: FAOSTAT, 2022, \*NA-Not Available



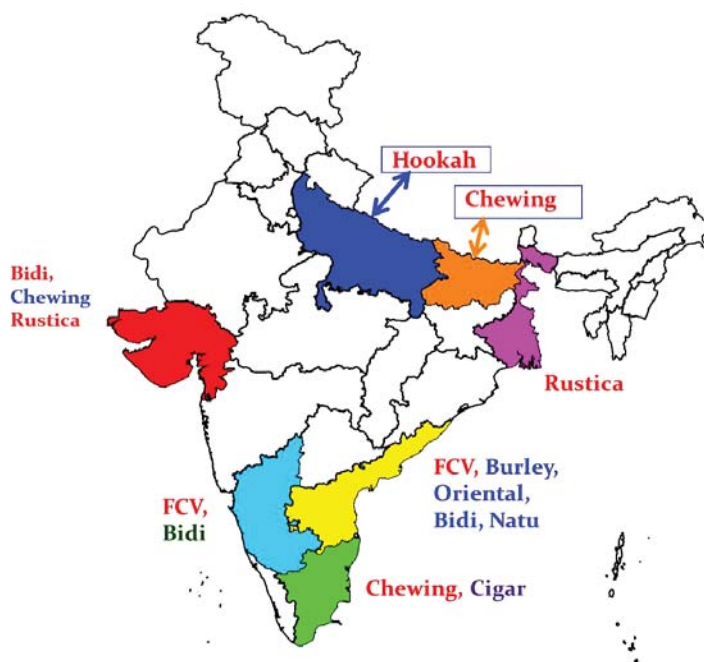
- India's share in global tobacco production has gradually increased from 7.68% during 1960-70 to 11.32 % during 2010-2020

### Geographical spread of tobacco in India

A unique feature of tobacco production in India is that myriad styles of FCV (Flue-Cured Virginia) and non-FCV tobacco are cultivated under widely differing agro-ecological situations. FCV, *Bidi*, *Hookah*, Chewing, Cigar-wrapper, Cheroot, Burley, Oriental, HDBRG, *Lanka*, *Pikka*, *Natu*, etc., are the main tobacco types grown in the country. The FCV and burley tobacco are mainly grown for export purpose. Major tobacco producing states and tobacco types grown are presented in Table 3 and Figure-1.

**Table 3: Major Tobacco Producing states in India**

State	Tobacco types
Andhra Pradesh	FCV, Burley, Oriental, <i>Bidi</i> , <i>Natu</i> , <i>Lanka</i>
Karnataka	FCV, <i>Bidi</i>
Gujarat	<i>Bidi</i> , Chewing, <i>Rustica</i>
Uttar Pradesh	Chewing, <i>Rustica</i>
Tamil Nadu	Chewing, Cigar, Cheroot
West Bengal	Chewing, <i>Rustica</i>
Bihar	Chewing
Other States	<i>Pikka</i> , Chewing, <i>Rustica</i> , <i>Hookah</i>



**Figure 1: Tobacco map of India**

### III. TOBACCO RESEARCH NETWORK SYSTEM

ICAR-CTRI has grown in its size and strength, presently Institute has four divisions at Headquarters (Crop Improvement, Crop Production, Crop Protection, Crop Chemistry and Soil Science) and has a network of six Regional Research Stations situated at Guntur, Kandukur, Jeelugumilli (Andhra Pradesh), Vedsandur (Tamil Nadu), Hunsur (Karnataka) and Dinhata (West Bengal). Research stations, year of establishment and types of tobacco grown are presented in the table-4. These Regional Stations are catering to the requirements of tobacco farmers in their respective agro-climatic zones by developing improved varieties and location-specific crop production and protection technologies.

#### Research stations and their locations



**Table 4: Research Stations of ICAR-CTRI, Rajahmundry**

Research Station	Year of Establishment	Type of tobacco grown
ICAR-CTRI, Rajahmundry (HQ)	1947	FCV, Lanka, Burley
RS, Guntur	1936	FCV, <i>Natu</i> , HDBRG
RS, Kandukur	1977	FCV
RS, Jeelugumilli	1987	FCV, Irrigated <i>Natu</i>
RS, Hunsur	1957	FCV
RS, Vedasandur	1948	Chewing, Cheroot, Cigar-filler
RS, Dinjata	1952	Chewing, <i>Hookah</i> , Cigar-wrapper

\* HQ: Head Quarters; RS: Research Station

Since its inception, the Institute has been making impressive strides in its evolution and contribution to the scientific development of the tobacco sector by way of developing varieties with desirable traits and a host of agro-technologies for improving the production efficiency. At present, the ICAR-CTRI is an ISO 9001:2015 certified Institute and functioning with the vision, mission, and mandate (revised in 2016) as stated below.

### **Vision**

Provide vibrant research backup for Indian tobacco to be less harmful, remunerative, and globally competitive in the changing milieu of national and international policy regimes.

### **Mission**

Developing environmentally sustainable agro-technologies for production efficiency, product quality, and diversified uses of tobacco.

### **Mandate**

- Basic and strategic research on domestic and exportable types of tobacco, improvement in quality, and value-added products
- Coordination of tobacco research and developing the alternate usage of tobacco
- Identification of alternative crops/ cropping systems for tobacco-growing regions of the country
- Dissemination of technologies and capacity building

### **ICAR-CTRI: Uniqueness**

- ICAR-CTRI is the only research institute in the country which has the exclusive mandate of providing research backup for the production and processing of varied tobacco types grown across the different agro-ecologies of the country
- Institute research programs are unique and do not represent the duplication of efforts by other institutes
- The mandated tobacco crop is a low volume-high value-commercial crop with a high socio-economic relevance because of its vast potential to generate income for the farmers, employment (45.7 million), and revenue (~28000 Crore) for the government
- Besides technical and extension support, the Institute has a unique service function of supplying high-quality tobacco seeds and seedlings to the farmers

### **ICAR-CTRI: Quality Policy**

- Ensuring the production of “quality tobacco” with reduced levels of harmful constituents
- Enhancing farm returns through innovative interventions for sustainable resource use and production efficiency
- Exploring and effective use of green energy sources for FCV tobacco curing
- Exploiting tobacco for diversified uses (phytochemicals and value addition)
- Effective technology transfer/consultancy services to address the stakeholders’ needs

### **Associated Schemes**

In addition to its mandated activity, ICAR-CTRI coordinates and manages the activities of the All India Network Project on Tobacco (AINPT) and two Krishi Vigyan Kendras (KVKs) located at Kalavacharla in East Godavari district and Kandukur in Prakasam district of Andhra Pradesh.

### **All India Network Project on Tobacco**

In view of different tobacco types and styles grown in various parts of the country and the importance of the tobacco crop in the national economy, the Indian Council of Agricultural Research (ICAR) sanctioned the All India Coordinated Research Project (AICRP) on Tobacco in the Fourth Five-year Plan during 1970-71 with the headquarters of the co-coordinating unit at Anand, Gujarat. The AICRP on tobacco was renamed as All India Network Research Project on tobacco under the administrative control of the Director, ICAR-CTRI, Rajahmundry w.e.f 16-08-1998. The All India Network Research Project (AINPT) will coordinate the multi-location testing of the varieties and location-specific technology development. At present, the AINPT has three main network centres located at Rajahmundry (AP), Shivamogga (Karnataka), and Anand (Gujarat), seven sub-centres at Nipani (Karnataka), Nandyal (AP), Berhampur (Odisha), Araul (UP), Dinhata (WB), Guntur (AP) and Hunsur

(Karnataka) and four Voluntary centres at Ladol (Gujarat), Jeelugumilli (AP), Kandukur (AP), and Vedasandur (TN).



Shivamogga (Karnataka)



Anand (Gujarat)



Nipani (Karnataka)



Nandyal (AP)



Berhampur (Odisha)



Araul (UP)

### KVK, Kalavacharla

Established at Kalavacharla, East Godavari District, Andhra Pradesh in 1983, catering to the training and extension requirements of the farmers and extension personnel of the East Godavari district of Andhra Pradesh.

### KVK, Kandukur

Established in 2012 at CTRI Research Station, Kandukur in the Prakasam district of Andhra Pradesh, catering to the training and extension requirements of the farmers and extension personnel in Prakasam district.

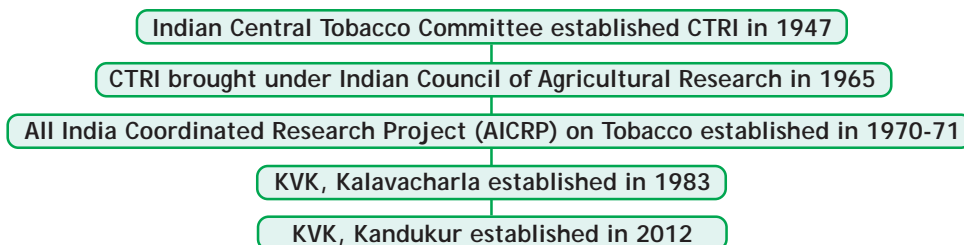


KVK, Kandukur, Prakasam dt, A.P



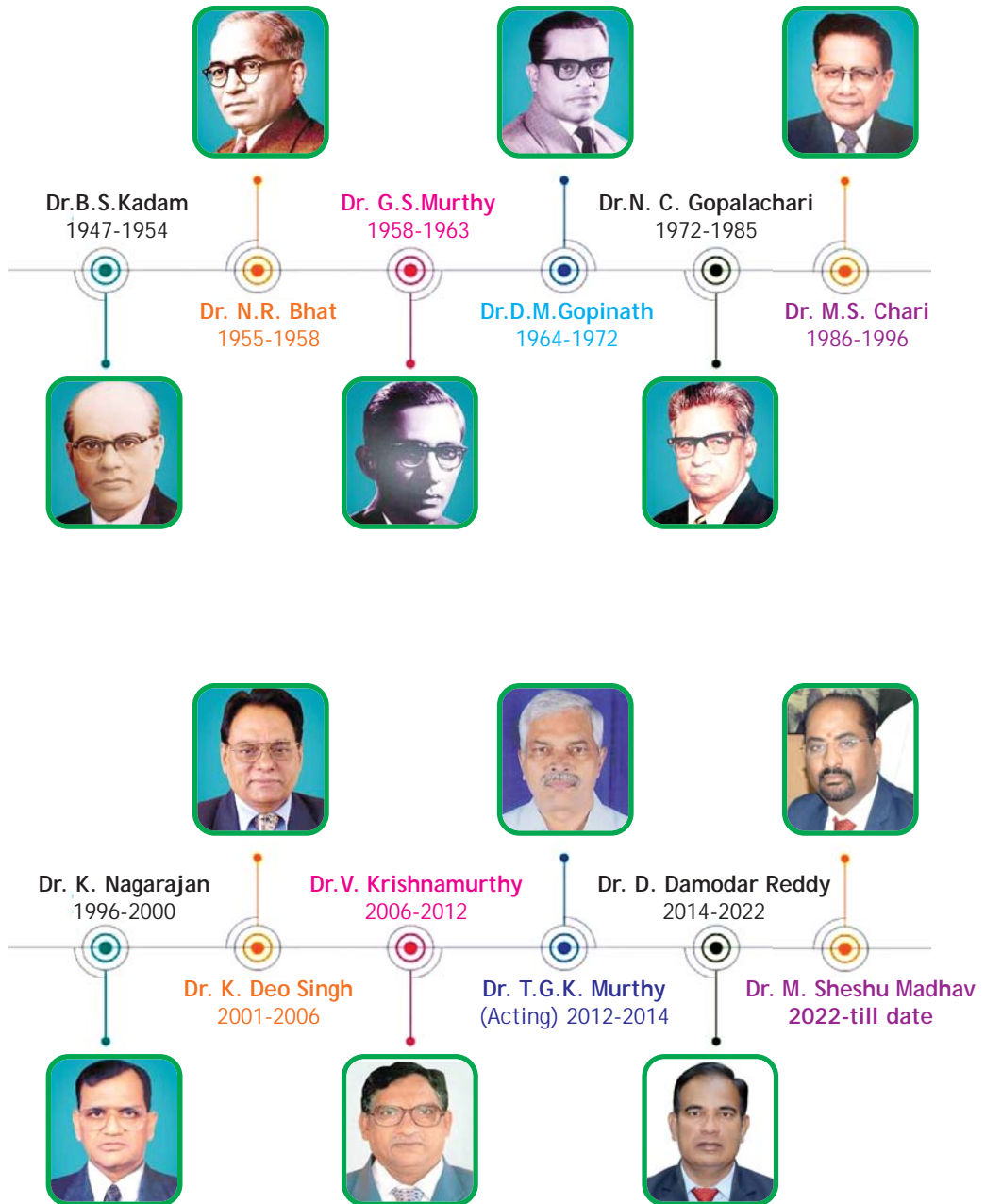
KVK, Kalavacharla, East Godavari dt, A.P

### ICAR-CTRI and Associated Schemes: Timeline



## Research Leaders of ICAR-CTRI, Rajahmundry: Timeline

Since the establishment of ICAR-CTRI in 1947, a total number of 12 Directors served in the research and administrative capacities.



## IV. ASSETS AND INFRASTRUCTURE

The institute Headquarters and regional stations are endowed with administrative buildings with all amenities, experimental farms and laboratories in soil and water testing, leaf quality evaluation, pesticide residue analysis, smoke research, biotechnology, curing facilities and farmers training facility *etc.*

### Land Bank

ICAR-CTRI and its Research Stations have land bank to the extent of 219.78 ha (Table-5).

**Table 5. Land bank at ICAR-CTRI and its Research Stations**

S. No.	Name of the Institute/Station	Land (ha)	Year of acquisition
1	CTRI Head quarters and BSR Farm, Rajahmundry (A.P)	57.88	1947 & 1977
2	CTRI Research Station, Guntur (A.P.)	22.51	1936 & 1946
3	CTRI Research Station, Jeelugumilli(A.P.)	22.01	1988 & 1996
4	CTRI Research Station, Kandukur (A.P.)	41.94	1977
5	CTRI Research Station, Hunsur (Karnataka)	19.64	1958,1963, 1967 & 1982
6	CTRI Research Station, Vedasandur (Tamil Nadu)	21.82	1948
7	CTRI Research Station, Dinhata (West Bengal)	19.43	1952 & 1970
8	Krishi Vigyan Kendra, Kalavacherla (A.P.)	14.55	1983

**Infrastructure** : Tray seedling unit, Briquette making facility, Roof top solar system, Curing facility units, Training halls, Grading halls, Automatic weather stations *etc.*



GCMS



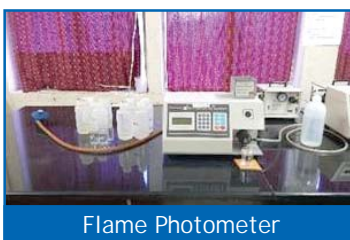
Auto analyser for leaf quality



Atomic Absorption Spectrophotometer



Smoking machine



Flame Photometer



N Distillation Unit



TOC Analyzer



UV-VIS Spectrophotometer



Gel documentation unit



Nanodrop Spectrophotometer



Particle accelerator (Gene gun)



Qiaxcel Capillary electrophoresis



Refrigerated centrifuge  
(Table top)



Thermal cycler New



Vacuum Concentrator



Root image analyser

## Equipment

**Human resources:** The scientific fraternity at ICAR-CTRI has made significant contribution in terms of varietal development, production and protection technologies, post-harvest management, farm mechanization, seed production etc. However, over the years, there was a phenomenal decrease in scientific cadre strength.

- Since mid-90s, Human Resource (Scientific) of the institute has been drastically come down from 81 (80+1) during 1996 to 40 (39+1) in 2022 (Figure-2).
- This might be due to i) ongoing uncertainties in tobacco sector, new scientists are skeptical about the future of the crop, ii) poor publishing potential of tobacco research results, iii) recurring inconvenient questions on budgetary support for tobacco and iv) social stigma attached to researchers working on tobacco.

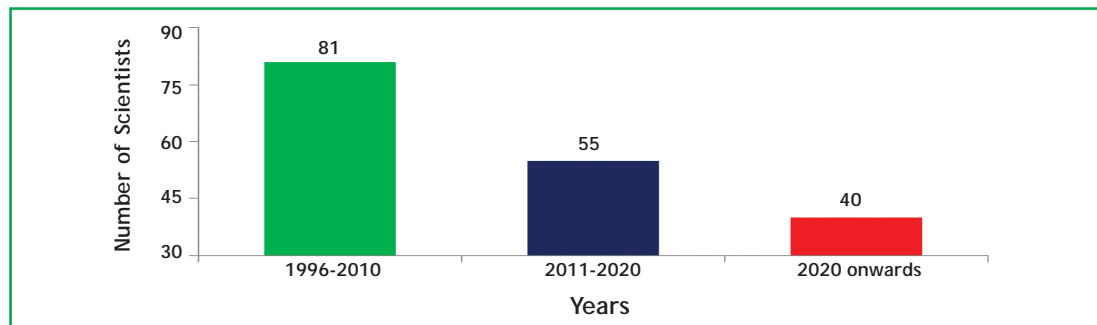


Figure 2: Change in scientific human resource over the years



## V. SIGNIFICANT RESEARCH ACCOMPLISHMENTS

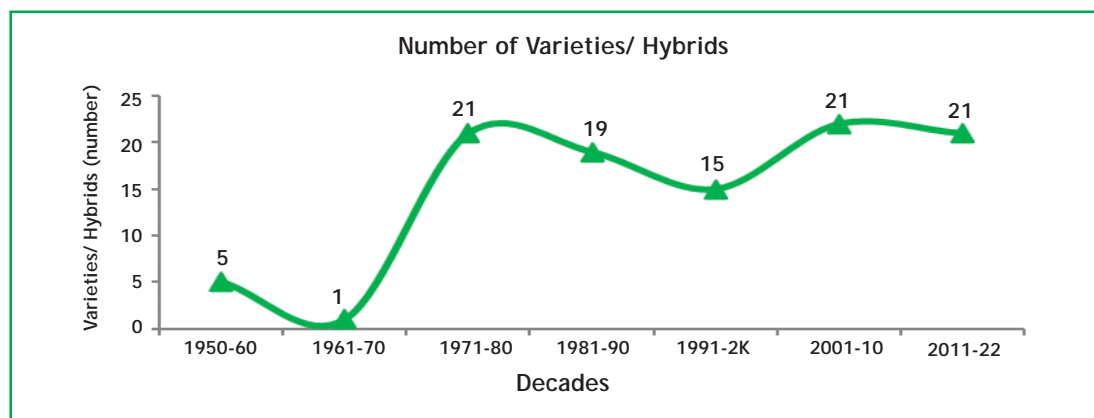
ICAR-CTRI focused on development of high yielding, biotic and abiotic stress tolerant varieties, crop production technologies for productivity enhancement and conservation of natural resources, protection technologies pesticide-free tobacco, post-harvest management and energy conservation in tobacco curing and phytochemicals from tobacco. Some of the significant contributions furnished below.

### Varieties developed/identified

Since its inception, the ICAR-CTRI released/identified 103 tobacco (FCV-33 and Non-FCV- 70) varieties/hybrids. Tobacco type wise varieties developed/identified are given table-6 and figure-3. The extent of adoption of different varieties is presented in table-7.

**Table 6: Varieties/ Hybrids developed/identified**

Type of Tobacco	Number of varieties released	Number of varieties Identified	Total
FCV	31	2	33
Burley	3	1	4
Bidi	17	2	19
Chewing	22	1	23
Rustica/ Hookah	9	2	11
Cheroot	5	1	6
Natu and Lanka	7	-	7
<b>Total</b>	<b>94</b>	<b>9</b>	<b>103</b>



**Figure 3: Timeline of tobacco varieties/hybrids developed/identified**

**Table 7: Extent of Adoption of ICAR-CTRI varieties**

Variety / Hybrid	Area covered
CH 3	~ 95% in NLS of AP and 45% of Karnataka Light Soils
FCH 222	100% of fusarium wilt endemic areas in Karnataka Light soils
FCR -15	42% of area in SLS, AP
Kamatchi	5% area of TN.
Abirami CR	100% sun cured tobacco area of Tamil Nadu
Siri	74% of area in SLS and above 90% in SBS, AP
Kanchan	20% area in NLS, AP and KLS
A 119	70% area in AP, 50% in Karnataka and 50% in Gujarat
GT 7	42% area of Gujarat
NBD-209	36% in Karnataka
Nandyala Pogaku-1	30% area in Andhra Pradesh
GCT 3	42% area of Gujarat
DCT 4	33% area of Gujarat

**Important agro-technologies developed by ICAR-CTRI**

1. Chemical sucker control in FCV tobacco using fatty alcohols
2. Fertiliser phosphorus management in FCV tobacco growing soils
3. Soil fertility thematic maps and water quality indices for different FCV tobacco growing regions.
4. Tray seedling production in FCV tobacco
5. Drip irrigation and fertigation in FCV and chewing tobacco
6. Micro sprinkler irrigation in tobacco nursery
7. Alternative fertiliser schedule for FCV tobacco grown in NLS and KLS
8. Farm pond technology in rainfed areas of SLS
9. Integrated barn technology for enhancing the energy efficiency
10. Process and purification of solanesol
11. Process for extraction of nicotine in tobacco leaf
12. Refining and pre-clinical toxicological evaluation of tobacco seed oil
13. Split application of potassium for enhancing the efficiency
14. Abiotic stress management strategies in KLS and SLS
15. Integrated pest and disease management modules in tobacco
16. New generation pesticides molecules for pesticide residue management
17. Agri-biomass briquettes as an alternative to wood for curing FCV tobacco
18. Polycarbonate roof chamber for harvesting solar energy
19. Prescription equations for different yield targets in FCV tobacco growing NLS region
20. Good agricultural practices for different tobacco types FCV, Chewing, Burley etc
21. Banana fibre extractor
22. Palmyrah fibre separator

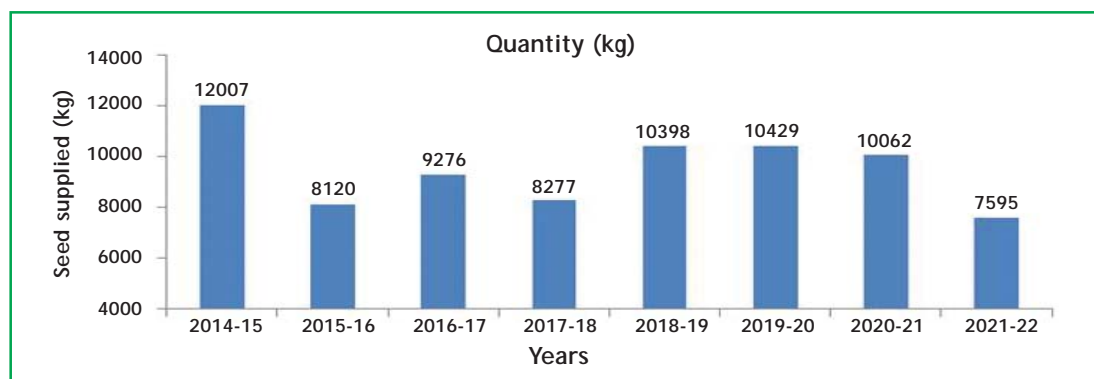
The details of extent of adoption of agro-technologies and area coverage are furnished in the table-8.

**Table 8: Extent of adoption of agro-technologies**

Agro-technologies	Extent of adoption (%)	Area of adoption
Tray nursery technology	90	NLS area of AP and KLS
Modified fertilizer schedule for replacing CAN	100	NLS area of AP
Updated package of practices in FCV	92	NLS area of AP
	80	SBS & NBS areas of AP
	72	SLS areas of AP
Pest control measures with new generation pesticides	100	NLS areas of AP
	88	KLS, SLS & SBS areas of AP
Farm pond technology	40	SLS & SBS regions of AP
Drip irrigation	28	NLS area of AP
Drip fertigation	16	NLS area of AP
Micro sprinklers in nursery	80	NLS area of AP
Turbofan	25	NLS area of AP & KLS
Alternative fuels	18	KLS

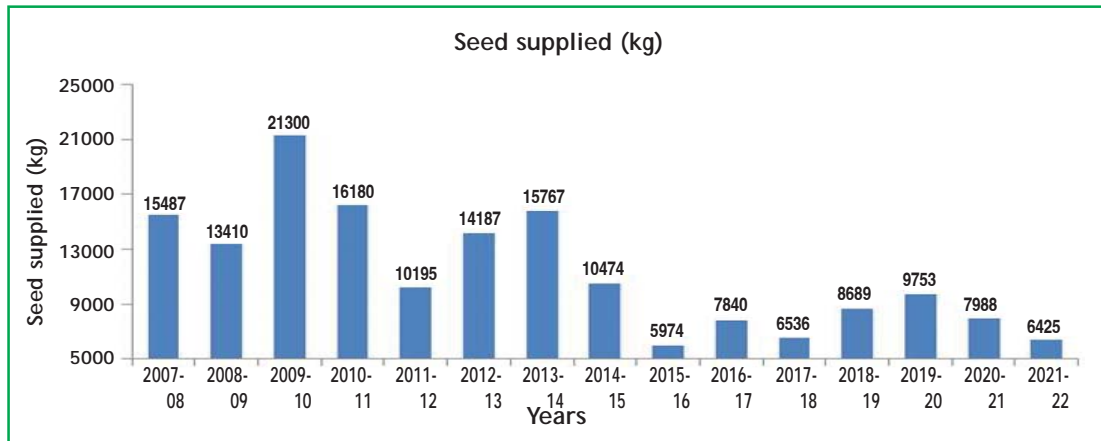
AP: Andhra Pradesh; NLS: Northern Light Soils; SLS: Southern Light Soils; SBS: Southern Black Soils; NBS: Northern Black Soils; KLS: Karnataka Light Soils

**Seed supply to farmers:** ICAR- CTRI has been supplying quality seed of all the popular tobacco varieties to the farmers in different agro-climatic zones of the country. Presently, the institute is supplying more than 9.0 tons of pure seed annually for all types of tobacco grown in the country to meet > 90% seed requirement of the farmers. Details of the seed supplied to farmers since 2014-15 is given in presented in the figure-4.



**Figure 4. Seed supplied (kgs) during last 8 years**

**Revolving Fund Scheme:** ICAR during 1990s sanctioned a “Revolving Fund Scheme” (RF Scheme) to CTRI with the objective of supplying pure seed and healthy seedlings of approved tobacco varieties to growers to improve the yield and quality of FCV tobacco. The institute produces seeds of recommended FCV and Lanka tobacco varieties under RF Scheme. Every year ICAR-CTRI supply ~7000 kg seed of recommended FCV tobacco seed to registered growers earning ~63 lakh rupees to the Institute. This phenomenal achievement is the testimony for the dedicated and relentless efforts of CTRI in the seed production arena. Seed supplied to farmers in the last 15 years is presented in the figure-5.



**Figure 5. Tobacco seed supplied to farmers for the 15 years**

### Technology dissemination

Conducting various technology outreach activities for technology dissemination is an important activity of the institute. Since its inception, the ICAR-CTRI has been providing in-season contingency advisories to the farming community and contributing to the capacity building of all the stakeholders including farmers, manufacturers, traders, and Tobacco Board staff. Capacity building programmes are being conducted to make the farmers understand the latest technical know-how for enhancing the productivity and quality and to reduce the pesticide residues, and NTRMs. Important technology dissemination activities include OFTs, FLDs, capacity building programmes, diagnostic visits, field days and kisan melas. Innovative outreach programmes implemented in convergence mode includes ‘Field friend’s programme’, model village concept, quality circles and Scientist-Farmer- Trade- Board interaction meetings. Every year the institute organizes 55-60 programmes for the benefit of the farmers. Capacity building programmes conducted to farmers for the last five years were given in table-9.

**Table 9: Farmers Covered and Impact**

Year	No.of training programmes
2016	55
2017	59
2018	58
2019	62
2020	76
2021	55

**Intellectual Property Rights:** ICAR-CTRI has been making continuous efforts in protecting the intellectual properties of the Institute through obtaining patents, copy rights and registration of germplasm with specific traits. Some of the achievements include

#### Patents

- IN211204: Process for purification of Solanesol (>95%) from crude/ enriched extracts of tobacco green leaf /tobacco cured leaf /tobacco waste
- IN227533: Palmyrah fibre separating machine

#### Copy Rights

Seven copyrights were granted by the Copyright Office of the Ministry of Human Resources, Govt. of India for the software's developed by ICAR-CTRI.

1. SW-14895/2021: Knowledge based system for tobacco weed management
2. SW-14404/2021: Expert System for Identification and Management of Plant Nutrient Disorders in Flue-Cured Tobacco (*Nicotiana Tabacum L.*)
3. SW-14310/2021 : Soil Test Crop Response Based Fertiliser Recommendation System for a targeted yield in FCV Tobacco
4. SW-14004/2020 : Mobile App : CTRI - FCV TOBACCO
5. SW-13893/2020 : Digital Field Notebook for Characterization of Tobacco lines
6. SW - 13101 /2019 : Rainfed *Natu* Tobacco Germplasm Information System
7. SW - 8169 /2014 : *Nicotiana* Species Information System

**Germplasm Maintenance:** ICAR-CTRI is maintaining a total Number of 3386 germplasm accessions of different tobacco types for varietal improvement. A total number of eight germplasm lines with special traits were registered with NBPGR, New Delhi (Table-10).

**Table 10: Germplasm with special traits**

S. No	Germ plasm Name	Special trait
1	NLCR-6-10	High leaf number
2	1/135	High Solanesol
3	JS 117,	TMV resistance
4	V-4914	TMV Resistance
5	HV.2000-6	Caterpillar resistance
6	BSR-1	Black shank resistance
7	F6-2-2	High seed yield
8	Jayalakshmi	White flower & seed

**ICTs in tobacco:** ICTs enables transmission of accurate information at right time and right place for improving the FCV tobacco production efficiency and produce quality and thereby augmenting farmers' income. The ICAR-CTRI developed ICTs such as mobile apps, decision support systems, e-portals, expert systems and whatsapp groups which were proven to be effective in terms of disseminating precise, reliable, timely updated information to the tobacco farmers and contributing to knowledge-rich FCV tobacco farming for enhanced farm incomes. Some of the ICTs developed include

- CTRI - FCV TOBACCO Mobile App
- Tobacco Agridaksh: An online expert system
- Expert system for Diagnosis and Management of Plant Nutrient Disorders in Flue-Cured Tobacco (*Nicotiana tabacum L.*)
- Digital Field Notebook for Characterization of Tobacco Lines
- Soil Test Crop Response (STCR) based online fertiliser recommendation in FCV tobacco
- Knowledge-Based System for Tobacco Weed Management
- Krishi Portal
- Tobacco Seed portal

#### **Externally Funded Projects**

- Characterization, value addition and utilization of tobacco seed oil and by products
- Development of Distinctiveness, Uniformity and Stability (DUS) Guidelines for FCV (Flue Cured Virginia) and *Bidi* tobacco
- Assessment of soil fertility and development of online recommendation system for FCV tobacco growing soils of India

- Development and evaluation of Solar thermal energy based FCV tobacco curing systems
- Development of Protocols and Comprehensive Analysis of Cost of Cultivation of FCV Tobacco in Different Soil Regions of Andhra Pradesh
- Development and Evaluation of Customised Fertilisers for FCV Tobacco Grown under Irrigated and Rainfed Conditions
- Evaluation of Boron fortified Potassium Scheonite for FCV tobacco grown in Karnataka and Andhra Pradesh.
- Evaluation of Bio-Consortia for nutrient supplementation, nematode/ disease control for enhancing productivity and quality of FCV Tobacco in KLS region
- Consultancy Project on Sustainable Burley Tobacco Production.
- Evaluation of loose leaf barn at CTRI RS Kandukur.

### Resource Generation

ICAR-CTRI generates internal resources to the tune of ~ Rs 150 lakhs every year (Figure-6).

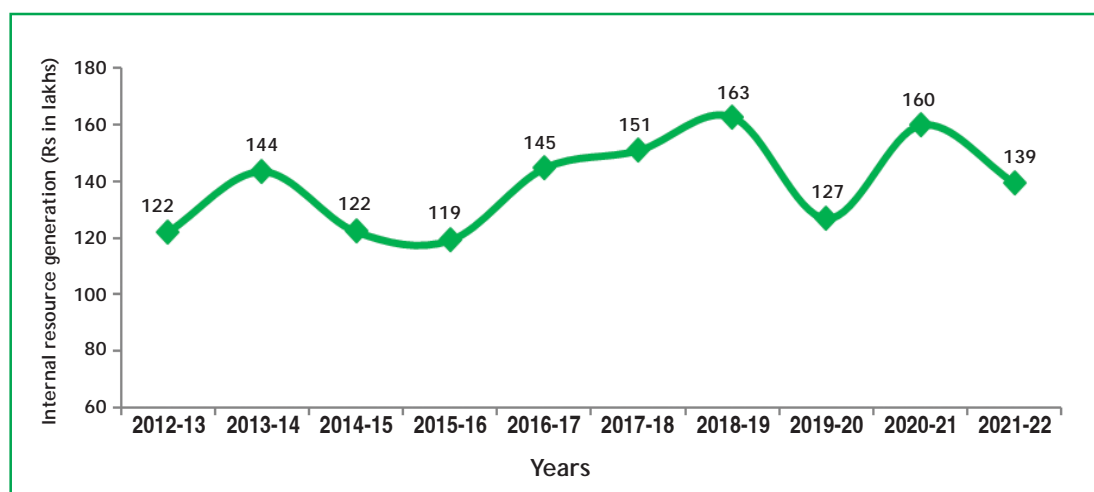


Figure-6. Internal resource generation over last 10 years

### Service functions

ICAR-CTRI extends service to farmers and stakeholders for soil, water, leaf chemical quality, smoke analysis and pesticide residues. Thus the institute generates resources to the tune of 5-6 lakhs every year (Table-11).

**Table 11: Resource generation through service functions**

Year	Resource generation (Rs in lakhs)
2017-18	5.76
2018-19	5.35
2019-20	5.05
2020-21	6.61
2021-22	5.13

### **Awards and Recognitions**

Prestigious awards and recognitions were conferred to the institute and personnel of ICAR-CTRI by the ICAR, reputed organisations, and professional societies.

#### **Institute awards:**

- Cashless ICAR Institute Award for effectively implementing the cashless transactions,
- FTCCI (The Federation of Telangana Chambers of Commerce and Industry) Award for excellence in social welfare initiatives for women empowerment
- Certification of Appreciation for proactively implementing ICAR Research Data Management Guidelines and uploading of all its Publications and Technologies for the last 6 years in KRISHI Portal
- Best KVK Exhibition stall by ICAR and APAARI and CII New Delhi

#### **Awards to scientists**

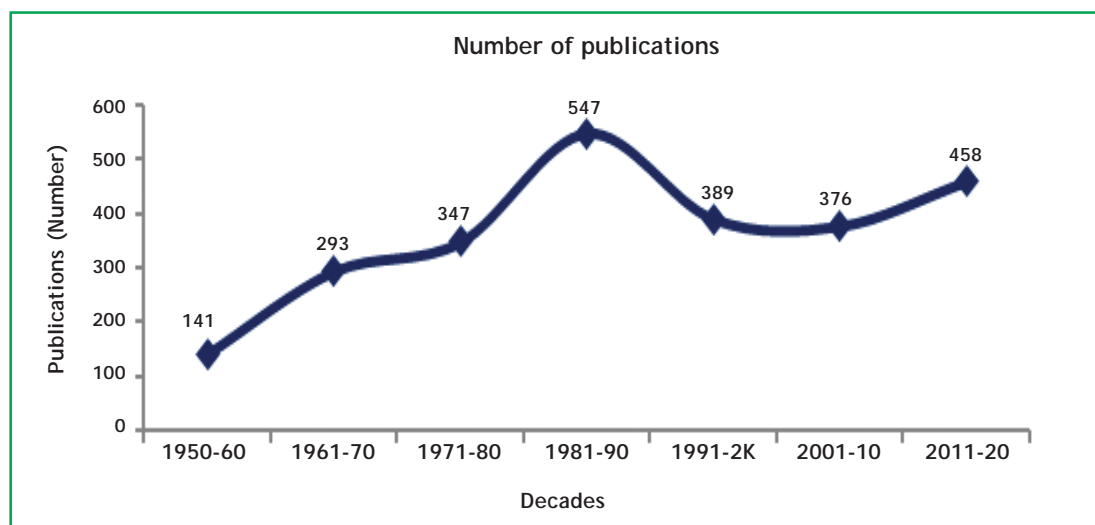
The scientists of the institute bagged 88 awards and recognitions from 2011-2021. The most significant awards are given in the table-12.



**Table 12: Esteemed Awards**

Name of the Scientist	Award	Organization
Dr. D. Damodar Reddy	Fellow	National Academy of Agricultural Sciences
Dr. K. Prabhakara Rao	Pran Vohra Award	Indian Science Congress Association
Dr. V.S.G.R. Naidu	Rajendra Prasad Puraskar award	Indian Council of Agricultural Research
Dr. K. Suman Kalyani	Swami Sahajanand Saraswati Outstanding Extension Scientist Award	Indian Council of Agricultural Research
Dr. B. Hema	Jawaharlal Nehru Award	Indian Council of Agricultural Research
Ms. Anindita Paul	NASI -Springer Best paper award	National Academy of Sciences, India
Dr. D. Damodar Reddy	Fellow	Andhra Pradesh Akademi of Sciences
Dr. H. Ravisankar, Dr. K. Prabhakara Rao & Dr.B.Hema	Associate Fellow	Andhra Pradesh Akademi of Sciences

**Publications:** The scientists of ICAR-CTRI published research papers in high rated national and international journals. On an average, the institute published 36 publications every year in the last 7 decades (Figure-7).



Source: CTRI & Research Stations publications (1998) and Annual Reports

**Figure-7: Publications in the last 7 decades**

## Farm Management Interventions in Research Farms of ICAR - CTRI

The ICAR-CTRI has introduced a set of management interventions in the year 2015-16 to rationalize the farm operations and enhance farm returns with an objective to bridge the gap between the expenditure incurred and the income accrued and explore possibility of increasing net farm income from institute farms. The implementation of a set of management interventions in the research farms of ICAR-CTRI and its Research Stations (about 100 ha) for 4 years (2015-19) led to increased farm income as evident from the increase in average annual net income of Rs (-) 32,379/ha (loss) during 2011-15 to Rs. 23,237/ha (profit) during 2015-19, with the effective impact being Rs. 55,616/ha per annum. The increased farm returns is attributed to both cost-cutting and income enhancement measures, with the relative contribution of 43% and 57%, respectively. It is hoped that this interventions would certainly enable other agricultural R&D institutions, universities, researchers, policy makers to emulate similar innovative farm management interventions and create greater impact on the research farms located across the country.

### Government of India programmes

#### SCSP Programme:

- ICAR-CTRI implemented the SCSP programme at Rajahmundry, its six research stations and also at KVKs. Different programmes under themes *viz.*, Integrated Pest management, post-harvest value addition, demonstrations, capacity building programmes, awareness programmes and animal husbandry were implemented. critical inputs like improved high yielding variety seeds (tobacco, paddy, turmeric, maize, bengal gram and biofortified korra seed, castor hybrid, coriander and ground nut), Planting material (arecanut, cashew, mango and marigold seedlings), irrigation pipes, poly trays for nursery, sprayers, taurpaulins, cattle feed, millet nutrikits etc were supplied. Facilities were created for value addition, data base management and capacity building. Multipurpose farmers pavilion was constructed for capacity building activities at CTRI Rajahmundry and CTRI Research Station Vedesandur. A total no of ~18,880 farmers were covered under this programme.

#### Tribal Sub-Plan

- ICAR- CTR Implemented Tribal Sub plan at CTRI RS Jeelugumilli, CTRI RS Dinara, CTRI RS Vedesandur and CTRI RS Hunsur. Capacity building programmes including Awareness programmes, trainings and exposure visits were organized. Critical inputs such as seed, taurpalins, battery operated sprayers, animal feed, polytrays, shade net *etc.* were supplied to farmers. A total no of ~3950 farmers were covered under this programme.

## NEH Programme

- ICAR-CTRI implemented the NEH Programme in collaboration with ICAR-Research complex Umiam and ICAR-NRC, Mithun. Apart from conducting different capacity building programmes, critical inputs viz., seed/ seedlings, chicks, piglets, pig feed, poultry feed, fish seed, ducklings *etc.* were supplied to the farmers and also strengthened the KVK-Tura, West Garo hills, Meghalaya under ICAR-Research complex Umiam by procuring the equipment for value addition, capacity building, digitization and ICT.



## Pulses Seed Hub

ICAR-CTRI, Rajahmundry is an implementing center of Pulses Seed Hub under National Food Security Mission with an objective to increase indigenous pulses production in India with a total outlay of Rs.150.0 lakhs is functioning from 2016-17. Established seed processing and storage infrastructure. ICAR-CTRI Produced Foundation/ Certified seed of major pulses (chickpea, pigeon pea, black gram and green gram) to the tune of 230 metric tons during 2016-2020 and supplied to the farmers through National Seed Corporation, Gol.

## Celebrations of India @ 75 Azadi Ka Amrit Mahotsav

ICAR-CTRI celebrated Azadi Ka Amrit Mahotsav to commemorate India's 75 years of Independence. Some of the important activities organized include

- Kisan Ghosti on "Integrated Soil Fertility Management and Balanced Use of Fertilizers" on 18.6.2021.
- Tree Plantation and Awareness Programme at ICAR-CTRI, Rajahmundry and its Research Station at Kandukur, Andhra Pradesh on the occasion of ICAR's Foundation Day on 16-07-2021.
- A programme on 'Food and Nutrition for Farmers' was organized on 26.08.2021 at ICAR-CTRI, Rajahmundry, its Research Stations. Awareness was created to 1500 farmers through Farmers WhatsApp groups.

- ICAR-CTRI live streamed the curtain raising event of 'International Year of Millets-2023' inaugurated by Sri Narendra Singh Tomar, Union Minister of Agriculture and Farmers Welfare, Govt. of India on 17-9-2021. In continuation 'Poshan Vatika Mahabhiyan and Tree Plantation' programme was conducted with Chief Guest Sri Margani Bharat, Member of Parliament, Rajahmundry.
- Farmers Interface Meeting on "Climate Resilient Crop Varieties and Agro Technologies" was organized on 28.09.2021. Live streaming of the Hon'ble Prime Minister's interaction with farmers and dedication of 35 crop varieties to the nation was done.
- Under Kisan Bhagidari Prathmikta Hamari Campaign, ICAR-CTRI conducted the Kisan Mela at its KVKs on 26.04.2022 and Awareness Programme on "Crop Diversification for Enhanced and Sustainable Farm Returns" on 28.04.2022 at ICAR-CTRI Research station, Jeelugumilli, Andhra Pradesh.
- Nationwide Interaction programme of Prime Minister with farmers and other scheme beneficiaries was organised on 31.05.2022 at ICAR-CTRI, Rajahmundry and also at CTRI RS, Kandukur. A total No. of 3100 farmers and beneficiaries participated in the programme.
- Conducted Awareness programme on Crop Intensification and Diversification for enhancing the farmers income in the rainfed eco-system at ICAR-CTRI RS, Kandukur on 31.05.2022
- Under National Campaign of Azadi Ka Amrit Mahotsav, International Day of Yoga (IDY), Farmers' Awareness Campaign on 'Efficient and Balanced Use of Fertilizers (including Nano-Fertilizers) and Awareness on region specific agro-forestry were conducted by ICAR-CTRI on 21.06.2022

As a part of celebration of the *Azadi Ka Amrit Mahotsav*, ICAR-CTRI, Rajahmundry has organized following lecture series.

- "Food Loss and Waste Reduction Policies" by Dr. B. Rajender, IAS, Minister (Agriculture), APR to FAO, WFP & IFAD, Embassy of India, Rome, Italy on 11.11.2021.
- 'Self-Reliant India through Self Sufficient Agriculture' by Dr. J.P. Sharma, Vice Chancellor, SKUAST- Jammu on 4.12.2021.
- 'Agribusiness Value Chains in a Changing Climate' by Dr. Ancha Srinivasan, ADB, Thailand on 22.01.2022.
- "Indian Agriculture: Transformation from Subsistence to Commercial farming" by Dr. G.R. Chintala, Chairman, NABARD, Mumbai on 27.01.2022.

- “Soil Ecological Stewardship-Soil Health and Microbial Inoculants” by Dr. D.L.N. RAO, ICAR-Emeritus scientist (Retd.), EX-Project Coordinator – AINP(SB-B), IISS, Bhopal, MP, India on 23.04.2022.
- “Processing and Value Addition in High Value Commercial Crops: Research Priorities” by Dr. Ch.V.V. Satya Narayana, Professor and Head, Food Process Engineering, Dr. NTR College of Food Science and Technologies, ANGRAU, Bapatla, AP, India on 27.05.2022.
- “Tobacco improvement activities in North-West of Iran” by Dr. Reza Darvishzadeh, Professor, Faculty of Agriculture, Dept. of Plant Production and Genetics, Urmia University, West Azerbaijan Province, Urmia, Iran on 14.07.2022
- “Legacy Phosphorus in Agricultural Soils - Understanding and Management’ by Dr. D. Damodar Reddy, Director, ICAR-CTRI, Rajahmundry, AP, India on 15.08.2022.

### **ADMINISTRATIVE CHANGES IN LAST 3 YEARS**

The following administrative reforms were implemented for the transparent administrative functioning of the Institute

- Cashless/ digital financial transactions
- Aadhaar Enabled Bio-metric Attendance System (AEBAS)
- E-procurement of goods and services.
- FMS/MIS Module in Pay Rolls, Bills, etc.
- Imparting training as per the action plan of HRM.
- Maintenance and updating the personal data of Scientists through PIMS
- Implementation of RTI through online.

## VI. RESEARCH AND TECHNOLOGY IMPACT

ICAR-CTRI has made a phenomenal contribution to technology adoption and transfer activities front. Coherent with the initiative of doubling farmers' income, studies have been taken up to assess the socio-economic impact of tobacco farmers in tobacco-growing areas. Interaction with the experienced tobacco farmers revealed that growing tobacco than other crops improved their situation sustainably. It was evident that tobacco cultivation significantly contributed to the income of the tobacco farmers and it is a major source of livelihood in tobacco-growing areas. Tobacco cultivation has a profound effect on the economic prosperity of the farmers in the region where it is grown. Further, the tobacco crop enjoys the elements of institutional support and employment generation in a chosen area. The wealth indicators in rural households show a propensity for consumption and asset creation amongst those who predominantly grow tobacco compared to the cultivation of other crops. Tobacco research and development in India has a multiplier effect on the economy and some of the major impacts are furnished below:

### 1. Adoption of tobacco varieties/technologies

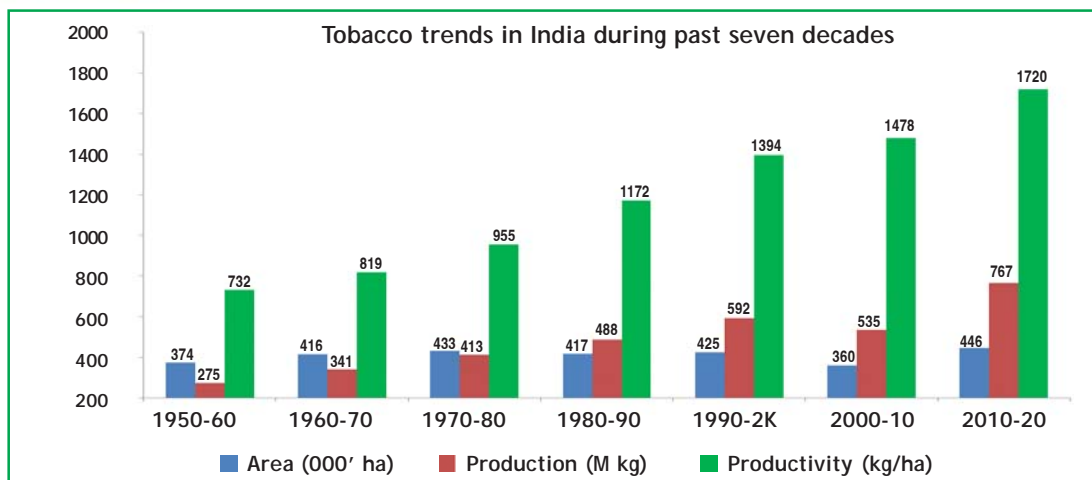
The institute has developed over the years a large number of improved varieties/hybrids (103), production, protection, and processing technologies (55) for enhancing the productivity and quality of tobacco. More than 90% of the tobacco area in the country is covered by these varieties and technologies.

### 2. Increase in Productivity of Tobacco

The concerted research efforts of ICAR-CTRI have led to a significant increase in the productivity of tobacco in the country. The annual average productivity of tobacco was very low at 732 kg/ha during 1950-60 and gradually increased over the decades and reached 1720 kg/ha during 2010-2020 owing to the large-scale adoption of scientific interventions and practices developed by the Institute.

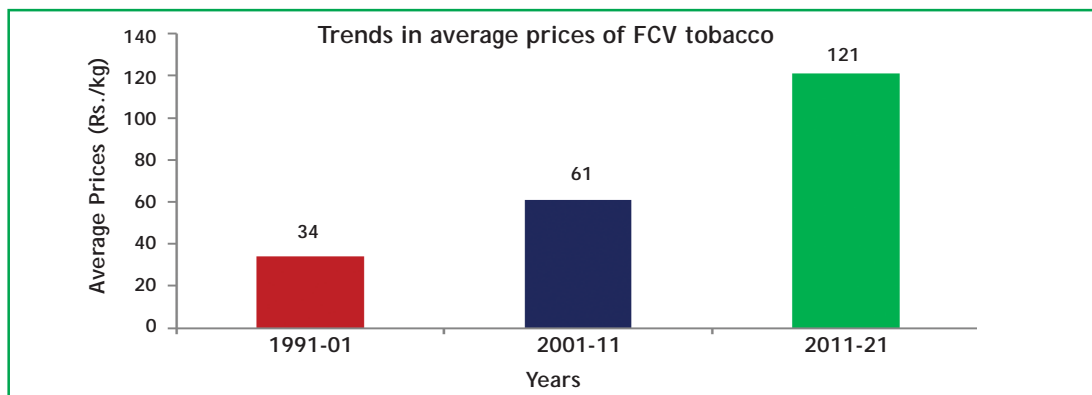
### 3. Productivity-led growth in Tobacco Production

The area under tobacco cultivation in the country has shown a slight increase from 374 lakh hectares during 1950-60 to 446 lakh hectares during 2010-2020. However, the average tobacco production increased by >2.5 times during the corresponding period (from 275 million kg to 767 million kg), primarily attributed to more than two-fold productivity enhancement resulting from the technological interventions in terms of high-yielding varieties, timely supply of quality seed, sustainable production, and protection practices made available by the institute.



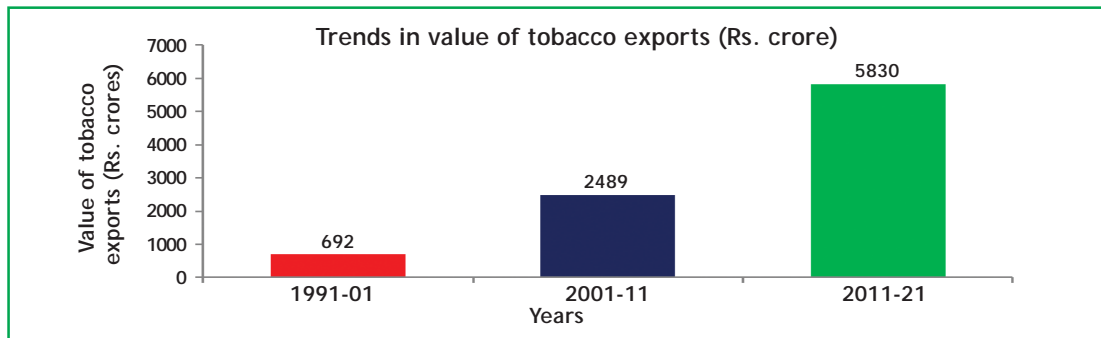
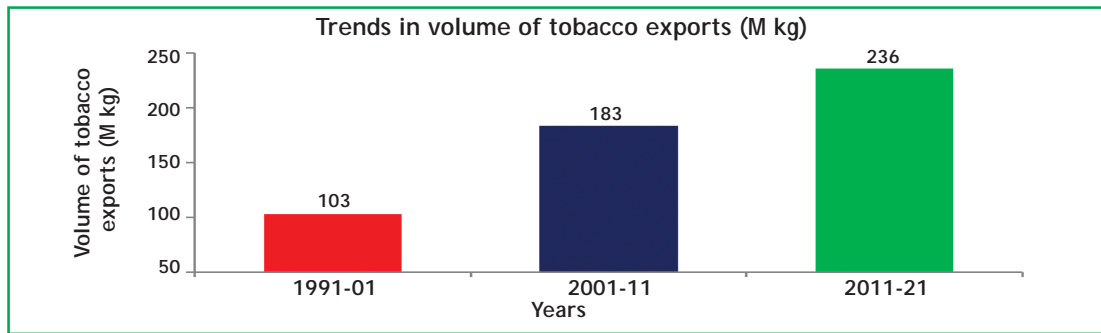
#### 4. Tobacco Prices

In India, the average price of FCV tobacco has increased more than two folds from Rs. 34/kg during 1990-01 to Rs. 121/kg during 2011-21. This increase is mainly due to an increase in demand for quality Indian tobacco in the international market and quality improvement such as balanced leaf chemistry, low pesticide residues, and heavy metals mainly due to the adoption of scientific management interventions recommended by the Institute.



#### 5. Tobacco Exports

Scrupulous adoption of technology interventions has led to the production of quality leaves with low levels of pesticide residues and free from NTRMs. Accordingly, there has been a continuous demand for Indian tobacco in the global market as is evident from the increased tobacco exports in the past three decades. The annual tobacco exports from the country increased by 2.3 times in volume and 8.4 times in value during the past three decades i.e. from an average of 103 million kg and Rs.692 crore during 1991-01 to 236 million kg and Rs. 5830 crores during 2011-21, respectively.



## Emerging Uncertainties in Tobacco Sector

Notwithstanding its socio-economic benefits in terms of employment generation and livelihood security and contribution to the national economy, tobacco is associated with a stigma. Public perception about tobacco is generally negative and growing with time. This is due to the fact that tobacco production and consumption cause adverse socio-environmental impacts in terms of public health risks and curing-induced deforestation and air pollution. Eyebrows are often raised questioning the rationality of continuing tobacco cultivation.

- 1. Public Health Hazards:** Tobacco consumption, both as smoke and smoke products, is implicated as the main cause for a number of diseases either directly or indirectly. It is linked to cardiovascular diseases, COPD, *etc.* Tobacco consumers are also reported to become more vulnerable to many infectious diseases.
- 2. Environmental Hazards:** Wood is the major source of fuel for curing FCV tobacco. To cure one kg of FCV tobacco ~ 5 kg of wood fuel is consumed. Annually, 1.2 million metric tons of wood is being utilized for curing resulting in deforestation, a serious environmental issue. Burning of wood fuel during the tobacco curing process also results in the emission of gases that cause environmental pollution. Added to this, tobacco smoking also contributes to air pollution. Spitting habits associated with tobacco chewing make the environment dirty and unhygienic.



## VII. GLOBAL AND NATIONAL POLICIES RELATED TO THE TOBACCO SECTOR

Stringent national and international tobacco control policies are put in place to reduce the demand and supply of tobacco.

### 1. WHO-Framework Convention on Tobacco Control, 2005

The WHO-Framework Convention on Tobacco Control (FCTC) with its overwhelming membership of 182 countries added a new dimension to the complex nature of the crop. It envisages non-price, price, and tax measures to reduce the supply and demand for tobacco in the world. India, being a signatory to the FCTC, is under obligation to support the measures for the reduction of supply and demand for tobacco. This convention was implemented to protect present and future generations from the devastating health, social, environmental, and economic consequences of tobacco consumption and exposure to tobacco smoke.

### 2. COTPA, 2003

The Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply, and Distribution) Act, 2003 is an important law made by Govt. of India on the prohibition of advertisement and regulation of trade and commerce, production, supply and distribution of tobacco.

### 3. World No Tobacco Day

The WHO observes the 31<sup>st</sup> of May every year as World No Tobacco Day (WNTD) to enhance public awareness about tobacco-related health hazards and discourage all forms of tobacco consumption.

### 4. Crop Diversification Programmes

To replace tobacco, DAC & FW, GoI is implementing Crop Diversification Programme in tobacco-growing states of Andhra Pradesh, Bihar, Gujarat, Karnataka, Maharashtra, Odisha, Tamil Nadu, Telangana, Uttar Pradesh, and West Bengal to encourage tobacco-growing farmers to shift to alternate crops/cropping system since 2015-16. The interventions include suitable activities/interventions for replacing the tobacco with alternate crops/cropping systems.

## VIII. PROSPECTS FOR DIVERSIFYING THE RESEARCH MANDATE

The Central Tobacco Research Institute, established in 1947, has been in existence for more than seven decades pursuing commodity-centric research exclusively on tobacco. The institute has been spearheading national tobacco research in all its dimensions and made immense contributions to the growth and development of tobacco sector. Despite the excellent research progress in terms of developing a large number of improved varieties and a whole range of production and protection

technologies for enhancing production efficiency and produce quality, the institute is facing an enigmatic situation because of continued uncertainties and stigma associated with its mandated tobacco crop. Though tobacco is known for its potential to give relatively high returns to the farmers and generate huge revenue to the government, the public perception in general is negative and is growing with time because of health risks and environmental issues associated with its production and consumption. In addition, the tobacco-control policies such as WHO-FCTC (2005), COTPA (2003) *etc.* and anti-tobacco campaigns have also contributed to prevailing uncertainty in the sector.

There has been a steady decline in tobacco consumption due to growing health consciousness among public on one hand and the national and international tobacco control policies on the other. Declining tobacco consumption resulted in a reduction of about 21 and 20% in the global tobacco acreage and production, respectively during the last five years. With the advent of Covid-19 pandemic, tobacco consumption is expected to decline further as tobacco consumers are generally reported to be more vulnerable to health risks in terms of infection, severity of symptoms and mortality. The declining demand is expected to reduce the tobacco production (supply) further in future. It is already evident from the fact that the Tobacco Board in India has recently reduced FCV tobacco crop size by 12% i.e., from 100 M kg to 88 M kg for crop season (2020-21) in the state of Karnataka. The Covid-19 pandemic has triggered emergence of "Tobacco New Normal" characterized by increased public awareness of tobacco hazards, strict enforcement of tobacco control policies and decreased tobacco demand and supply. In response to building New Normal, tobacco crop would experience a gradual phase out making the room for other commercial crops as components of the crop diversification being promoted by the Govt. of India.

## IX. WAY FORWARD

In the context of emerging trends in agriculture, it becomes imperative for ICAR-CTRI to diversify its focus to multi-commodity research; the research framework of the institute needs to be built on the basis of all possible avenues and opportunities for improving crop productivity, farm returns and farmers' profitability. The diversification of research in the domain of crop diversification, agro-processing and value addition, farm mechanization and export orientation, which are the key areas that aid in augmenting farm income and boost agri-exports. Thus, the institute to remain relevant in the present context, there is a strong need to diversify its research mandate and change research priorities for its future sustenance. The institute intends to transform into **National Institute for Research on Commercial Agriculture** in the coming years.





**ICAR - Central Tobacco Research Institute**

(An ISO 9001: 2015 Certified Institute)

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