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Impact of FCR 15 (CTRI-SRESHTA) FCV tobacco variety in SLS & SBS regions of Andhra Pradesh

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Abstract

Tobacco (Golden Leaf), the mandate crop of ICAR – National Institute for Research on Commercial Agriculture (NIRCA) is one of the important commercial crops in India. With the current annual production of about 750 x 10⁶ kg cured leaf from an area of 0.45m ha, India is the second largest tobacco producer in the world, next to China and stands also second in the export of tobacco and tobacco products after Brazil. India's average Flue-Cured Virginia (FCV) tobacco productivity is generally lower than the world average and significantly below leading global producers, despite India being the 4th largest FCV producer. Challenges are to make farmers aware of latest varieties suitable for their region and ensure their adoption in the field in order to increase the production, productivity and net income to the farmers. To achieve this ICAR-NIRCA-Krishi Vigyan Kendra, Kandukur has conducted on farm demonstrations with improved FCV tobacco variety FCR-15 for three years from 2021-22 to 2023-24 in *Rabi* season in 150 ha area at different locations of SLS (Southern Light Soils) & SBS (Southern black Soils) rainfed farming regions of Andhra Pradesh. The productivity and economic returns of FCR-15 in demonstrations fields were calculated and compared with the local variety Siri. The results revealed that FCR-15 variety recorded highest yield of 1920 kg/ha with 22.2% average increased yield over the control. The economics analysis of the data over three years revealed that FCR-15 tobacco variety recorded higher gross returns Rs. 4,53,419/- and net returns Rs.2,21,152/- per hectare with B:C ratio 1.9 compared to local check variety Siri with Rs.3,70,125/- gross returns and net returns Rs.1,34,525/- per hectare with B:C ratio 1.5 wherein doubling farmers' income has been achieved. The additional net returns in FCR-15 demonstrated fields was Rs.86,627/-per hectare and Rs.586 crores in both SLS & SBS regions of the Andhra Pradesh. Further 93% of the FCV tobacco area and tobacco growers in these two regions have been occupied by FCR-15 variety within 3 years.

Keywords: FCV tobacco, FCR-15 (CTRI-SRESHTA), Flue-Cured Virginia tobacco

Introduction

Tobacco (Golden Leaf), the mandate crop of ICAR – National Institute for Research on Commercial Agriculture (NIRCA), is one of the important commercial crops in India. With the current annual production of about 750 x 10⁶ kg cured leaf from an area of 0.45 m ha, India is the second largest tobacco producer in the world, next to China and stands also second in the export of tobacco and tobacco products after Brazil. Tobacco makes a significant contribution to national economy by way of export earnings of about 60 bn INR and excise levies of over 200 bn INR, besides providing employment and livelihood security to an estimated 45.7 million people engaged in its cultivation, curing, grading, manufacturing and marketing. The main beneficiaries of tobacco production are the small and marginal farmers, landless agricultural labourers, rural women and tribal youth. The crop is grown in area of 0.45 million hectares in over 15 states in the country. Major tobacco growing states are AP (45%), Karnataka (26%), Gujarat (14%), UP (5%), Tamil Nadu (2%), Bihar (2%) and

WB (1%). India occupies second place in world tobacco production (750 m kg) after China (2300 m kg) (Vision 2050 document of CTRI). A unique feature of tobacco production in India is that myriad styles of Flue-cured Virginia (FCV) and non-FCV tobacco are cultivated under widely differing agro-ecological situations. The FCV, bidi, hookah, chewing, cigar-wrapper, cheroot, burley, Oriental, HDBRG, Lanka, Pikka, Natu etc. are the main types of tobacco grown in the country, with FCV and Burley tobacco being the main exportable types. Among all the tobacco types FCV is most important type as it is being completely controlled by the Tobacco Board under Ministry of Commerce and Industry, Government of India.

Tobacco growing areas have been broadly classified into 4 regions viz NLS (Northern Light Soils), NBS (Northern Black Soils), SLS (Southern Light Soils), SBS (Southern Black Soils) located in Andhra Pradesh and KLS (Karnataka Light Soils) located in Karnataka state. SLS and SBS regions of Andhra Pradesh comprises of Prakasam, SPSR Nellore districts. In both SLS & SBS regions together

tobacco is being grown majorly under rainfed condition in an area of 75,000ha by 30,212 farmers with 24,696 registered barns. Siri variety of FCV tobacco released by ICAR-CTRI during 2006 used to grow majority of the farmers in SLS & SBS regions. Main constraints farmers used to face with variety was low harvesting intervals, could not withstand to heavy rains, leaf colour retention days were low and not suitable for rainfed light soils. In order to overcome these problems ICAR-NIRCA has developed and released new variety called FCR-15 (CTRI Sreshta) in 2023. Main features of the FCR-15 are FCR-15 has a leaf yield it has yield potential of 3000 kg/ha under normal conditions, it produces a total of 22-27 curable economic leaves, it was found to withstand heavy rainfall, during grand growth period with even maturity, good quality leaves and longer colour retention, possessing TMV resistance and the quality characteristics i.e. nicotine 2.37-2.62%, reducing sugars 12.56-18.26%, chlorides 0.21-0.43% are in the acceptable range (Madhav, S. *et al.*, Disruptive technologies of CTRI, 2023). Keeping this in view of these additional advantages, ICAR-NIRCA-Krishi Vigyan Kendra, Kandukur has

conducted on farm trials (OFT) in farmers' fields for three years (2021-2023) studied its impact over a period of time with an objective of studying the extent of adoption of FCR-15 tobacco variety, to study the socio-economic impact of adoption of FCR-15 and to find out the factors attributed to the adoption of FCR-15 variety by SLS+SBS region farmers in Andhra Pradesh.

Methodologies

Totally 150 large scale on farm demonstrations covering 150 ha area on FCR-15 against locally grown Siri variety as control were conducted by *Krishi Vigyan Kendra*, Kandukur from 2021-22 to 2023-24 in SLS and SBS regions of the state as shown in Table 1. In order to study its impact, from SLS region out of 6 tobacco auction platforms 60 farmers (10 farmers from each platform) and in SBS region out of 5 tobacco auction platforms 50 farmers (10 from each platform) were selected using stratified random sampling method making all together 110 (60+50) farmers for the study as shown in Table 2.

Table 1: On farm Demonstrations conducted:

Region	No. of demonstrations in 2021-22	No. of demonstrations in 2022-23	No. of demonstrations in 2023-24	Total
SLS Region	25	25	25	75
SBS Region	25	25	25	75
	Total			150

Table 2: Sampling procedure of the respondents:

Region	Auction Platform-1	Auction Platform-2	Auction Platform-3	Auction Platform-4	Auction Platform-5	Auction Platform-6	Total
SLS Region	10	10	10	10	10	10	60
SBS Region	10	10	10	10	10	-	50
Total	20	20	20	20	20	10	110

Ex-post facto research design was used for the study. The data on production, productivity, attributing factors for higher adoption, gross income, net income, BC ratio, extension gap, technology gap and technology index were collected through well-developed questionnaire along with interview method as well as secondary data from tobacco board. The results obtained during three years were analyzed using appropriate statistical tools viz., mean, standard deviation, descriptive statistics and the results were concluded at the respective levels of significances between means ($p < 0.05/0.01$) of leaf Length, leaf breadth, leaf weight, Inter nodal length, plant height, harvest interval, economic curable leaves/plant, days to maturity between FCR-15 and Siri variety. The technology gap, extension gap and technology index were calculated as per Samui *et al.*, (2000) ^[5]. Farmers feedback on perceived attributes of

innovation were studies using 5 factors like relative advantage, complexity, compatibility, trialability and satisfaction.

Operationalization of various parameters

- Technology gap = Potential yield - Demonstration yield
- Extension gap = Demonstration yield - Yield under existing practice
- Technology index = Potential yield - Demonstration yield X 100 / Potential yield

Results and Discussion

The data obtained through interview schedule and secondary data on impact of FCR-15 FCV tobacco variety were subjected to analysis and explained in the following heads.

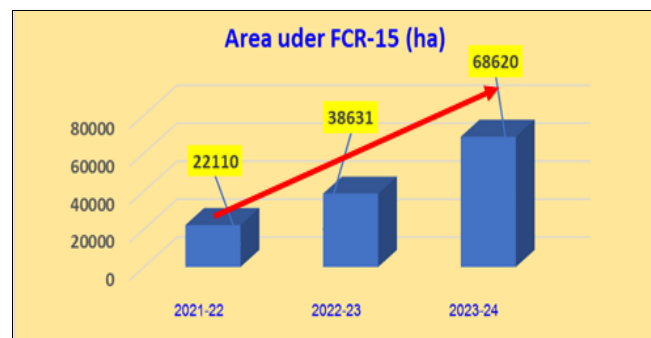
Table 3: Area spread of the FCR-15 FCV Tobacco variety and farmers adoption over period of time in SLS & SBS regions:

Component	SLS region	SBS Region	Total areas of FCV Tobacco as on 2023-24	Area occupied by FCR-15 as on 2023-24	% of FCR-15 variety
FCV Tobacco Cropped area	36,085 ha	36,260 ha	72,345 ha	67,680 ha	(93%)
Farmers covered (No.)	15,840	14,160	30,000	27,900	(93%)

In both the SLS & SBS regions FCV tobacco is being grown in an area of 72,345 ha by 30252 farmers as on 31.03.2024 (Tobacco Board annual report-2023-24). Out of which FCR-15 was sown in an area of 67680 ha which is

93.5% of total area and 27900 farmers covering 92.2% of total farmers grown this variety as it is evident from the Table 3. This clearly shows within 2 years of its release because of its outstanding performance vis-à-vis leaf length,

leaf breadth, leaf weight, inter nodal length, plant height, harvest interval, economic curable leaves/plant, days to maturity, yield, net returns, climate resilient characters etc. better than the locally grown Siri leads to drastic improvement of area and adoption under this variety by the farmers. FCR-15 variety has occupied 45% area in 2022-23 and 93.45% in 2023-24 (Tobacco Board annual report-2022-23, 20p, 2023-24, 20p) ^[9].



(Source: Tobacco Board Annual reports – 2021-22, 22-23 & 23-24)

Graph 1: Area spread of FCR-15 over a period of 3 year

Table 4: Farmers perceived attributes on FCR-15 variety: (n=110)

S No	Perceive attributes	FCR-15	
		Frequency	%
1	Relative advantage	102	92.7
2	Compatibility	98	89.1
3	Trialability	103	93.6
4	Observability	104	94.5
5	Complexity	4	3.6

Feedback on the performance of new variety was obtained from 110 farmers by using well-structured interview schedule and the results were shown in Table 4. A critical analysis of perceived attributes of FCR-15 latest variety by farmers revealed that 92.7 percent of the farmers expressed that this variety has got more relative advantage over local Siri variety. Similarly, 89.1 percent farmers expressed compatibility, 93.6 percent farmers agreed that it was easily trialable without any difficulty and 94.5 percent farmers expressed observability of additional benefits in FCR-15 variety compared to local check variety. Merely 3.6 percent farmers expressed that there was complexity in adoption of this improved variety compared to local check probably because of untimely sowing. Similar results were also reported by Babu *et al.* 2023 ^[3].

Table 5: Potential yield, technology gap, extension gap and technology index of FCR-15 in SLS & SBS regions during 2021-22 to 2023-24 against Siri.

Variety	Yields 2021-22 (kg/ha)	Yields 2022-23 (kg/ha)	Yields 2023-24 (kg/ha)	Avg. Yield (kg/ha)	Potential yield (kg/ha)	% Increase in yield over control	Extension gap (kg/ha)	Technology gap (kg/ha)	Technology index (%)
FCR-15	1671	1998	2092	1920	3000	22.2	349	1080	36.0
Siri	1452	1538	1725	1571	3500	-	-	1929	55.1

From the data presented in Table 5, it is evident that yield of demonstrated variety FCR-15 performed better than local check. FCR-15 variety recorded highest yield of 1920 kg/ha with 22.2% average increased yield over the Siri which gave 1571 kg/ha. Yield improvement due to use of FCR-15 in tobacco was also reported by Sheshu Madhav *et al.* (2023) ^[8], Babu *et al.* 2023 and annual report of ICAR-NIRCA, 2024.

Extension gap of 219, 460 and 367 kg/ha were observed during 2021, 2022 and 2023 respectively. On an average extension gap under three-year OFT programme was 349 kg/ha that is the gap between OFT variety FCR-15 and locally grown Siri variety. Reduced extension gap and technology gaps due to use of FCR-15 were also reported by Babu *et al.* 2023 ^[3].

The technology gap of 1080 kg/ha was recorded in FCR-15

variety and in case of Siri it was 1929 kg/ha i.e., yield gap between demonstrated technology and potential yield that could still to be minimized with favorable climatic and soil factors. Similar results were also expressed by Babu *et al.* 2023 ^[3].

The technology index shows the feasibility of the variety at farmer's field. The lower the value of technology index more is the feasibility. Data in Table 5 revealed that the technology index was 36.0% in FCR-15 variety where as it was 55.1% in Siri variety suggesting the superiority and better performance of FCR-15 compared to local. It shows more feasibility of new variety disseminations in state. Better performance of FCR-15 variety was also reported by Babu *et al.* 2023 ^[3] in his research study conducted in Prakasam district of Andhra Pradesh.

Table 6: factors contributing for significant performance of FCR-15 over Siri

Sn	Parameter	Mean score		Mean difference	Z-Cal value
		FCR-15	Siri		
1	Leaf Length(cm)	58.75	55.5	3.25	2.94**
2	leaf breadth (cm)	29.6	26.5	3.1	3.15**
3	leaf weight (g)	48.0	38.75	9.25	6.84**
4	Inter nodal length (cm)	4.38	3.8	0.58	1.56*
5	Plant Height (cm)	158.6	132.0	26.6	5.47**
6	Harvest Interval (Days)	7.08	4.91	2.17	3.87**
7	Economic curable leaves/plant	26.4	22.3	4.1	4.13**
8	Days to maturity (No.)	51.3	51.16	0.14	0.58 NS
9	Yield (kg/ha)	1920	1571	349	6.84**

** significant at 0.01 probability * significant at 0.05 probability NS - Non Significant

In order to find out significant factors contributed for the better performance of demonstrated variety FCR-15 over Siri was 9 crucial parameters were taken in to consideration and they were subjected to statistical analysis. From the data presented in Table.6 it is evident that leaf length, leaf breadth, leaf weight, plant height, harvest interval, economical curable leaves and yield were found to be significant in FCR-15 compared to Siri at 0.01 level of probability. Whereas internodal length was significant at 0.05 level of probability and there was no significant

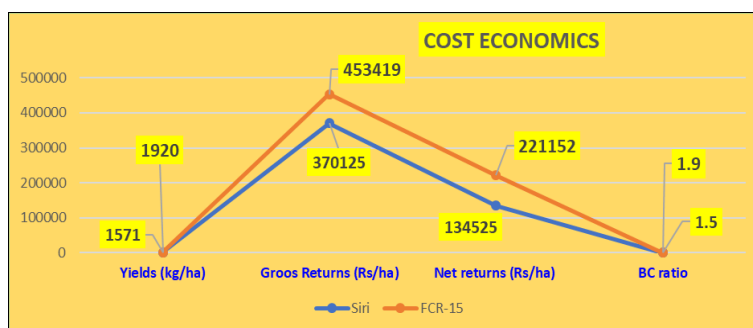
difference between FCR-15 and Siri vis-à-vis days to maturity. Based on this it could be concluded that the above factors were performed better in FCR-15 compared to Siri which have direct positive impact on net returns of the farmers and hence its adoption was very high (93%) with 3 years of its introduction. CTRI Sreshta variety having the ability to withstand rain damage during crop growth and also have more curable leaves was reported by Sarala *et al.* (2025) ^[7] and Sheshu Madhav *et al.* (2023) ^[8].

Table 7: Cost economics of FCR-15 over Siri during period of 3 years:

Year	Avg. Yields (kg/ha)		Cost of cultivation (Rs/ha)	Market price (Rs/kg)	Gross Returns (Rs/ha)		Net returns (Rs/ha)		BC ratio	
	FCR-15	Siri			FCR-15	Siri	FCR-15	Siri	FCR-15	Siri
2021-22	1671	1452	189542	182	304122	264264	114580	74722	1.6	1.4
2022-23	1998	1538	231575	226	451548	347588	219973	116013	1.9	1.5
2023-24	2092	1725	285684	289	604588	498525	318904	212841	2.1	1.7
Avg.	1920	1571	235600	232	453419	370125	221152	134525	1.9	1.5

The cost economics of FCR-15 FCV tobacco variety against traditionally grown Siri variety were estimated and the results have been presented in Table 7. The economic analysis of the data over the year revealed that FCR-15 FCV tobacco variety recorded higher gross returns Rs. 4,53,419/- and net returns Rs.2,21,152/- with Benefit Cost ratio 1.9 per hectare compared to local variety where gross returns were

Rs. 3,70,125/- and net returns Rs.1,34,525/- with Benefit Cost ratio of 1.5 clearly revealed that due to adoption of improved FCR-15 variety farmer obtained additional net return of Rs.86,627/ ha. Higher yields and profitability in growing FCV-15 tobacco varieties was also reported by Viswanatha Reddy, K. *et al.* (2024) ^[13], Babu *et al.* (2023) ^[3] and annual report of ICAR-NIRCA, 2023.



Graph 2: Cost economics of FCR-15 over Siri during period of 3 years

The higher net returns were due to various factors like higher leaf weight, leaf length, leaf breadth, plant height, more number of leaves per plant, more economically curable leaves lead to higher yields as well as higher market price obtained in the demonstration technology over control plots.

Impact of FCR-15 FCV tobacco variety: Impact refers to the long-term, tangible changes in behavior, knowledge,

skills, and socio-economic conditions (such as increased income or productivity) resulting from frontline extension and advisory services. It acts as a measure of effectiveness, assessing how well our technology achieves the ultimate objectives, such as adoption of new technology or improved quality of life. In this context the impact of FCR-15 FCV tobacco variety was assessed and given hereunder.

Table 8: Impact of FCR-15:

Component	SLS region	SBS region	Total	Area occupied by FCR-15	%
Cropped area	36,085 ha	36,260 ha	72,345	67,680 ha	(93%)
No. of Farmers covered	15,840	14,160	30,000	27,900	(93%)
Additional net income	Rs.86,627/ha net returns X 67680 ha area occupied in these regions			586.2 crores in these regions during 2023-24 financial year.	

The above table clearly shows that due to outstanding performance of improved FCV tobacco variety FCR-15 in both SLS & SBS regions within three years of its introduction it has spread to 93% of the area (67680 ha out of normal area of 72345ha) with adoption by 93% of the total FCV tobacco growers (27900 growers out of total

30000) in these two regions. Besides this net additional income of the FCV tobacco growers in these regions enhanced to Rs.586 crores per year (2023-24) which clearly indicated that Doubling Farmers Income (DFI) has been achieved due to adoption of this technology. Rapid spread of FCR-15 variety in SLS and SBS region was also reported

by Sarala, K. *et al.* (2023) ^[6], Babu *et al.* (2023), Tobacco Seed Production technology technical bulletin 04/2023 and Central Tobacco Research Institute @ 75 Years, technical bulletin 01/2023

Conclusion

Performance of FCR-15 FCV tobacco variety under demonstration were found be better than their respective local check Siri. The FCR-15 variety recorded highest yield of 1920 kg/ha with 22.2% average increased yield over the control. The economics analysis of the data over three years revealed that FCR-15 tobacco variety recorded higher gross returns Rs. 4,53,419/- and net returns Rs.2,21,152/- per hectare with B:C ratio 1.9 compared to local check variety Siri with Rs.3,70,125/- gross returns and net returns Rs.1,34,525/- per hectare with B:C ratio 1.5 wherein doubling farmers' income has been achieved. The additional net returns in FCR-15 demonstrated fields was Rs.86,627/- per hectare and Rs.586 crores in both SLS & SBS regions of the Andhra Pradesh. Further 93% of the FCV tobacco area and tobacco growers in these two regions have been occupied by FCR-15 variety within 3 years. Hence it could be concluded that due to adoption of improved FCR-15 variety farmers income have been doubled and their socio-economic status was enhanced.

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References

1. ICAR-NIRCA. Annual report. 2023:94. https://nirca.org.in/digital_library/images/Annual/Annual%20Report%202023.pdf
2. ICAR-NIRCA. Annual report. 2024:1. https://nirca.org.in/digital_library/images/Annual/Annual%20Report%202024.pdf
3. Babu GP, Venugopal Rao PVV, Gangadhar K, Anuradha M, Sheshu Madhav M. Impact of FCR-15 tobacco variety in Prakasam district of Andhra Pradesh. In: International Conference Frontiers in Tobacco and Commercial Agriculture Towards Preparedness for Future Farming; 2023:107. https://nirca.org.in/digital_library/pdf/2023/ISTS%20ICFTCA%20Abstracts%20Final.pdf
4. ICAR-Central Tobacco Research Institute. Central Tobacco Research Institute @ 75 years. Technical Bulletin No. 01/2023; 2023:12. https://nirca.org.in/digital_library/images/Technical%20Bulletin%201%20-%20CTRI%2075%20Years%20Jan%202023.pdf
5. Samui SK, Mitra S, Roy DK, Mandal AK, Saha D. Evaluation of frontline demonstration on groundnut. Journal of the Indian Society of Coastal Agricultural Research. 2000;18(2):180-183.
6. Sarala K, Gangadhar K, Prabhakara Rao K, Sheshu Madhav M, Shanti Nandivelu K, Srinivas M, *et al.* Varietal scenario and breeding efforts towards FCV varieties suitable to rainfed regions of Andhra Pradesh. In: International Conference Frontiers in Tobacco and Commercial Agriculture Towards Preparedness for Future Farming; 2023:26. https://nirca.org.in/digital_library/pdf/2023/ISTS%20ICFTCA%20Abstracts%20Final.pdf
7. Sarala K, *et al.* All India Network Project on Tobacco biennial report (2023-25); 2025:9. https://nirca.org.in/digital_library/images/Annual/AINPT%20Biennial%20Report%202024-25.pdf
8. Sheshu Madhav M, Kasturi Krishna S, Paul A, Hema B. Disruptive technologies of CTRI. ICAR-Central Tobacco Research Institute, Rajahmundry; 2023:1-100. https://nirca.org.in/digital_library/pdf/2023/Disruptive%20Technologies%20of%20CTRI.pdf
9. Tobacco Board. Annual report. 2022-2023:1-20. [https://tobaccoboard.com/tbdata/publicationsfiles/AR-2022-23\(English\).pdf](https://tobaccoboard.com/tbdata/publicationsfiles/AR-2022-23(English).pdf)
10. Tobacco Board. Annual report. 2023-2024:25-26. https://tobaccoboard.com/tbdata/pdf/TOB_ENGLISH_2023-24.pdf
11. ICAR-Central Tobacco Research Institute. Tobacco seed production technology: Success story of three decades. Technical Bulletin No. 04/2023; 2023:8. https://nirca.org.in/digital_library/images/Technical%20Bulletin%204%20-%20Tobacco%20Seed%20Production%20Technology-Success%20story%20of%20three%20decades.pdf
12. ICAR-Central Tobacco Research Institute. Vision 2050 for ICAR-CTRI, Rajahmundry; 2050:1. https://nirca.org.in/digital_library/4CTRI%20Vision%202050.pdf
13. Viswanatha R, Reddy K, Sheshu Madhav M, Sandeep K, Prasad LK. Economic analysis of FCV tobacco in southern light soil region of Andhra Pradesh. Tobacco Research. 2024;50(1):13-15.