CTRI Sulakshana: A High Yielding TMV Resistant and Aphid Tolerant Virginia Tobacco Variety for Black Soils of Andhra Pradesh

Complete Details of Technology: :

Flue-cured Virginia (FCV) tobacco grown in black soils and Southern light Soils of Andhra Pradesh is known for its neutral coloury filler character. For increasing and stabilizing the yield levels of these areas, ICAR-Central Tobacco Research Institute (CTRI), Rajahmundry has under taken breeding programme to develop aphid tolerant and TMV resistant high yielding tobacco variety suitable for these areas. A new high yielding, superior quality and pest resistant FCV cultivar was evolved through modified pedigree and back cross methods of breeding involving interspecific hybridization utilizing the cultivars, VT-1158, Hema and *Nicotianagossai*. After necessary trials, the cultivar was released in the name of "CTRI Sulakshana" for commercial cultivation at the 37thmeeting of AP State Seed Sub-Committee for Varietal Release conducted on 26.11.2018.

Plant of CTRI Sulakshana has semi erect habit, grows to above 2 m height, stem is light green to cream coloured and internode short to medium (5.5 cm on an average). The plant produces a total of 30 to 38 leaves with 27-33 economic leaves. Leaves are broadly elliptic, sessile, moderately recurved, light green cast in nature with medium auricle development. Leaf lamina is very long (~80 cm), broad (~42 cm), margin wavy and tip medium pointed with medium puckering. The cured leaf is lemon yellow to lemon-orange colour in lower plant positions and lemon-yellow to light orange in higher plant positions. Cured leaf is medium bodied, oily with good ripeness characteristics and good aroma. Flowers are medium pink with strong expression of corolla tips.

In the Initial Varietal Trials conducted at six All India Network Project centres during 2008-09 season, CTRI Sulakshanashowed significant superiority over better checks at four centres viz., Rajahmundry, Kandukur, Guntur and Jelugumilli with 19% in cured leaf over better check. In Advanced Varietal Trials conducted at three centres viz., Rajahmundry, Kandukur and Guntur, this variety showed 19% higher cured leaf over better check. In the comparative on-farm evaluation at 12 locations in SBS and SLS areas during 2013-14 season, CTRI Sulakshana gave 14-15 % higher cured leaf yield than the ruling variety, Siri. It possesses resistance to TMV under artificial inoculation, besides field tolerance to tobacco aphid and leaf blight. The physical and chemical characteristics of cured leaf of variety CTRI Sulakshana are in desirable range. The variety has good Smoke flavour profile with higher quantities of Geranyl *acetone,* Neophytadiene, Megastigmatrienone isomers and 3-Hydroxysolavetivone. Most of the parameters of Smoke and Blend analysis of CTRI Sulakshana were on par with check variety, Siri.

Advantages: CTRI Sulakshana has a yield potential of about 3300 Kg/ha under rain-fed conditions of Andhra Pradesh. Has 15% additional yield advantage than the existing varieties. CTRI Sulakshana is recommended to Black Soil tobacco growing areas of

Andhra Pradesh under conserved soil moisture condition. It is also suitable for cultivation under Southern Light Soils. Found to give stabile yield due to biotic stress tolerance. Farmer can get an additional income of Rs. 15,000 to 20,000/- kg/ha using this variety.

Brief Description of Technology Including Salient Features:

CTRI Sulakshana is a high yielding Flue Cured Virginia tobacco variety, developed through interspecific hybridisation. It has a leaf yield potential of 3300 kg/ha under normal conditions. The variety is resistance to Tobacco Mosaic Virus (TMV) and tolerance to Aphid. CTRI Sulakshana is recommended for cultivation in Black Soil tobacco growing areas of Andhra Pradesh under conserved soil moisture condition. It is also suitable for cultivation under Southern Light Soils. It has 15% additional yield advantage than the existing varieties. Found to give stabile yield due to biotic stress tolerance. Farmer can get an additional income of Rs. 15,000 to 20,000/- kg/ha using this variety. Physical and chemical characters of the variety are in acceptable range. The variety has good Smoke flavour profile with higher quantities of Geranyl acetone, Neophytadiene, Megastigmatrienone isomers and 3-Hydroxysolavetivone.

Benefits/Utility :

- CTRI Sulakshana is recommended for cultivation in Black Soil tobacco growing areas of Andhra Pradesh. It is also suitable for cultivation under Southern Light Soils.
- Variety is Resistant to Tobacco Mosaic Virus (TMV) and tolerant to Aphid
- Has good Smoke flavour profile with higher quantities of Geranyl acetone, Neophytadiene, Megastigmatrienone isomers and 3-Hydroxysolavetivone.
- Has 15% additional yield advantage over the existing varieties•
- Stabilisesyield due to biotic stress tolerance
- Farmer can get an additional income of Rs. 15,000 to 20,000/- kg/ha using this variety

Tobacco Hybrid, CH-3

Complete Details of Technology: :

The Flue Cued tobacco grown in Karnataka Light Soils (KLS) has unique demand in the international market as natural neutral filler.Increasing production cost over years has resulted increase in cost of cultivation and gradual reduction of farmers net income. In order to sustain the competitive edge in the exports production cost need to be reduced through lower cost of cultivation or higher productivity or both. With the objective to enhance the monitory benefits accrued to KLS farmers and sustain the export demand, a high yielding hybrid, CH-3 having superior quality and flavour characteristics has been developed by M/s ITC Ltd and ICAR-CTRI. CH-3 is a high yielding Cytoplasmic Male Sterile FCV tobacco Hybrid developed by crossing CMS Kanchan with P18-1, a FCV germplasm line.

The plant has semi erect habit and grows to a height of 185 cm under un-topped condition.It has green colour stem, very long, medium broad leaves and short to medium internodal length. Leaf has good puckering and frills. The leaf is medium green cast in nature and has a wavy lamina and acute to acuminate tip. Leaf is sessile with high auricle development. The plant produces a total of 28 to 32 leaves with 28 curable leaves. The hybrid has a cured leaf yield potential of 2700 kg/ha under Karnataka Light Soil condition. The physical and chemical quality characteristics are within the acceptable range. The cured leaf is lemon to lemon orange colour in lower plant positions and orange to deep orange colour in the higher plant positions. The leaf is medium bodied, oily with excellent ripeness characteristics and good flavour.

In replicated yield trials conducted during 2000 to 2004 at Pala village, HunsurTaluk, Mysore district, CH-3 yielded significantly higher cured leaf (22-28%) over Kanchan. During the year 2005, under adverse weather conditions (high rainfall and low sunshine hours),also, CH-3 performed well over check Kanchan, with 23% higher cured leaf yield with better grade out turn. Under Initial Varietal Trials (2006),the hybrid, CH-3 showed promise over Kanchan at CTRI Research Station, Hunsur and AINRPT Centre, Shimoga in terms of cured leaf yield and TGE. In Advanced Varietal Trial (2007 & 2008) at CTRI Research Station, Hunsur, the hybrid, CH-3 showed promise over the check variety with 7% increase in cured leaf yield and 8% increase in top grade equivalent. At AINRPT Centre, Shimoga the hybrid, CH-3 was significantly superior over the check, Rathna in all the yield parameters. In bulk evaluation trials (2008 & 2009) at CTRI Research Station, Hunsur the hybrid, CH-3 recorded an increase of 21% in cured leaf yield and 26% increase in TGE over Kanchan.

In the on-farm trials conducted during five seasons (2004 to 2008) across Mysore area, thehybrid showed 12-36% increase in cured leaf yield over Kanchan. The hybrid was also reported to perform better than check, Kanchan in low rainfall areas in KLS region, as opined by the farmers. The hybrid, CH-3 showed similar level of pest andincidence like the control, Kanchan under field conditions.

The hybrid, CH-3 produced 76% mature to ripe leaf as compared to 73% in Kanchan in a study conducted to assess the performance related to leaf maturity. Chemical analysis data revealed that percentage of nicotine (1.03-2.89), reducing sugars (13.9-20.2) and chlorides (0.04-0.30) are in desirable range and at par with Kanchan. The hybrid, CH-3 also proved superior to check Kanchan in sensory evaluation of smoke in cigarettes. Smoke test data and Manufacturability test revealed that the hybrid, CH-3 possessed lower tar content than check, Kanchan. CH-3 recorded significantly higher values of neutral volatile flavor compounds than check, Kanchan, thereby indicating that it is a flavourful hybrid and suitable for exports. In storage & manufacturability tests, the hybrid, CH-3 was graded on par with Kanchan in parameters taken for the study.

Advantages: The hybrid, CH-3 has desired plant type and cured leaf traits such as more leaf width, better leaf maturity, ripeness, colour and spotting; higher yield potential, superior smoke profile, lower tar content and higher flavor as compared to the ruling variety, Kanchan. Also, farmers opined that hybrid, CH-3 performs well under low rainfall. In view of its overall superior performance, trade preference and farmers acceptance, the hybrid, CH-3 is released for commercial cultivation in Karnataka Light Soils.

Brief Description of Technology Including Salient Features:

CH-3 is a flavourful high yielding Cytoplasmic Male Sterile FCV tobacco Hybrid developed by crossing CMS Kanchanwith P18-1, a FCV germplasm line. The plants of CH-3 produces a total of 28 to 32 leaves with 28 economic leaves. The hybrid has a potential of 2200 to 2700 kg/ha under Karnataka Light soils. The cured leaf produces lemon to lemon orange colour in lower plant positions and orange to deep orange colour in the higher plant positions. The leaf is medium bodied optimally spotted, oily with excellent ripeness characteristics and good flavour. The percentage of nicotine, reducing sugars and chlorides are within the acceptable range. The hybrid was rated higher to control in the sensory evaluation of cigarettes. The smoke test revealed that the hybrid, CH-3 possesses lower tar content than check, Kanchan. The analysis of flavor compounds also showed considerably higher neutral volatile compounds in the hybrid than check, Kanchan and hence can be considered as flavourful. In view of its overall superior performance, trade preference and farmers acceptance, the hybrid, CH-3 is release for commercial cultivation in Karnataka Light Soils.

Benefits/Utility :

- CH-3 is high yielding flavourful tobacco suitable to Karnataka light soils
- CH-3 possess lower tar than control variety
- CH-3 performs well under low rainfall condition
- Has > 20% additional yield advantage over the existing varieties
- Farmer can get an additional income of Rs. 30,000/- kg/ha using this hybrid

Insecticide baits for management of tobacco caterpillar, Spodopteralitura

Complete Details of Technology: :

Tobacco caterpillar, *Spodopteralitura* is the key pest of tobacco both in nursery and planted crop. Management of the pest with foliar sprays of insecticides under outbreak situation, cyclonic weather conditions and in grown up crop is a problem. Under such situations insecticide baits have been recommended for management of the pest. However, the baits with chemical insecticides viz., chlorpyriphos, monocrotophos and carbaryl are not eco-friendly and pose a hazard when used indiscriminately. Hence, there is need to search for alternative eco-friendly baits for management of the pest. A replicated field experiment was conducted for three seasons (2009-12) in planted flue cured Virginia tobacco cv Kanchan. Baits were prepared with the test insecticide +rice bran+ jaggery+ water and applied in the leaf axils of the plant at 60 days after planting (DAP) in FCV tobacco.

The insecticides used in the bait were lufenuron 5 EC @ 30 g a.i. /ha, novoluron 10 EC @ 50 g a.i. /ha, emamectin benzoate 5 SG @ 11 g a.i. /ha Sl NPV @ 1. 5 X 1012 PIBs/ha + boric acid 1%, *Bacillus thuringiensis* (B.t.k.)1 kg + potassium carbonate@ 375 g/ha and compared with chlorpyriphos 20 EC @ 500 g a.i./ha bait. Pooled analysis data showed that the infestation was least (10.64%) in the plots treated with emamectin benzoate bait at 4 days after treatment (DAT) followed by novoluron bait treated plots (12.26%) which was on par with lufenuron treated plots (13.60%). All the three treatments were significantly superior to chlorpyriphos bait treated plots (16.36%). At 10 DAT emamcetin benzoate treated plots continued to be the least infested (10.64%) followed by that in novoluron treated plots (12.26 %) both of which were superior to all other treatments except that of novoluron. As regards to the mean number of leaves damaged, emamectin benzoate recorded least number of leaves damaged both at 4 and 10 DAT. It remained on par with novaluron at 4 DAT and was significantly superior to all the treatments at 10 DAT.

The per cent leaf area damaged was also least in emamectin benzoate treated plots both at 4 and 10 DAT (8.43% & 9.59%) which was significantly superior to all the treatments except to that of chlorpyriphos (9.75 & 10.62) which was found to be on par with novoluron and lufenuron treated plots both at 4 and 10 DAT. The highest (1982 kg/ha) cured leaf yield was recorded in emamectin benzoate bait treated plots followed by that in Novoluron treated plots (1931) which was on par with that of lufenuron bait treated plots.

Brief Description of Technology Including Salient Features:

Baits prepared with novaluron, lufenuron and emamectin benzoate along with rice bran and jaggery were found highly effective against *S.litura* as shown by less infestation, leaf damage and higher yield parameters on FCV tobacco. Emamectin benzoate bait treatment recorded highest cured leaf yield (1982 kg/ha) and net returns (₹ 1,39,966/ha) with an ICBR of 1:16.28 where as novaluron and lufenuron bait treated plots recorded 1931 & 1812 kg cured leaf yields per hectare with net returns of ₹ 1,34,203 & 1,20,756 and ICBR of 1:14.83 and 1:11.48 respectively.

Benefits/Utility : :

The baiting technology will avoid blanket application of insecticides and contribute in reduction in pesticide pollution. The baiting technology has direct relevance to IPM under outbreak situations and cyclonic weather conditions as it will avoid repeated blanket application of insecticides, conserve the natural enemies and contribute to the reduction in pesticide pollution due to drift and water pollution. *Spodopteralitura* is the key pest of several crops viz., tobacco, groundnut, chilli, pulses, sunflower, soybean in India and this technology is applicable in all these crops along with tobacco.

Management of ground beetle, Mesomorphusvilliger in FCV tobacco

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Complete Details of Technology:

Tobacco ground beetle, Mesomorphusvilliger is one of the important insect pests of tobacco. It causes damage by gnawing the tender stem of the seedlings immediately after transplanting, resulting in death and thereby creating gaps in the field, sometimes to an extent of 50-60% of the area. In view of the problems in its control, new insecticides and methods of application for management of the pest were evaluated in a field experiment for two seasons. The results indicated that at 30 days after planting (DAP), the treatment comprising seedling root dip in imidacloprid 70 AF @ 0.14% before transplanting + foliar spray (FS) of imidacloprid 200 SL @ 0.005% at 5 days after planting recorded the least plant mortality (3.5%) followed by Seedling root dip in imidacloprid 70 AF @ 0.14% (7.01%) and Imidaclorpid 200 SL @ 0.005% in transplant water (8.49 & 11.99%). Data on yield parameters showed that Seedling root dip in imidacloprid 70 AF @ 0.14% + FS of imidacloprid 200 SL @ 0.005% at 5 DAP recorded the highest mean cured leaf yield (2465 kg/ha) followed by Seedling root dip in imidacloprid 70 AF @ 0.14% before transplanting (2420kg) and application of imidaclorpid 200 SL @ 0.005% in transplant water (2388 kg/ha). The experimental results indicated that ground beetle M. villiger could be managed in Virginia tobacco with seedling root dip in imidacloprid 70 AF @ 0.14% before transplanting + foliar spray (FS) of imidacloprid 200 SL 0.005% at 5 days after planting or seedling root dip in imidacloprid 70 AF @ 0.14% or transplant water treatment with imidacloprid 200 SL @ 0.005%.

Brief Description of Technology Including Salient Features:

A replicated field trial was conducted for two seasons in planted flue cured Virginia tobacco cv. Siri at the institute research farm, during 2013-15 to evaluate the efficacy of eight treatments viz., T1- Foliar spray (FS) of imidacloprid 200 SL @ 0.005% on the seed bed 1 day before transplanting, T2-Seedling root dip in imidacloprid 70 AF @ 0.14% for 30 minutes just before transplanting, T3 Imidaclorpid 200 SL 0.005% in transplant water, T4-Foliar spray of imidacloprid 200 SL 0.005% a day after transplanting (DAP), T5- T2 + FS of imidacloprid 200 SL 0.005% 5 DAT, T6- T1 + T5, T7- Neem cake application @ 5g/plant, T8- FS of tray seedlings 1 day before transplanting with imidacloprid 200 SL @ 0.005% and Untreated Control.

Benefits/Utility

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Freshly transplanted tobacco seedlings can be protected from ground beetle damage that results widespread mortality and gaps in the field. The technology not only saves money to the farmers in terms of replanting of tobacco seedlings in the gaps but also helps in rising uniform crop and aid in production of uniform, quality tobacco without pesticide residues. As indiscriminate use of insecticides is avoided in the early crop growth stage, the technology not only saves money but also protect the environment.

Soil Test Crop Response Based Fertilizer Recommendation for Yield Targets of FCV tobacco in Northern Light Soils of A.P.

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Complete Details of Technology:

Rationale Soil testing as a tool for judicious fertilizer use is a well-recognized practice all over the world which takes care of too little, too much or disproportionate applications of nutrients. The soil testing and fertility management programmes have been given adequate importance for sustaining crop production and balanced fertilization in Indian agriculture. After introduction of high yielding varieties and hybrid crops, the need for systematic soil test crop response research in different soil Agro-Climatic regions become evident. ICAR established the AICRP on STCR in 1967 and the STCR concept was developed by Ramamoorthy et al., during 1967. STCR provides the relationship between a soil test value and crop yield.

The soil test values are needed to be correlated with actual crop response obtained under field conditions. Concept of STCR and Targeted Yield The approach is aiming at precise quantitative adjustment of fertilizer doses under different soil test values and response conditions of the farmers and for a given targeted yields.

The fertilizers will be recommended based on the following criteria.

- Fertilizer recommendations based on regression analysis approach
- Recommendations for certain % of maximum yield Methodology To develop the prescription equations for fertiliser nutrient requirement for a targeted yield following basic data is required which is to be generated through standard STCR field experimentation methodology.
- Nutrient requirement (NR) in kg per quintal of the produce • Percentage contribution from soil available nutrients (Cs)
- Percentage contribution from added fertilizers (Cf) towards making effective fertilizer prescriptions for specific yields. Adjustment equations for required fertiliser nutrient for a given yield target i.e cured leaf (q ha-1):

Fertiliser N/P_2O_5 /K2O = NR / (Cf /100) * T - Cs / Cf x STV Where,
F = Fertilizer (kg ha-1);
NR = Nutrient requirement; Cs = Per cent contribution from soil;
Cf = Per cent contribution from fertilizer; STV = Soil test value (kg ha-1);
T = Yield target (q ha-1).

STCR based Online Fertiliser Recommendation software has been developed by linking the Fertiliser Nutrient Prescription Equations for FCV Tobacco in NLSin the form of a website with two main modules viz., Administrator and ‘User’.The ‘User’ module classified into three menus viz., Farmer details, Field / Crop details, Soil test data and yield target. Range of yield targets for respective

region was given which were to be selected by the user. Once the ‘submit’ button is selected report will be generated for the selected yield target for FCV tobacco farmers of NLS region.

Brief Description of Technology Including Salient Features:

Technology:

• STCR based fertilizer prescriptions equations and On-line fertilizer recommendation system for FCV tobacco in Northern Light Soils of Andhra Pradesh.

Salient features:

• Provide anefficient and profitable site-specific fertilizer recommendation for increased crop production and for maintenance of soil fertility.

• Aims to provide balanced, efficient and profitable nutrient application rates for pre- set yield targets giving due consideration to basic fertility status of soil.

Benefits/Utility :

• Farmers of a specific agro-climatic region can get the fertiliser recommendation for their fields using soil test values for a desired yield target of FCV tobacco.
• Report of fertiliser recommendation can be generated online and same can be taken as a hard copy from any place

Soil fertility assessment and Spatial mapping of FCV tobacco soils in NLS region

Complete Details of Technology: :

Rationale and Methodology: Nutrient status in soils are depleting due to continuous mining of nutrients without replenishment and affecting sustainable productivity of a soil. Assessment of soil fertility including micronutrients in areas growing commercial crops is essential to manage the nutrient availability and enhance production levels. Especially, Efficient use and management of Nitrogen and Potassium is essential in FCV tobacco as they play a key role in improving the yield and quality. Micronutrient Zn and Cu are very important for getting high yield and maximum percentage of top quality of tobacco. Hence, it is important to know the variation of soil properties in a spatial scale of an area or a region which help in identifying hot spots and specific zones of interest. Spatial thematic mapping of soils using GIS as a tool is the better way to observe the variation which support in developing strategies for managing inputs, soil and crop interventions to improve production and productivity. Therefore, to assess the soil fertility and develop thematic maps of the area field level soil samples and Geo reference points were collected from FCV tobacco representative villages (116) in NLS region of West Godavari district of Andhra Pradesh.

With the help of laboratory data and GIS software soil fertility status was assessed and maps developed. Soil fertility status: Soil pH of Northern Light Soils are mostly moderately acidic in nature with a mean value of 6.43. The electrical conductivity (E.C) values showed that the soils are well within the salt free limits (0.01 to 0.6 dS m^{-1}). The mean value was 0.07 dS m^{-1}.The mean per cent organic carbon and mean available nitrogen contents of NLS were 0.27 per cent & 106.0 kg/ha, respectively.The average available phosphorus of NLS was 89.6 kg/ha. While, mean available potassium content was 276 kg/ha. The % distribution of available K status showed that 9 % samples are in low, 48 % samples are in medium and 43 % are in high status.The available zinc in the soils ranged from 0.03 to 9.57 ppm. 22 % samples are in very low range and 51 % samples are in low range (< 0.6 ppm).

Available copper content was very low to low class (25 % samples) i.e 0.0 - 0.30 ppm. The available iron and manganese contents are in the range of 2.13 to 94.04 ppm and 3.34 to 56.3 ppm respectively and are mostly in high to very high class. Acidic pH conditions and Fe and Mn containing parent material of the soils led to higher availability of these two micronutrients. Soil fertility maps: Spatial maps depicted that available nitrogen is low except in some heavy soils under APF: Devarapalli. Nitrogen was much lower in sandy soil areas under APF JangareddyGudem-I and II compared to other areas. Spatial variation showed that the available phosphorus status was high throughout the region.

Except very few soils under APF JangareddyGudem - II where the soils are medium in P status. Available potassium status was medium to high in the region. It varied from medium status (120 – 280 kg ha-1) in light soil areas under JangareddyGudem-I, II and Devarapalli to High (> 280 kg ha-1) in medium to heavy textured red and alluvial black soils under APF: Koyyalagudem, Gopalapuram and Devarapalli. Lower available zinc levels observed spatially in almost all the soils under different platforms except in few soils under JangareddyGudem-I, Koyyalagudem and Gopalapuram. Few heavy textured soils under APF: Devarapalli and Koyyalagudem showed lower Zinc levels compared to the other areas.

Brief Description of Technology Including Salient Features:

Technology:

- Assessed soil fertility and their spatial maps of FCV tobacco soils of NLS using Global Positioning System and Arc GIS as a guiding tool in monitoring different macro and micronutrient levels of soils in a spatial manner.

Salient features:

- The Northern Light Soils under FCV tobacco were low in both per cent organic carbon and available nitrogen status
- The Northern Light Soil area under FCV tobacco was high in available phosphorus status
- The available potassium status was medium to high in Northern Light Soil area under FCV tobacco
- Among available micronutrients, available zinc is very low to low in 73 % samples followed by available copper where 25 % samples are in very low to low status
- The soil available Chlorides are below the critical limits with a mean value of 45 ppm.

Benefits/Utility :

It helps to develop production management strategies of inputs, soil and crop interventions in FCV tobacco in NLS region.

Poly Carbonate Roof Chamber : A fuel saving device in FCV tobacco curing through solar energy harvesting

Complete Details of Technology: :

Tobacco, the golden leaf is one among the leading commercial crops in India with a cultivated area of 0.47 million ha, producing 800 million kg annually. Of the total tobacco production, the Flue-cured Virginia (FCV) tobacco is grown in 1.5 lakh hectares and accounts for about 30% (240 m kg) of total tobacco production. Post-harvest drying of FCV tobacco leaves is done through a process of flue curing in a specially constructed structures called 'Barns' under controlled conditions by regulating the temperature and humidity to obtain desired leaf quality. Annually for FCV tobacco curing a total quantity of 1.0 million kg wood is consumed that results in deforestation and also represents a serious environmental issue. Exploiting solar energy use for tobacco curing is one of the options available to reduce dependency on fuel wood. A polycarbonate roof chamber as a solar energy collector was evaluated for three consecutive years (2016-2019) at CTRI Research farm Katheru to evaluate its efficacy in harnessing the solar energy as supplement to wood fuel for curing the FCV tobacco at CTRI Research farm Katheru.

Designed a roof top chamber of 2ft height with polycarbonate sheet (1.2mm thick) mounted on a iron frame over the existing curing barn (24'x16'x10.6') roof (PCRC) with metal sheet over the barn as an solar radiation absorber. A provision for air circulation was made through a duct from the barn top. The tin sheet surface of the barn was painted with black colour for increasing the absorption efficiency of solar radiation. Curing barn with PCRC was compared with traditional curing barn with wood exclusively as a fuel for curing FCV tobacco. Fixing PCRB on the barn resulted in a temperature rise of 86^0F inside the barn due to trapping the solar radiation through greenhouse effect.

A consistent raise in temperature was recorded in upper tiers inside poly carbonate roof barn compared to conventional barn. The temperatures of Tin sheet on the top of curing barn ranged from 117-125^0F in the traditional barn and in PCRC barn 134-155^0F because of which the leaf temperatures maintained inside the PCRB were high (96-131^0F) during the curing process compared to traditional barn (90-127^0F) which hastened the curing process there by reduced the wood fuel consumption. Physical and chemical (nicotine, reducing sugars, chlorides) and biochemical (starch, rutin and chlorogenic acid) parameters in cured leaf remained unchanged due to the polycarbonate roof chamber over the barn.

Wood consumption per one kg cured leaf was 3.13-3.99 kg with poly carbonate roof barn against 4.39 - 5.66 kg in traditional barn. About 22-29% wood was saved due to harnessing the solar energy by the polycarbonate roof chamber compared to traditional barn.

Brief Description of Technology Including Salient Features:

Polycarbonate roof chamber as a solar energy collector was evaluated for three consecutive years (2016-2019) at CTRI Research farm Katheru to evaluate its efficacy in harnessing the solar energy as supplement to wood fuel for curing the FCV tobacco at CTRI Research farm Katheru. Designed a roof top chamber of 2ft height with polycarbonate sheet (1.2mm thick) mounted on a iron frame over the existing curing barn (24'x16'x10.6') roof (PCRC) with metal sheet over the barn as an solar radiation absorber.

A provision for air circulation was made through a duct from the barn top. The tin sheet surface of the barn was painted with black colour for increasing the absorption efficiency of solar radiation. Fixing PCRB on the barn resulted in a temperature rise of 60^0F inside the barn due to trapping the solar radiation through greenhouse effect. A consistent raise in temperature was recorded in upper tiers inside poly carbonate roof barn compared to conventional barn.

Physical and chemical (nicotine, reducing sugars, chlorides) and biochemical (starch, rutin and chlorogenic acid) parameters in cured leaf remained unchanged due to the polycarbonate roof chamber over the barn. Wood consumption per one kg cured leaf was 3.13-3.99 kg with poly carbonate roof barn against 4.39 - 5.66 kg in traditional barn. About 22-29% wood was saved due to harnessing the solar energy by the polycarbonate roof chamber compared to traditional barn.

Benefits/Utility :

About 22-29 % wood fuel can be saved by harnessing the solar energy through polycarbonate roof chamber. Approximately 0.25 million tonnes of wood can be saved annually which reduces the deforestation to that extent. Farmer gets a additional benefit of Rs 4750/- per barn per year.

Tobacco stalk Biochar as a soil amendment

Complete Details of Technology: :

The tobacco stalk biochar (TS Biochar) was produced from tobacco stalk biomass (TS Biomass) through the process of pyrolysis. The TS Biochar production parameters (heating temperature and duration) were optimized at ICAR-CIAE, Bhopal, India. The TS Biochar used in this investigation was produced by pyrolysing TS Biomass at a temperature of 500 0C and holding time of 90 minutes (giving a biochar yield of 40%). and analyzed for important characteristics. Laboratory and field experiments were conducted to assess the effectiveness of TS Biochar vis-à-vis other amendments viz., untreated TS Biomass and synthetic zeolite (SZ). A laboratory leaching experiment was conducted in duplicate to study the N and K leaching losses as affected by tobacco stalk biochar (TS Biochar) and synthetic zeolite (SZ) as soil amendments. The treatments included: T1: N+K, T2: N+K+TS Biochar, T3: N+K+ SZ, T4: N+K+TS Biochar + SZ, T5: TS Biochar and T6: Control. The leachate samples were collected after every leaching event and analyzed for pH, ammonium and potassium contents.

The dynamics of soil pH, N and K fertility of an Alfisol amended with different organic and inorganic soil amendments were assessed in a 90- day incubation experiment in two factor completely randomized block design with eight treatments, eight different days of incubation and with three replications. The soil amendments tested were tobacco stalk biochar (TS Biochar), tobacco stalk biomass (TS Biomass) and synthetic zeolite (SZ). The treatments for incubation experiment included: T1 (100% RDF), T2 (100 % RDF+1 t ha^{-1} TS Biochar), T3 (100 % RDF+ 250 kg ha-1 SZ), T4 (100 % RDF+1 t ha-1 TS Biochar+250 kg ha^{-1} SZ), T5 (100 % RDF +0.5 t ha^{-1} TS Biomass), T6 (1 t ha^{-1} TS Biochar+250 kg ha^{-1} SZ), T7 (1t ha^{-1} TS Biochar) and T8 (Control). The sub-samples of soils were drawn eight times at pre-decided intervals (1, 7, 15, 30, 45, 60, 75 and 90 days) during the course of incubation and analysed for soil properties. Fertilizer nutrients, especially N and K, once applied to light textured sandy soils are vulnerable to losses through leaching. A field experiments with flue cured virginia (FCV) tobacco as a test crop was conducted at ICAR-CTRI, Rajahmundry, Andhra Pradesh. It was laid in randomized block design with eight treatments and three replications.

The treatments included 2 organic amendment treatments (1 t ha^{-1} TS Biochar) and (0.5 t ha^{-1} TS Biomass) combined with 100% RDF, inorganic amendment (250 kg ha^{-1} SZ) with 100% RDF, adjusted dose of N and K + 1 t TS Biochar ha^{-1}, combination of both organic (1 t ha^{-1} TS Biochar) and inorganic (250 kg ha^{-1} SZ) soil amendments with 100 % RDF, 100 % RDF alone, combination of TSB and SZ alone, and the control. The 8 treatments in all were tested in a RBD with 3 replications. Growth parameters like plant height no. of leaves and leaf area index were recorded at 60 DAT. Plant samples collected at 60, 75 DAT and harvest were assessed for their nutrient content. Tobacco leaf yields and leaf

quality (in terms of nicotine, reducing sugars and chlorides) were recorded. Nutrient uptake and use efficiency parameters were calculated. Final soil samples were collected depth wise and analyzed for soil properties. Experimental results revealed that optimum conditions for complete charring of tobacco stalk biomass were attained at a temperature of 500^0C and holding time of 90 minutes with the yield recovery of 40%. Biochar yield tended to decrease with increase in reactor temperature and holding time.

TS biochar showed the enrichment of the carbon and nutrients owing to mass reduction by 2.5 times. The FTIR spectrum of TS Biomass indicated the lignocellulosic nature coupled with various polar functional groups, while that of TS Biochar showed degradation of broad peak around WN 3340 cm^{-1} (resulting in degraded broad peak around WN 3030 cm^{-1}) thereby indicating dehydration of biomass structure and cleaved of phenolic groups at high temperature (500 0C). Vibration in the frequency range of WN 1100 cm^{-1} to WN 1500 cm^{-1} represented peaks for carbonate and carbonate-carboxyl, and WN 1660 cm^{-1} to WN 1670 cm-1 showing the peaks for carboxylic acid. Peaks at WN 1555 & WN 1613 cm^{-1} represented basic groups such as quinones.

Effect of soil amendments on soil pH indicated that among all the treatments maximum increase in pH was recorded in T6 (1 t ha^{-1} TS Biochar+250 kg ha^{-1} SZ) followed by T7 (1 t ha^{-1} TS Bbiochar). These results clearly demonstrated that TS Biochar serves as a very effective liming agent for acid Alfisols. Results on leaching experiment indicated that treatments including TS Biochar recorded higher pH values of the leachates than the treatments without TS Biochar. The per cent inhibition of leaching of applied ammonium and potassium by tobacco stalk biochar was 28.10 and 25.28%, respectively. Field experiment with FCV tobacco grown on an Alfisol under irrigated conditions revealed that the application of TS Biochar + 100% RDF and TS Biochar + SZ + 100% RDF resulted in a significant increase in tobacco leaf yield compared to the 100% RDF. The relative yield obtained with soil amendments ranged from 92 to 123%.

The highest uptake of nitrogen (84.56 kg ha^{-1}) and potassium (122.73 kg ha^{-1}) by tobacco was observed in T2 (100% RDF+1 t ha^{-1} TS Biochar). Recovery efficiency of N and K applied was greater in tobacco stalk biochar soil amendment with 50.78 and 77.83 per cent as against 100 % RDF alone with 32.83 and 49.64 per cent, respectively, indicating that the tobacco stalk biochar can serve as soil amendment for minimizing nutrient leaching losses in light textured Alfisols. All treatments with TS biochar also improved the soil quality as evident from increased nutrient availability, soil organic carbon content and relatively greater carbon management index (CMI).

Brief Description of Technology Including Salient Features:

Among different soil amendments organic soil amendment tobacco stalk biochar was rich in total organic carbon content. Per cent inhibition of leaching losses of ammonium and potassium from sandy soils was observed in case of TS Biochar soil amendment. Tobacco stalk biochar was characterized by rich carboxylate functional groups. Among the treatments, 100% RDF with 1 t ha^{-1} TS Biochar in FCV tobacco showed improvement in nutrient availability, growth, yield, yield attributes, uptake, use efficiency, quality and soil properties.

Tobacco stalk biochar also improved the soil quality which is evidenced from increased soil total organic carbon content and high carbon management index. From the research findings it was well understood that organic soil amendment TS Biochar prepared from TS Biomass can be used as soil amendment for improving the nutrient holding capacity of sandy soils. From the research findings it was also understood that application of TS Biochar along with recommended dose of fertilizer improved growth, yield, yield attributes, nutrient uptake and quality of tobacco. It acted as soil amendment and also an additional source of nutrients and there by increased the nutrient content, uptake and use efficiency of crop. Hence, from the study it can be concluded that application of tobacco stalk biochar (1 t ha^{-1}) along with 100% RDF can be recommended to improve yield and yield attributes of tobacco.

Benefits/Utility :

Application of TS Biochar along with recommended dose of fertilizer improved growth, yield, yield attributes, nutrient uptake and quality of tobacco. It acted as soil amendment and also an additional source of nutrients and there by increased the nutrient content, uptake and use efficiency of crop. Hence, application of tobacco stalk biochar (1 t ha^{-1}) along with 100% RDF can be recommended to improve yield and yield attributes of tobacco and it will have implications for improving nutrient use efficiency particularly of N & K under conditions of NLS and thereby reduce the cost of production.

EFFECT OF DRIP IRRIGATION AND TRAY SEEDLINGS ON FCV TOBACCO

Complete Details of Technology: :

FCV tobacco under irrigated alfisols conditions is cultivated by giving 12-13 furrow irrigations to the field crop amounting to 350 ha-mm. Irrigating the field crop with furrow irrigation will lead to leaching of nutrients from plant available root zone to unavailable deeper soil layers. The furrow irrigation will not provide optimum soil moisture all the time. Immediately after irrigation the soil may be having excess soil moisture above field capacity and just before irrigation, the field may have less available soil moisture. Both excess moisture and less available soil moisture will have deleterious effect on crop growth. Moreover, giving furrow irrigation is a labour intensive field operation and the labour supply is scarce now-a-days.

Giving irrigation through drip system will provide almost uniform soil moisture throughout the crop growing season and improves water use efficiency(WUE). Planting of poly tray seedlings in the field will promote advance crop by 10-15 days with very meager percentage of gaps and also lead to uniform crop growth and uniform maturity. Hence this study was taken up with aim of improving productivity and WUE. The experiment consisted of 9 treatments replicated five times in RBD with different combinations of drip irrigation, Furrow irrigation, tray seedlings, normal seedlings, drip fertigation and soil application of fertilizers at 3rd, 25-30, 40-45 days after planting or at 10, 25-30, 40-45 days after planting (DAP). The experiment was grown with a fertilizer dose of 120 kg N, 60 kg P_2O_5 and 120 kg K_2O/ha.

The experiment was planted in 2nd fort night of 2013 and 25th October, 2014 for two seasons as per the treatments. Drip irrigation+tray seedlings +drip fertigation at 3rd, 20-25 and 40-45 DAP followed by drip irrigation+tray seedlings +drip fertigation at 10, 25-30 and 40-45 DAP recorded higher green leaf yield, cured leaf yield, grade index, green leaf/cured leaf yield and grade index/ cured leaf when compared to other treatments. The treatment consisting of drip irrigation+tray seedlings+ drip fertigation at 3rd, 20-25 and 40-45 DAP increased green leaf yield by 3,556 kg (23.87%), cured leaf yield by 415 kg (16.67%) and grade index by 450 kg (23.44%) when compared with furrow irrigation+ normal seedlings+soil application of fertilizers at 10, 25-30 and 40-45 DAP . The treatment drip irrigation+trayseedlings+dripfertigation at 3rd, 20-25 and 40-45 DAP showed an increase of 0.38 (6.4%) in green leaf/ cured leaf ratio and 4.5 (5.89%) in grade index/cured leaf (%). Among all the treatments furrow irrigation, normal seedlings and soil application of fertilizers recorded the lower yields.

Brief Description of Technology Including Salient Features:

Drip irrigation+tray seedlings +drip fertigation at 3rd, 20-25 and 40-45 DAP followed by drip irrigation+tray seedlings +drip ferti-gation at 10, 25-30 and 40-45 DAP recorded higher green leaf yield, cured leaf yield, grade index, green leaf/cured leaf yield and grade index/ cured leaf when compared to other treatments. The treatment consisting of drip irrigation+tray seedlings+ drip fertigation at 3rd, 20-25 and 40-45 DAP increased green leaf yield by 3,556 kg (23.87%), cured leaf yield by 415 kg (16.67%) and grade index by 450 kg (23.44%) when compared with furrow irrigation+ normal seedlings+soil application of fertilizers at 10, 25-30 and 40-45 DAP .

The treatment drip irrigation+trayseedlings+dripfertigation at 3rd, 20-25 and 40-45 DAP showed an increase of 0.38 (6.4%) in green leaf/ cured leaf ratio and 4.5 (5.89%) in grade index/cured leaf (%). Among all the treatments furrow irrigation, normal seedlings and soil application of fertilizers recorded the lower yields. Inference:The tray seedlings with drip fertigation plot recorded increased cured leaf yield by 415 kg (16.47%) and grade index by 425 kg (23.5%) when compared with normal seedlings and furrow irrigation in bulk trial. The additional profit accrued due to tray seedlings, drip fertigation plot is Rs 25,285/- per ha with a B:C ratio of 1.823 and with 57.2% of total furrow irrigation water requirement thus showing 42.8% saving in irrigation requirement.

Benefits/Utility :

The additional profit accured due to tray seedlings, drip fertigation plot is Rs. 25,285/- per ha with a B:C ratio of 1.823 and with 57.2% of total furrow irrigation water requirement thus showing 42.8% saving in irrigation requirement.

Crop intensification for enhancing the profitability in *bidi* tobacco under middle Gujarat agro- climatic zone

Complete Details of Technology: :

Experiments were conducted during 2015-17 in bidi tobacco growing areas of middle Gujarat to find out the profitable cropping sequence. The experiment was conducted with six treatments viz., Tobacco (Kharif-Rabi) alone, Ground nut (Kharif) – Potato (Rabi), Maize (Kharif) – Potato (Rabi), Pigeon pea + Pearl millet (Kharif) – Cluster bean (Summer), Sesamum (Kharif) – Potato (Rabi) and Tobacco (Kharif-Rabi) – Pearl millet (Summer) and replicated four times under RBD design on Goredu soils during Kharif and Rabi soils.

Details of the varieties used in respective crops along with their spacing, fertilizer dosage and the season in which they are cultivated are given below No. Crop Variety Spacing (cm) Fertilizer (NPK, kg/ha) Season C1 Tobacco MRGTH 1 90 x 75 220 – 0 – 0 Kharif C2 Groundnut GG 2 45 x 15 25 – 50 – 0 Kharif C3 Potato KufriBadshah 45 x 25 180 – 80 – 40 Rabi C4 Maize HQPM 1 45 x 30 100 – 50 – 40 Kharif C5 Pigeon pea GT 1 90 x 30 25 – 50 – 0 Kharif C6 Pearl millet GHB558 45 x 15 80 – 40 – 0 Kharif C7 SesamumGujTill 1 45 x 15 37.5 – 25 – 0 Kharif C8 ClusterbeanGuj Guar 1 30 x 15 25 – 50 – 0 Summer Observations were collected on different yield parameters and the economics was calculated accordingly to find out the profitable cropping sequence

Brief Description of Technology Including Salient Features:

Tobacco – Pearl millet cropping system showed significantly higher tobacco equivalent yield in the individual years of the study i.e., 2015-17 (3610, 3902 and 3565 kg/ha) and also in pooled analysis (3692 kg/ha). Tobacco – Pearl millet cropping system recorded higher gross returns (149579 Rs. /ha) as well as net profit (81240 Rs. /ha). Based on the three years study, by taking into account the yield of different crops and also the economics, Tobacco – Pearl millet cropping sequence was recommended for bidi tobacco growing areas of middle Gujarat.

Benefits/Utility :

Tobacco – Pearl millet cropping system recorded higher values of tobacco equivalent yield (3692 kg/ha), gross returns (149579 Rs./ha) as well as net profit (81240 Rs./ha). Hence growing pearl millet was recommended as a succeeding summer crop to bidi tobacco for getting additional income in middle Gujarat

DRIP IRRIGATION FOR HIGHER PRODUCTIVITY IN CHEWING TOBACCO

Complete Details of Technology: :

Chewing tobacco is a commercial crop grown in around 8,000-10,000 ha. in Tamil Nadu. Normally, 20-25 irrigations (600-750mm) are given to the crop, since the economic produce being the leaf. The western and southern zone of Tamil Nadu, where tobacco is grown generally faces decline in water availability due to erratic distribution of rain fall and the farmers have to depend on the ground water. In last few years the ground water recharge has become poor and irrigating agricultural crops by conventional method has become a difficult task. In order to improve the water use efficiency (WUE) thereby productivity and bringing additional area under irrigation, drip irrigation plays a key role.

A field experiment was conducted at the experimental farm of CTRI, Research station, Vedasandur (latitude 100 32^0N longitude 770 57^0) during 2008-10. The soil of the experimental site was alfisols with alkaline pH (8.1). low in available N(210 kg/ha).,P (6.5 kg/ha) and medium in available K (275 kg/ha). The treatments comprised of drip daily and drip alternate days with 50,75 and 100%ETc, irrigation at 1.0IW/CPE and conventional method of irrigation. The experiment was conducted in a randomized block design with three replications. Farm yard manure 25 t/ha was applied as basal manure, ridges and furrows were formed at a spacing of 90 cm and 45 days old seedlings were planted at a spacing of 75 cm. Phosphorus 44 kg P/ ha as super phosphate was mixed with 2.5 t/ha of sieved farm yard manure and spot applied. The drippers were kept near the root zone of the seedlings and the pressure gauge was maintained at 1.5 kg/cm3. The recommended dose of fertilizer, 75:50:50 kg NPK/ha was given to the crop. Nitrogen was given in the form of urea in two splits at 45 and 60 days. Potassium was given as Muriate of potash at 45 days after transplanting. The N and K fertilizers were placed near the root zone. Irrigation was given as per the treatments.

Chewing tobacco ‘Abirami’ released from this station was used for planting. The ‘Abirami’ is a sun cum smoke cured type of tobacco with a medium inters nodal length (5.5 to 6.0cm diameter) and leaf with ovate, moderately puckered surface having prominent mid ribs and venation. First grade leaf yield (FGLY) with daily drip at 100% ETc and alternate day drip at 100% ETc was comparable. The yield recorded with daily and alternate day drip at 100% ETc were 2.54 and 2.48 t/ha respectively. The FGLY increase with daily drip at 100% ETc and alternate day drip at 100% ETc was 14 and 11% respectively over the conventional method of irrigation. Total cured leaf yield (TCLY) at daily drip at 100% ETc and alternate day drip at 100% ETc was comparable with each other. The TCLY recorded with

daily drip at 100%ETc and alternate day drip at 100% ETc were 3.43 and 3.37 t/ha respectively. The study indicated that drip irrigation daily or at alternate days at 100% ETc are comparable, with respect to yield and net returns. Considering the labour availability and feasibility, it could be concluded that alternate day drip at 100% ETc would be sufficient for higher productivity, profitability, better chewing quality and lamina chemical quality.

Brief Description of Technology Including Salient Features:

Field was plough 3 to 4 times, Farm yard manure 25 tonnes was basal manure ridges and furrows were formed at 90 cm and 45 days old seedlings was planted at a spacing of 75 cm. Phosphorus 44 kg P/ ha as super phosphate was mixed with 2.5 t/ha of sieved farm yard manure and spot applied. Three flood irrigations @ 30mm, totally 90 mm was given to all the treatments at the initial stage of the crop (0-25 days).

Drip irrigation was followed from crop development stage onwards. Main pipe lines were laid out followed by secondary pipe lines. Drip laterals 16 mm was fitted in the secondary pipe lines at a distance of 90 cm spacing. Drippers were fitted at 75 cm spacing near the plant root zones. The output per hour of dripper was 4 litres. The pressure was maintained at 1.5 kg/cm3.The drip irrigation was given based on the pan evaporation and effective rain fall. The drip was operated daily as well as on alternate days. Drip irrigation daily or at alternate days at 100% ETc are comparable, with respect to yield and net returns. Considering the labour availability and feasibility, it could be concluded that alternate day drip at 100% ETc would be sufficient for higher productivity, profitability, better chewing quality and lamina chemical quality.

Benefits/Utility :

8 to 10% increased yield over the conventional method of irrigation. Higher water saving (> 40%) and water use efficiency Better chewing quality and lamina chemical quality

ABIRAMI - A HIGH YIELDING SUN-CURED CHEWING TOBACCO VARIETY

Complete Details of Technology: :

ABIRAMI is a mutant chewing tobacco variety of I.64 (Monnai) base suitable for sun-cured Monnai tract as a replacement for I.64 (Monnai) and Bhagyalakshmi covering more than 10,000 ha in the sun-cum-smoke cured chewing tobacco belt of Tamil Nadu. It performed consistently well over the years both in the Research Station Farm and in outstation centers yielding 4078 kg/ha mean cured leaf. In the replicated yield trial conducted at CTRI Research Station, Vedasandur from 1986-2000, it recorded a mean yield of 4054 kg/ha cured leaf which is 8.95, 11.34 and 14.39% higher over the checks Meenaskhi, Bhagyalashmi and I.64 respectively.

In the bulk trials conducted at CTRI Research Station, Vedasandur from 1992-1997 it recorded 3028 kg/ha mean cured leaf yield, an increase of 7.07, 15.65 and 20.35% over the checks. Meenaskhi, Bhagyalashmi and I.64 respectively. At location bulk trials, from 1989 to 2001 the variety recorded mean cured leaf yield of 4078 kg/ha, an increase of 9.27, 13.97 and 18.89% over the checks Meenaskhi, Bhagyalashmi and I.64 respectively. The cultivar HV.86-5 (ABIRAMI) showed its superiority over Bhagyalashmi, Meenaskhi, and I.64 for chewing quality and economic returns as well as in terms of field tolerance to TMV and leaf curl disease attack. It has got the highest solanesol content (2.61%) and thus an ideal candidate for alternate use. It is also equally good for smoke-curing purpose. Hence it is chosen for identification based on the traders acceptance and consumers preference and farmer’s demand.

Brief Description of Technology Including Salient Features:

Significantly superior parent I.64, Meenakshi and Bhagyalakshmi in yield. Significantly superior to Meenakshi, Bhagyalakshmi and I.64 in station as well as location bulk trials. * Higher physical quality score. Comparable in chemical quality attributes. Less susceptibility scores for TMV and leaf curl. Significantly superior to Meenakshi in agronomic evaluation. Consistency in bulk performance (4078 kg/ha cured leaf) Favorable traders opinion. Favorable consumers score. Need for replacing the pure line variety I.64 (Monnai) and also Bhagyalakshmi to improve productivity for higher economic returns. Ready acceptance among farmers of I.64 (Monnai) tract as also sun and smoke-cured area of Bhagyalakshmi, Thangam and PV.7 Highest soloanesol content (2.61%) potential for alternate use.

Benefits/Utility :

Increased yield (200 kg/ha) when compared to other chewing tobacco varieties. Suited for three types of curing viz., Sun, Smoke and Pit curing.

MOBILE APP ON GOOD AGRICULTURAL PRACTICES FOR FCV TOBACCO

Complete Details of Technology

The app consists of four main modules viz., 'TOBACCO', 'SHARE' 'CONTACT' and 'ABOUT'.(different colors) TOBACCO module provides technical information on 'Good Agricultural Practices of FCV Tobacco' which in turn consists of three main modules viz., Nursery, Field Crop and Post-Harvest Management. 'Nursery' module has two sub modules viz., Conventional and Tray Nursery methods embedded with information on 'management practices, Insect pest and disease management' supported by good photographs. 'Field crop' module consists of information on production practices for different FCV tobacco zones viz., Northern Light Soils (NLS), Southern Light Soils (SLS), Black soils and Karnataka Light Soils (SLS),. 'Insect pest management, Disease management, Nutrient Management, Weed Management, Topping and sucker control, Harvesting and Orobanche Management. 'Nutrient Management' module is developed as a decision support system which allows the user to view the visual deficiency symptoms along with Corrective Measures.'Weed Management' module is a knowledge-based system which provides the information on Weed Description with good photographs and control. 'Post-Harvest Management' module provides the information on "Green leaf management, Curing, Bulking, Grading and Baling' of FCV tobacco with good photographs. SHARE' module provides hyperlink to access CTRI website. 'CONTACT' module provides contact details. 'ABOUT' modules provides the general information of CTRI.

Brief Description of Technology Including Salient Features:

ICAR-Central Tobacco Research Institute established in 1947 has done yeomen service to farming community through technology backstopping on myriad aspects of tobacco cultivation. Adoption of latest technologies in crop management is essential for achieving the goal of doubling the farmer's income as envisaged by Government of India. Latest technologies need to be disseminated to the farmers' doorstep and can be accessed instantly even in their fields. Currently, with the availability of ICT tools viz., mobile app and e-portals,

technology can be transferred more effectively with text, pictures, interactive software's for instant crop advisories etc. right into the hands of farmers. Such applications are more effective in case of tobacco crop as majority of the tobacco farmers are well educated and progressive. Now a days the farmers are using smart mobiles hence, technology dissemination strategies through mobile phones will an effective tool in real time for transmitting required agro-techniques and contingency measures. It is against this backdrop, ICAR-CTRI developed an android based mobile application on Good Agricultural Practices for FCV tobacco. The Mobile App is free to download for all the tobacco growers, trade and tobacco based officials through google play store. It is a icon based user-friendly menu driven application for easy and instant accessing of the FCV tobacco information. 'Share' option in the mobile app provides access to ICAR-CTRI website. Provides the information instantaneously as it contains different sub modules on various facets of tobacco production. Information is supported by good quality photographs which facilities the user for easy understanding and accessing. The software is embedded with Decision Support and Expert Systems for easy retrieval.

WebLocation/URL, if any:
https://play.google.com/store/apps/details?id=com.icar.ctri&hl=en

Benefits/Utility :
Android Based Static Mobile App was developed on Good Agricultural Practices of FCV tobacco for global accessing of the information through smart phones. Quick and instant accessing assist the tobacco farmers in semantic management of crop for achieving higher yields with desired quality It also helps in transferring the latest technology instantaneously.

AGRI-BIOMASS AS ALTERNATE FUEL FOR TOBACCO CURING

AINPT centre **:**Shivamogga

Tobacco type : FCV

Problem Situation

FCV tobacco is mainly grown in Karnataka and Andhra Pradesh wherein wood is the major source of fuel for curing of green leaf and to produce 240 plus million kg of cured tobacco, an estimated 1.0 million kg of wood is to used anunually. Due to the increase in scarcity of fuel wood and in view of environmental degradation, there is an imperative need for searching an alternative source of energy for curing FCV tobacco.

Technology Description

Experiments were conducted during 2007-13 in a simplex barn (13'x13'x13') at AINPT centre Shimoga with hopper type of furnace designed to burn the agri bio-wastes. A top slot was provided using cast iron pieces and enough slope was provided so that the bio-wastes put into the furnace slowly descend towards firing range. Locally available bio-wastes such as coffee husk, areca nut husk and maize rinds were used as fuel sources in different combinations. Among the bio-wastes, coffee husk had the maximum calorific value (3400 to 4200 k. cal/kg) and hence heat provided by it was high. In Integration of three kinds of bio-wastes 1.1+2.3+5.1 kg of coffee husk + areca husk + maize rinds were used per kg was superior to other bio resources and their combinations.

	
Traditional furnace	**Hopper type furnace**

Different sources of fuel consumption and calorie value for curing FCV tobacco

Fuel Source	Fuel consumption (kg /kg cured leaf)	Calorie used per kg cured leaf (k cal)
Wood	7.2	21600
Coffee husk	6.2	23560
Coffee husk + Maize rinds	3.0 + 6.2	26900
Coffee husk + Areca husk+Maize rinds	1.1 + 2.3 + 5.1	24290
Coffee husk + Areca husk +Maize rinds	0.23 + 4.2 + 6.3	22064
Areca husk + Maize rinds	4.39 + 6.29	29773

Recommendation

Farmers in Karnataka are recommended to use the local bio-wastes such as coffee husk, arecanut husk and maize rinds as an alternative source of fuel for curing of tobacco leaves which are an effective substitute for fuel wood.

TRAY SEEDLING PRODUCTION IN FCV TOBACCO

Complete Details of Technology: :

Mother trays : In tray seedling production unlike in conventional method, seedlings are raised on composted coir pith medium (coir pith alone or coir pith + FYM (3:1)) in mother trays (cement bins/trays/brick beds) for about 25-30 days under protected condition. Coir pith medium is to be fortified with single super phosphate @ 300 g of single superphosphate, 250 g ammonium sulphate, 150g potassium sulphate/100kg. Spraying of blitox @ 2g/l on the medium is be done as a precautionary measure to avoid soil born diseases. In these Mother trays sand is added at the bottom and only top 4' is to be filled with the coir pith medium. Before sowing lines are to be made with broomstick on the media and the seed is sown @ 0.4 -0.6 g/sqmt. Water application is to be done in the initial stage with sprayer two times a day.

Excess watering is to be avoided. Seeds start germinating from 5th day onwards and the germination will be completed by 7-8 days. Fertiliser spray with 10g each of Ammonium sulphate/CAN and potassium sulphate/10 litre is to be given two times @ 10 days interval after sowing. Seedlings will be ready for transplanting the trays by 20-25 days. Resetting in trays: Fortified coir pith is to filled tightly in the cells by periodical pressing in trays of 70/98 cells. Before filling coirpith is to be moistened by applying required quantity of water so that filling is easy. After filling, the trays seedlings of 20-25 days are planted in the trays by making a suitable hole using a nail or small stick. After planting the media around the seedling is to be pressed.

After resetting, the trays are to be kept in shade for 3-4 days. After that the trays are shifted to the raised beds in shade net (50%). Fertilisers are to be given three times at 5,20 and 25-30 days @ 100 ml,200ml and 300 ml of N and K (50g of CAN + 50 g of Sulphate of potash in one litre) in 10 litres rosecan/ 40 trays. Washing of the seedlings is to be done after fertilizer application. Three days after third dose of fertilizer application seedlings are to be kept outside shade for about 7 days for hardening. Thus healthy seedlings will be ready after 60-65 days. At this stage when it is pulled seedlings will come easily from the tray because the coir pith is covered by the root mass. Clipping can be done if the field conditions are not ready for planting. Three to four days before transplanting ridomil @ 2.5 ml/10 litre and Flue bendamide @ 20g/1o litre is to be sprayed to avoid subsequent mortality in the main field due to the incidence of leaf blight and stem borer.

Brief Description of Technology Including Salient Features:

A tray nursery technique has been developed and standardized to produce healthy tobacco seedlings to overcome disease problems and to preclude transplantation shock. The technique is simple and entails sowing tiny tobacco seeds on coconut coir pith compost and transferring the young seedlings of about

20-25 days to poly-trays for raising them on the growth media with standard nutrient and watering schedules.

The tray nursery seedlings take about 60-65 days from sowing to transplanting. Tray nursery seedlings offer the unique advantage of ensuring crop uniformity with minimum gap fills and consequently increased cured leaf yield and quality as against the seedlings grown under conventional raised soil-bed nursery.

Extent of Adoption: Front line demonstrations and training programmes were conducted to farmers and stake holders at different locations in collaboration with tobacco board, sensitization programmes were conducted through Field Friends programme. More than 80% farmers in Northern Light soils of Andhra Pradesh and 90% farmers in Karnataka light soils adopted the technology.

Benefits/Utility :

Advantages of tray nursery :

- 100% establishment, improves the yield by 10-25%
- Uniform crop growth due to less gap fillings (<1%), no transplantation shock, Uniform field operations viz., topping and harvesting.
- No Weed problem in tray nursery
- Water and fertilizer use efficiency will be more. Hence, seedlings can be raised even under water scarcity.
- Pests and diseases incidence very less.
- Farmer friendly technology: Can be performed in back yards unlike conventional nursery
- Tray seedlings improves moisture and nutrient holding capacity and the soil health
- Higher net returns and cost benefit ratio.
- Total man days for seedling production less
- Crop duration will be reduced by 10 days
- Reduces the pest and disease incidence in main field
- Total cost of cultivation reduced