CROP DIVERSIFICATION IN TOBACCO GROWING AREAS

Stakeholders Perspective

सत्यमेव जयते

Sponsored by

DAC & FW, Government of India

ICAR Central Tobacco Research Institute

Rajahmundry - 533105, Andhra Pradesh, India

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Preface

Tobacco is one of the important commercial crops grown in India and is valued more for its potential to generate farm income, employment and revenue. Particularly, FCV tobacco which is under regulation by the Tobacco Board, GOI makes a significant contribution to national economy by way of export earnings. Composed with its potential and its uncertainties those stem from health risks for those who consume tobacco, use of large quantities of wood fuel in flue curing of tobacco, emerging conflicting concerns and changing milieu of national and international policy regimes, Indian tobacco sector is facing formidable challenges.

At this important juncture, National policy calls for an integrated approach of controlling tobacco from both the demand and supply side, as a concerted action directed for effective tobacco control. Supply side control emphasizes crop diversification and it is vital to look at possible crops and livelihood diversification options and opportunities that tobacco farmer can switch to. In this context, ICAR-CTRI organized DAC & FW sponsored National Seminar on Crop Diversification on 18.01.2016 at Rajahmundry, A.P. involving representatives from ICAR and SAUs, State Agricultural Departments, Tobacco Board, Health, Farmers and Trade. Considering the effective outcome from different stakeholders and need to showcase relevant information, we made an attempt to bring out a publication entitled "Crop Diversification in Tobacco Growing Areas – Stakeholders Perspectives". This publication contains the mainstream areas relating to crop diversification viz., Facets of Indian tobacco, diversification options for sustainable farm productivity, prospects of available options, experiences in crop diversification, strengthening support for diversification and viewpoints from farmers and industry. Further, the important recommendations of National Seminar on Crop Diversification are also presented in this publication.

We appreciate and place on record our profound thanks to all the resource persons for the sincere efforts made for timely submission of material that is compiled in this publication. The financial support extended from Dr. S.K. Malhotra, Agriculture commissioner and Dr.A.P.Singh, Additional commissioner (Crops), DAC & FW, GOI towards this publication is gratefully acknowledged. We express our deep sense of gratitude to Dr. T. Mohapatra, Secretary, DARE & DG, ICAR and Dr. J.S.Sandhu, DDG (Crop Science), ICAR and Dr.D.Damodar Reddy, Director, ICAR-CTRI, Rajahmundry for their constant encouragement and guidance in bringing out this publication. We fervently hope that this publication would serve as resource book to all the stakeholders engaged in the Indian tobacco sector.

Date : 24.03.2016

(D. DAMODAR REDDY)

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Crop Diversification for Sustainable Farm Productivity and Livelihood Security

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Introduction

Crop diversification refers to the competition among the growing crops in a region. The keener the competition, the higher the magnitude of crop diversification, and the lesser the competition, the greater will be the trend towards crop specialization or monoculture farming, where emphasis is on one or two crops. Shifting from less profitable crop /cropping system to more profitable crop/cropping system is a key strategy in crop diversification. It has emerged as an important alternative to attain the objectives of enhanced output growth, employment generation and natural resources sustainability. The farmers all over the world particularly in the developing countries try to grow several crops in their holdings in an agricultural year. The level of crop diversification largely depends on the geo-climatic, socio-economic and technological development in a region. Though 7,000 crop types have been used for food by humans throughout history, 75% of the global food share comes from only 12 plant and 5 animal species. Sixty per cent of the world's food energy intake comes from rice, maize and wheat and that to from smallholder agriculture in developing countries.

India is supporting 17 % of the human population and about 11 % of livestock population with just 2.4 % land and 4.2 % of water resources of the world. Country needs to produce about 5-6 million tonnes additional food grains every year along with proportional increase in oilseeds, fibres, sugar, vegetables, fruits and livestock products to meet the requirement of the burgeoning population. At the same time, Indian agriculture is facing second generation problems such as decline in ground water table, soil health, deterioration of natural resources, small farm holdings etc. These issues are threatening the food, water, nutritional, health and environmental security. In the last two decades, there has been a dramatic change in domestic food consumption patterns, demand and consequently markets. Demand for high value food products is growing due to raising income, growing urbanisation and change in tastes and preferences. In addition, the demand for the value added products is growing very fast in the domestic and international markets. On the other side, climate change and environmental concerns are posing greater threat to the sustainable farm productivity.

In this context, crop diversification is a promising option to meet the challenges of global agriculture as well as the changing needs of global markets. If carried out appropriately, diversification can be used as a tool to augment farm income, generate employment, alleviate property and conserve precious soil and water resources. However, supply and demand factors coupled with infrastructural development and innovative institutions drive these changes. A sound understanding of the opportunities & patterns of crop diversification and its constraints would help in crafting appropriate research backup, institutional arrangements and creation of adequate infrastructure which could promote crop diversification.

I. DIFFERENT FACETS OF CROP DIVERSIFICATION

Crop Diversification Influenced by Varied Factors over Time

Initially, self reliance in food grains has been the corner stone of our policies. Subsequently, commercial agriculture has been developed which has become the major earner of country's

foreign exchange. In sixties and seventies, the area under food grains increased substantially due to the yield advantage created by irrigation expansion and green revolution technologies and government policies. The increased productivity of food grains has made it possible to allocate more area to other crops such as pulses and oilseeds. Thus, the specialised crop sector diversification has come into focus. It is generally considered that higher the level of agricultural technology, the lesser the degree of diversification. Moreover, rich farmers prefer to specialize in agricultural enterprise while the poor and subsistent farmers are generally more interested in diversification of crops.

Crop Diversification - Response of Both Opportunities and Compulsions

a) Significant changes are taking place in patterns of domestic and export demand for crop products due to changing life styles and preference patterns.

b) Diversification also driven by the governmental policies both supportive and regulatory in nature i.e., compulsions on some crops and thrusts on some crops over a given time.

c) Crop diversification is practiced in rain-fed lands to reduce the risk factors of crop failures due to drought or low rainfall.

d) Specific natural resource related problems of soil and water.

e) Adoption of crop diversification is influenced not only by resource related factors but also by institutional and infrastructure factors

f) Highly fluctuated input and output prices.

In the wake of globalization and opening up of the global markets, opportunities for crop diversification are many. The country will be required to promote much more diversified agriculture. In future, with improved living standards along with increased purchasing power, more and more people will look for nutritional and quality foods which will also call for greater crop diversification. The crops which are export oriented need to be supported in terms of area expansion and quality improvement to further boost the exports. The imports are to be contained through area expansion and increased productivity. Availability of efficient decision support systems, government policies, geographic information systems, information and communication technologies (ICTs) etc., which provides needful market information will also lead to crop diversification.

Constraints in Crop Diversification

a) **Low volume markets** are associated with high price volatility. Start up high prices for diversified produce is often leading to oversupply and a consequent collapse of prices.

b) **Social aspects** like small size holding, use of family labour and availability of limited resources

c) **Inadequate information** on viable diversification technologies

d) **Improper focus** on services like market demand and credit

e) **Insufficient policy support** for infrastructure and remunerative prices

f) **Inadequately** trained human resources

g) **Weak** research – extension – farmer linkages

h) **Poor supply** of critical inputs

Socioeconomic Determinants of Crop Diversification

a) Availability of viable diversification options

b) Adequate institutional support for credit and critical inputs

c) Development of marketing facilities and provision of remunerative prices

d) Promotion of infrastructure like agro-processing
e) Provision of proper policy environment
f) Technology transfer on adoption of cluster approach

Hence, need to look on a wider livelihood perspective that includes not only the income provision from a crop but also the institutional support i.e. market, extension and credit support.

Available Institutional and Infrastructure Developments Towards Crop Diversification

The National Agricultural Research System with its crop and commodity based institutions, Natural Resource Management based institutions and State Agricultural Universities are jointly addressing the issues connected with the crop diversification. The Government of India has also developed a counter support mechanism through the establishment of crop directorates for each of the major crops and for crop groups like oil seeds and pulses. Further, measures like launching of technology missions, national agricultural insurance schemes, and provision of agro based industries, strengthening of marketing etc. led to crop diversification.

Extension Support for Crop Diversification

Extension service that is more demand driven, decentralized, accountable to all stakeholders, efficient in reaching smallholders and farmers of remote and marginal areas is the key element in achieving desired crop diversification. It should aim advisory services with increased relevance, efficiency, effectiveness and sustainability with the ultimate objective of enhancing productivity of farms and income of farmers.

In view of the above, making extension system more demand driven, involving farmers and other stakeholders through participatory processes, orienting advisory services toward local, regional and international markets, strengthening networks and associations of farmers to increase their social capital are key principles which are to be incorporated in delivery of diversification options. In order to promote crop diversification effectively, extension tools such as Farmer Field Schools and Farmer Participatory Programmes which work on community based approach which helps in strengthening commodity value chains and connecting them to markets can be introduced. Mobile advisory through cell phones and Kisan call centres may become a valuable source of information for farmers in educating about crop diversification. Help of agencies dealing with multi stakeholders like Agricultural Technology Management Agency (ATMA) can be sought in promoting the strategies of crop diversification effectively.

II. STRATEGY FOR PROMOTING CROP DIVERSIFICATION – INTERVENTION POINTS

a) Formulation of clusters/ micro zones based on scientific input
b) Adoption of villages suitable for crop diversification
c) Involving farmers organisations in planning, policy and decision making
d) Identification of viable options on systems perspective
e) Organising awareness campaigns with the help of local level departments
f) Training of extension workers and farmers
g) Conducting cluster level demonstrations on crop diversification models
h) Use of mass media and other communication strategies
i) Inputs supply and market support for produce from farmers who adopted crop diversification
j) Improving interaction and coordination through meetings between research and extension personnel

Strategies for initiating crop diversification will depend upon driving forces viz., responsiveness of farmers to available opportunities, net returns, availability of marketing facilities

and market demand. For developing further insights/ strategies/processes for diversification from tobacco, it is significant to consider the factors responsible for continued tobacco cultivation.

a) **Bio-physical factors**
- FCV tobacco crop grow well in rain fed situations with satisfactory quality and yield levels
- Perform better in soils of poor fertility and withstand adverse weather conditions
- Mostly, raised by small and marginal farmers with no alternative crop

b) **Socioeconomic factors**
- Ensuring a better standard of living to its growers by giving higher income as compared to other crops under identical conditions.
- A prestige of tobacco grower in the village
- Crop is interwoven with livelihoods of different categories involved in tobacco production

c) **Institutional factors**
- Organised support in production, processing and marketing from Tobacco Board
- Structured research and extension support from ICAR-CTRI, Tobacco Board and Traders
- Incentives, input subsidies, loans and welfare measures from Tobacco Board
- Secured system of licensing, banking linkage and marketing through e-auction

d) **Trade factors**
- Direct involvement of tobacco industry
- Export demand driven market trading

Characteristics of Tobacco Cultivation in non-FCV Tobacco Sector

- Farmers are small, marginal and tribal origin
- The only livelihood opportunity in most cases
- No structured and organised production and marketing system like FCV tobacco
- Used mostly for domestic consumption
- Petty and local trade oriented market

III. CHALLENGES IN DIVERSIFICATION FROM FCV TOBACCO

a) How to substitute/diversify predominantly commercial and remunerative crop?
b) Selecting equally remunerative crop in rain fed areas of FCV tobacco
c) How to ensure livelihood security of farm workers engaged in production chain of FCV tobacco?
d) How to compensate the existing registered barns or assets of FCV tobacco production?

IV. THE PROCESS OR STEPS TO ADDRESS THE ABOVE CHALLENGES

a) Preparation of status paper on tobacco crop and suitable alternative crops/cropping systems for different tobacco growing regions
b) Motivating FCV and non-FCV tobacco farmers by providing incentives in the form of farm machinery and inputs
c) Assisting diversified tobacco farmers growing alternative crops with crop insurance against crop failures and the undue price fluctuations
d) Sensitizing and motivating the tobacco farmers for the purpose of diversification through exposure visits, study tours and campaigns related to crop diversification
e) The most important point for ensuring agricultural diversification away from tobacco is the involvement of the tobacco farmers themselves at different stages of implementation of agricultural diversification

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Myriad Facets of Tobacco Production in India – Options for Crop Diversification

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Tobacco (Golden Leaf), one of the important commercial crops, is widely grown in many countries including India and valued more for its income, employment and revenue generating potential. Purely on economic terms, tobacco crop fetches more farm returns to farmers than many other crops grown in identical agro-ecological conditions. In India, tobacco makes a significant contribution to national economy by way of export earnings of about 65 bn INR and excise levies of over 200 bn INR per annum, besides providing employment and livelihood security to millions of people engaged in its cultivation, curing, grading, manufacturing and marketing etc. Despite this huge socio-economic significance, the growing public perception of tobacco in India, as in rest of the world, is generally negative owing primarily to health risks associated with its consumption.

Today tobacco sector is caught in the whirlpool of diametrically conflicting concerns relating to the livelihood security of those who are associated with tobacco production, processing and marketing on one hand and the serious health risks for those who consume it on the other (Fig. 1). Though the tobacco's contribution to economy is huge, the deforestation resulting from the use of huge quantities of wood as source of energy for tobacco curing is a serious concern. Further, the emerging issues relating to climate change impacts, resource degradation, biotic and abiotic stresses, escalating production costs, pesticide residues, consumer preferences and regulatory policies are becoming increasingly complex.

Given the compelling need for safeguarding interests of farmers and others drawing livelihood from tobacco sector on one side and protecting public and environmental health on the other, a balanced and pragmatic approach is required to address all concerns. The crop diversification,

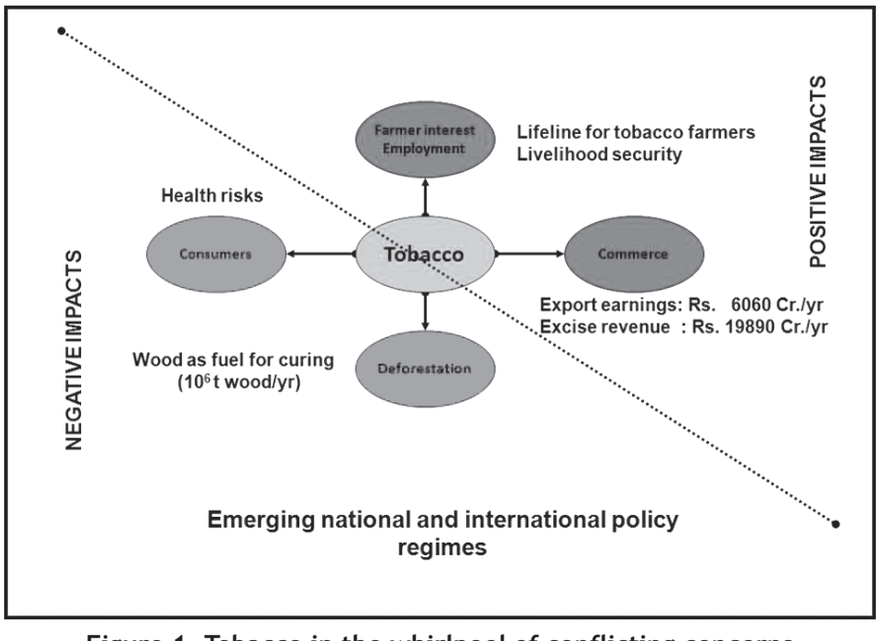
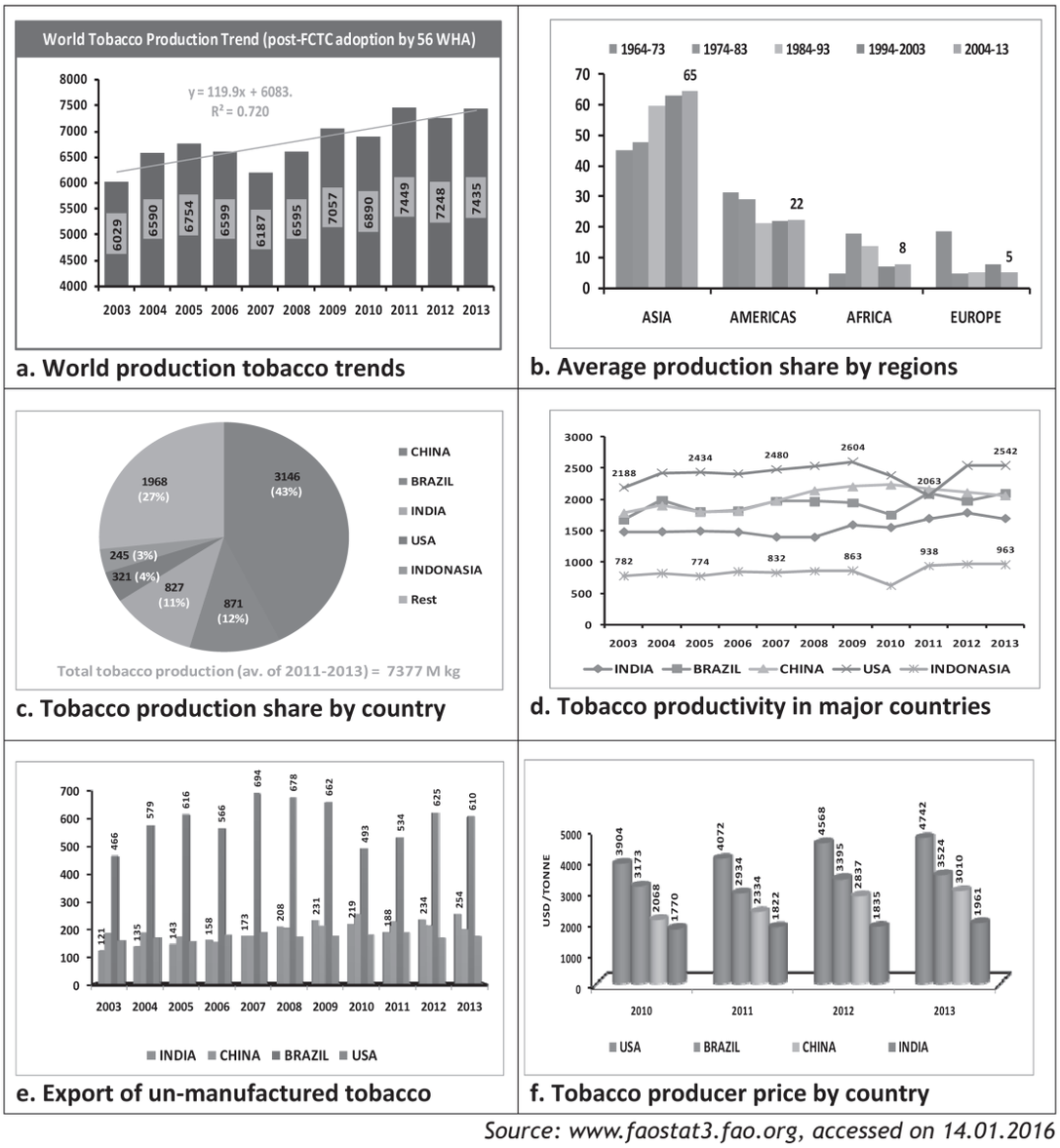


Figure 1. Tobacco in the whirlpool of conflicting concerns

as a component of such approach, is considered as a potential tool for creating alternative crop/ enterprise options in different tobacco growing regions which the tobacco farmers can switch to, if required in response to government policies and adverse market forces. It is in this context that this article looks at tobacco scenario in India vis-a-vis other countries and explores the possible crop diversification options.

World Tobacco Scenario

Tobacco is grown as commercial crop in many countries of the World, with the major producers being China, Brazil, India, USA and Indonesia. As per the latest production statistics (2013), the world tobacco production is 7435 million kg. The tobacco production witnessed an increasing trend during the past decade (2003 -2013) with an average growth rate of about 120 million kg per annum (Fig. 2a). The tobacco production share by regions indicated that the Asia not only accounted for a lion's share (65% during 2004-2013) but also showed consistent increase over the decades (Fig.2b). The share of the other regions in the tobacco production during the



Source: www.faostat3.fao.org, accessed on 14.01.2016

Figure 2. World Tobacco Scenario: (a) World tobacco production trends, (b) Average production share by regions, (c) Tobacco production share by country, (d) Tobacco productivity in major countries, (e) Export of un-manufactured tobacco and (f) Tobacco producer price by country

previous decade followed the order: Americas (22%) > Africa (8%) > Europe (5%). Among the tobacco producing countries, China with a production share of 48% ranks first, with Brazil (12%) and India (11%) occupying second and third positions, respectively (Fig.2c).

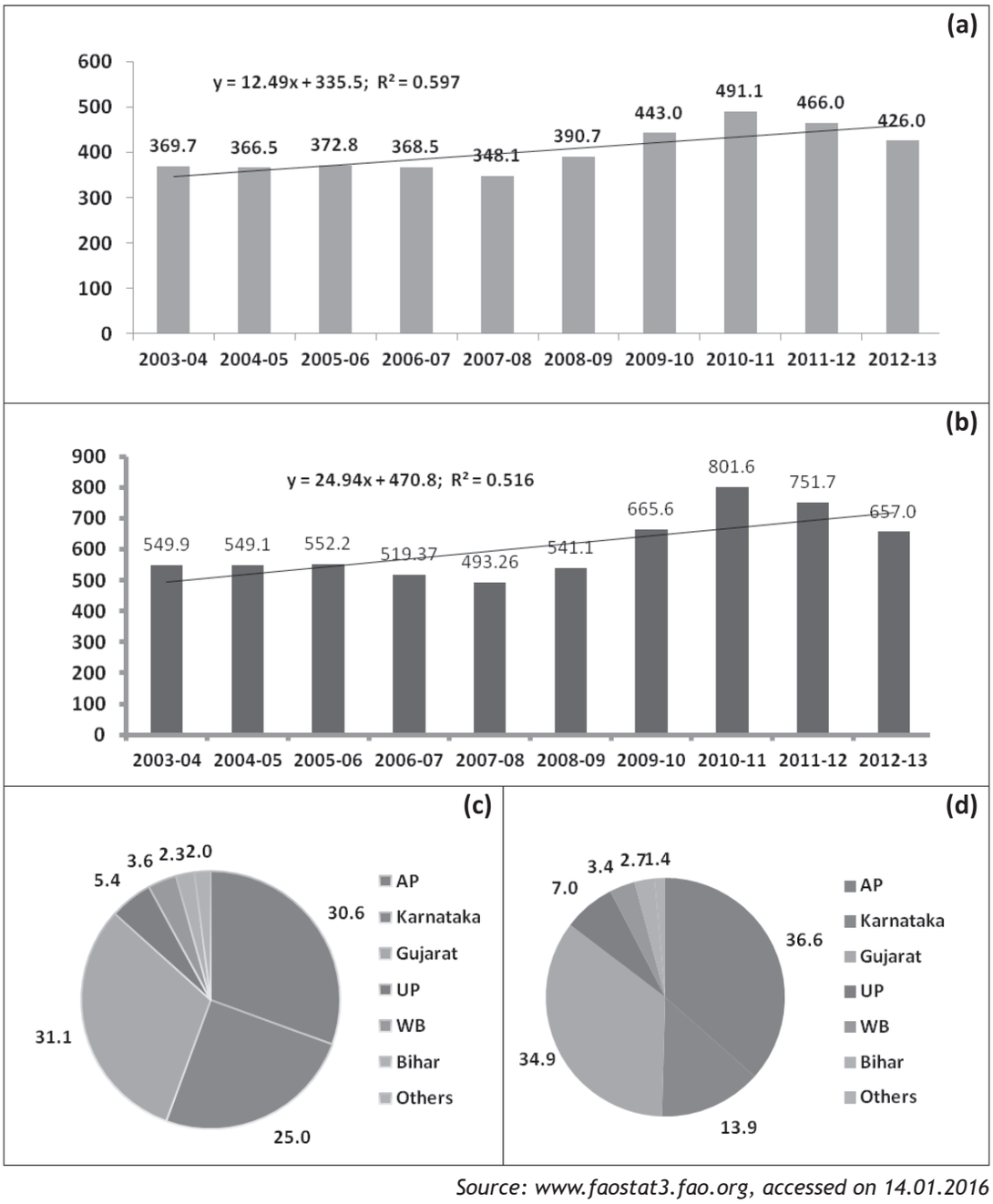
The other countries making significant contribution to tobacco production include USA (4%) and Indonesia (3%). The tobacco productivity, however, varied widely across the major tobacco producing countries (Fig.2d). The productivity levels (kg/ha) in 2013 for the top five tobacco producers followed the order: USA (2452) > Brazil (2099) > China (2062) > India (1694) > Indonesia (963). In the tobacco exports, Brazil continued to be the front runner over the years, with India occupying distant second position (Fig.2e). The producer price of tobacco also presents a very contrasting picture among different countries (Fig.2f). The producer price has always been very low in India (1.96 USD/kg at present) as compared to that in USA, Brazil and China.

Indian Tobacco Matrix

In India, tobacco represents one of the important high value cash crops and is grown in more than 0.4 million hectares of area across the country. The area under tobacco also registered an increasing trend over the years, with an average annual growth rate of 12,500 ha per annum (Fig 1a). The states of Andhra Pradesh, Gujarat and Karnataka account for 86.7 % of the area under tobacco cultivation (Fig 3c). At present India stands third in tobacco production and also enjoys second position in the global tobacco exports. India has an advantage over the other leading tobacco producing countries in terms of availability of different styles of tobacco produced with relatively low production costs and also diverse agro ecological conditions favouring the production of myriad tobacco types.

Presently, tobacco occupies about 0.24% of the India's arable land supporting many varieties of tobacco viz. cigarette tobacco, bidi tobacco, chewing tobacco, hookah tobacco, cheroot tobacco, cigar wrapper tobacco, cigar filler tobacco, oriental tobacco, dark fire cured tobacco etc. (Table 1) and produces about 800 Million kg (2014-15). For the period from 2007 to 2013, the tobacco production levels in the country showed an increasing trend (Fig. 3b). Though the crop is grown in more than 15 states, major tobacco growing states are Andhra Pradesh, Gujarat, Karnataka, Uttar Pradesh, West Bengal and Bihar. Three states viz., A.P, Gujarat and Karnataka alone contribute more than 85 % total tobacco produced in the country (Fig. 3d). Of the total tobacco production, the Flue-cured Virginia [FCV] tobacco accounts for about 40 %, while the rest is represented by non-FCV tobacco. The FCV tobacco, used for manufacturing cigarettes, is predominantly grown in the states of Andhra Pradesh and Karnataka under distinct soil domains (Table 2).

In India, the cultivation of tobacco is mostly done by small and marginal farmers and different seasonal activities of the crop provide a livelihood security to landless agricultural labourers, rural women and tribal youth. It also supports large manpower who is involved in the manufacturing and marketing of different tobacco products like cigarettes, bidis, cigars and chewing mixtures in different parts of the country. At present, the tobacco sector provides employment to millions and contributes about Rs.200 billion as excise duty and around Rs.65 billion in terms of foreign exchange to the national exchequer.



Source: www.faostat3.fao.org, accessed on 14.01.2016

Figure 3. Tobacco in India : (a) Tobacco area ('000 ha) (b) Tobacco production (million kg) (c) State wise share (%) of the tobacco area (d) State wise share (%) of the tobacco production

Table 1. Major tobacco producing states and tobacco types in India

State	Tobacco types
Andhra Pradesh	FCV, Burley, Oriental, Bidi, Natu
Karnataka	FCV, Bidi
Gujarat	Bidi, Chewing, Rustica
Tamil Nadu	Chewing, Cigar
West Bengal	Hookah, Rustica
Bihar	Chewing
Uttar Pradesh	Bidi, Chewing
Other States	Pikka, Chewing, *Rustica*, *Hookah*

In Andhra Pradesh, FCV tobacco is grown during *rabi* season by making use of conserved soil moisture in SBS and SLS domains, while 25 % of tobacco area is under irrigated conditions of NLS domain. In contrast, FCV tobacco is predominantly grown as rain-fed crop during *kharif* season in Karnataka (Table 2).

Table 2. Main Production Domains of FCV Tobacco in A.P. and Karnataka

State	Soil Domain	Districts
Andhra Pradesh	Northern Light Soils (NLS)	West Godavari
	Southern Light Soils (SLS)	Prakasam, Nellore
	Southern Black Soils (SBS)	Prakasam
Karnataka	Karnataka Light Soils (KLS)	Mysore, Hassan

CROP DIVERSIFICATION

Crop diversification implies a shift from regional dominance of one crop to another crop intended to give a wider choice in the production of a variety of crops in a given area and also to mitigate the risk factors and to sustain production and farm incomes. A crop shift generally takes place in an area due to the influence of factors like unfavorable bio-physical environment, inadequate technological back-up, lack of input availability, poor marketing facility and high cost of cultivation with less return. It is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops. Sometimes the diversification also takes place due to governmental policies promoting or discouraging some crops in the national interest.

Diversification from Tobacco

Crop diversification in case of tobacco growing areas is seen as an important strategy in the context of changing policy regimes and stakeholders' concerns on livelihood security, health and environmental issues related to production and consumption of tobacco. In India, the volume of non-FCV tobacco production and consumption is very large when compared to FCV tobacco. Non-FCV tobacco (0.26 million ha) is mostly grown in Gujarat, UP, West Bengal, Bihar, Tamil Nadu and characterized by unregulated production (500 million kg) with unorganised local markets. The farmers are not assured of inputs or welfare measures unlike in FCV tobacco where area (0.2 million ha) and production (300 million ha) are under regulation of Tobacco Board with a transparent market facility besides an assured input supply. Hence, there is an ample scope to diversify this unorganised sector of non FCV tobacco with suitable alternative crop options.

In this regard, A Pilot project on ***Alternative crops to Bidi and chewing tobacco in different agro-ecological sub regions*** sponsored by Ministry of Health, GOI was taken up by ICAR-CTRI, Rajahmundry during 2008-2011. The research at ICAR-CTRI has identified some alternative/next best crop/cropping system options for *Bidi* and *chewing* tobaccos grown in the states of Gujarat, Karnataka, Andhra Pradesh, West Bengal and Tamil Nadu. The details are furnished in Table 3.

Table 3. Alternative/next best crop options for different non-FCV tobacco growing regions

Tobacco type	State	Crops/Cropping Systems Identified
Chewing Tobacco	Tamil Nadu	1. Annual moringa + Chilli 2. Annual moringa + Onion 3. Maize - Sunflower
Chewing Tobacco	West Bengal	1. Potato 2.Maize 3. Wheat 4. Mustard
Bidi Tobacco	Karnataka	1. Sugarcane (irrigated conditions) 2. Soybean – Sorghum 3. Groundnut – Sorghum

Bidi Tobacco	Andhra Pradesh	1. Maize - Sunflower 2. Maize – Black gram 3. Maize – Chickpea
Bidi Tobacco	Gujarat	1. Castor (K-R) – Pearl millet (S) 2. Cotton (K-R) – Groundnut (S) 3. Pearl millet (K) – Rajma (R) – Pearl millet (S)

Source: *Pilot project report on Alternative crops to Bidi and chewing tobacco in different agro-ecological sub regions (2008-2011).*

FCV tobacco compared to non-FCV tobacco is a highly remunerative crop with secured market facility. It is not always easy to find an equally remunerative alternative crop for diversification for diversification in FCV tobacco growing areas. Therefore, the initiatives on diversification from FCV tobacco especially need to take into account the interests of the tobacco farming community and their willing support.

For any diversification strategy to be successful, the crops that are having substantial acreage under their cultivation in tobacco growing areas need to be considered as most likely candidate crops for replacing FCV tobacco because of their proven adaptability to the local bio-physical environment and existing markets. The most probable crops with sizable area under their cultivation in each of the three important FCV tobacco growing Districts of AP and Karnataka are listed in Table 4.

Table 4. Predominant crops grown in FCV tobacco growing districts of AP & Karnataka (2013-14)

State	District	Predominant Crops	Area (ha)
Andhra Pradesh	West Godavari	Tobacco	24,720
		Oil palm	56,000
		Maize	49,482
		Sugarcane	24,411
	Prakasam	Tobacco	70,821
		Chickpea	1,12,135
		Cotton	67,044
		Redgram	56,626
Karnataka	Mysore	Tobacco	74,350
		Cotton	44,424
		Maize	33,510
		Ragi	21,283

Note:

a) Data source for tobacco: *Annual Reports, Tobacco Board, Guntur*

b) Data source for crops other than tobacco: *www.eands.dacnet.nic.in and www.des.kar.nic.in (viewed on 14.09.2015)*

Policy Driven Diversification: Diversification can take place not only for the aspects like production and productivity but also due to government policies to alleviate some of the social and environmental issues as in the case of tobacco crop. Recently, Tobacco Board decided to decrease the crop size of FCV Tobacco from 172 to 120 m kg for the year 2015 -16. This will certainly lead to sparing of some land from tobacco cultivation and using the same for other crops. The area that can be spared from tobacco as a result of Tobacco Boards' policy is estimated to be in the order of 40,000 Ha in A.P (Table 5). The most likely candidate crops that can occupy the area so spared are suggested in Table 5.

Table 5. Area sparable from tobacco to other crops in different zones of Andhra Pradesh

zone	Area registered in 2014-15 (ha)	Area proposed For 2015-16 (ha)	Area that can be sparedfor other crops in 2015-16 (ha)	Candidate crops for diversification
NLS	26,500	14,000	12,500	*1.Maize 2.Sugarcane*
SLS	43,000	31,765	11,235	*1.Redgram 2.Blackgarm*
SBS	32,500	16,168	16,312	*1.Chickpea 2. Cotton*
NBS	2,900	1,538	1,362	*1.Maize 2.Sugarcane*
Total	**104,900**	**63,491**	**41,409**	

Comparative Economic Analysis of FCV Tobacco *vis-a-vis* Other crops grown in Andhra Pradesh and Karnataka

Comparative economic analysis of tobacco and other major crops grown in tobacco production domains is furnished in Table 6. Soil domain wise average crop productivity, average cost of cultivation and average prices has been taken into account for computing economics. In all the production domains (A.P. and Karnataka), the FCV tobacco clearly outscores all other crops with respect to gross and net returns. The net returns (Rs. 19,500/ha) from tobacco grown under SLS domain of Andhra Pradesh are relatively low as compared to the returns of the crop grown in other domains (Rs.30,000-72,000/ha) of A.P. and Karnataka. FCV tobacco grown in NLS domain of A.P. fetches higher net returns (Rs. 72,000/ha) owing to the fact that the crop is grown under irrigated conditions. Even when compared to the net returns from the other crops grown in similar conditions (maize - Rs. 30000/ha and sugarcane Rs. 28000/ha), the profit margin of FCV tobacco is distinctly high. In Karnataka, the net return from FCV tobacco is of the order of Rs. 50,000/ha which is again far superior over that from the other major crops grown in similar conditions.

It may be noted that the cost of cultivation of FCV tobacco is also higher than that of all other major crops grown in similar conditions. Tobacco farmers, unlike other farmers, enjoy the institutional and market support facilitated by the Tobacco Board (Ministry of Commerce, Govt. of India) to cope up with high cost of cultivation.

Table 6. Comparative Economics of FCV tobacco and other major crops grown in FCV tobacco domains

Soil Domain	Major Crops	Yield(kg ha^{-1})	Economics		
			Cost of Production (Rs. ha^{-1})	Gross Returns (Rs. ha^{-1})	Net Returns (Rs. ha^{-1})
NLS	*FCV tobacco*	2200	170000	242000	**72000**
	Maize	6250	45000	75000	30000
	Sugarcane	85000	125000	153000	28000
SLS	*FCV tobacco*	1050	75000	94500	**19500**
	Red gram	750	20500	31500	11500
	Cotton	1500	38000	51000	13000
	Black gram	750	20000	33750	13750

SBS	*FCV tobacco*	2000	150000	180000	**30000**
	Cotton	2000	50000	68000	18000
	Chickpea	1815	32500	47150	14650
KLS	*FCV tobacco*	1100	71250	121000	**49750**
	Maize	4000	15000	40000	25000
	Cotton	1500	20000	45000	25000
	Field bean	2500	8000	25000	17000
	Chillies (green)	60000	22000	50000	28000

Conclusions

In India, tobacco continues to hold a huge socio-economic significance because of its potential for generating farm income to farmers, employment to landless farm labourers and revenue to the government. General perception of tobacco, however, is negative owing to public health risks and adverse environmental impacts associated with its production, processing and consumption. Given this context, the crop diversification is viewed as a strategy to foster transition from tobacco to other sustainable crops/farm enterprises/livelihoods. Notwithstanding the serious negative concerns about the tobacco, the crop diversification in tobacco growing areas faces some formidable barriers that include issues of profitability, institutional support, processing, marketing infrastructure and employment potential relating to other crops/enterprises chosen as components of diversification. Further, it is important to note that any diversification strategy should be suitable to and compatible with the specific production structures. The tobacco production domain specific crop diversification strategies need to be developed and implemented in a phased manner for the desired success. In this direction, it is essential to recognize that the crops that are having substantial acreage under their cultivation in tobacco growing areas are most likely candidate-crops for replacing tobacco due to their adaptability to the local bio-physical environment and existing markets. The real scope for diversification in tobacco growing areas lies in selection of suitable crops/cropping systems, providing technological and financial inputs, establishing market facilities and creating opportunities for value addition in alternative crops.

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Diversification is the Need of the Hour in the Interest of Society and Farmers Too

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Indian tobacco demand will be declined due to glut in international demand and it is going to be reduced by 20% in domestic use in next 10 years. Demand and supply reduction has to happen simultaneously. Hence, we should make farmer ready for crop diversification. There should be an alternative use/product from tobacco which is equally profitable, so that, one can think of diversified uses of tobacco. Continuous tobacco cultivation is not advisable as its consumption causes one million deaths/year. Further stated, around 27.5 crore Indians are using tobacco products and it kills every third user.

Tobacco has become a killer plant and COTPA had prohibited the cigarettes and other tobacco products. The Justice for Juvenile Act-77 prohibited/ restricted selling of tobacco products to minors with an imprisonment of 7 years. Similarly, Food act Section 2.3.4 regulation said that tobacco cannot be added. In India, 85-90% of tobacco is consumed in the form of *Gutka*. Thousands of barns registered in India causing pollution through CO_2 emission and through deforestation. Tobacco cultivation leads to pesticide contamination and exhausting soil nutrients like N, P & K. Green tobacco sickness and nicotine toxicity to farmers who live 24/7 in the tobacco fields, is increasing the victims of tobacco. In view of the health and environmental concerns gradual phasing out of tobacco cultivation and simultaneously providing an economically viable alternative for tobacco workers and growers is a sustainable option.

Recommendations for Indian tobacco sector to act upon:

- Government to make efforts to progressively discontinue all forms of institutional support to tobacco production including promotion, market support and subsidies. Incentives and support to be provided for tobacco control and for adoption of viable alternatives to tobacco.
- A rapid assessment to be done on current policies to analyse which aspects are contradictory to tobacco control policies and WHOFCTC and mandate immediate change.
- Data collection to be done to provide actual numbers of tobacco farmers, workers, bidi rollers and tendu leaf pluckers employed in the tobacco sector with geographical distribution and mandays/months spent on this employment.
- Ministry of Agriculture, Ministry of Labour & Employment and Ministry of Rural Development to initiate a comprehensive, national initiative on economically viable alternative vocations for tobacco workers and growers, in coordination with all key stakeholders through public-private partnership across states.
- Ministry of Labour, Agriculture and Rural Development to draw a clear roadmap on alternative livelihoods each for tobacco farmers and bidi rollers in view of the country's obligations under WHOFCTC.

- In compliance to Article 5.3 of the FCTC, Government to set up clear protocols/guidelines or code of conduct for prohibiting any form of partnership with the tobacco industry. No investments by governments or public officials be made in the tobacco industry and no industry representation be present on government tobacco control bodies. All government interactions with the tobacco industry to be transparent and made public.

Suggestions to FCV Tobacco farming

- There should be a clear roadmap for gradually phasing out tobacco cultivation in the next 20 years and assisting farmers to shift to viable alternatives.
- Ministry of Agriculture and Ministry of Commerce to discontinue all direct and indirect incentives and subsidies both at the central and state level, such as subsidies on fertilisers and pesticides etc. to tobacco farmers in a phased manner. Facilities like soft loans and credit facility for cultivating tobacco also be discontinued.
- Incentives and support to be given by Ministry of Agriculture and Ministry of Commerce, through a separate fund towards alternate cropping initiatives for tobacco growers who want to shift.
- The Tobacco Board (Ministry of Commerce) and the Central Tobacco Research Institute (Ministry of Agriculture) should revise their mandate and provide a rehabilitation package with technical assistance, market support, and subsidies for farmers who want to shift to other crops.
- The National Agriculture Insurance Scheme/ Rashtriya Krishi BimaYojana (Ministry of Agriculture), Small Farmers Agro-Business Consortium, National Bank for Agriculture and Rural Development (NABARD) and United Nations Development Assistance Framework (UNDAF) to be approached to organize farmer groups and support alternative crops.
- Ministry of Agriculture in collaboration with Ministry of Health and Family Welfare and the Tobacco Board to initiate the pilot project on alternative crops /cropping systems beginning with non-FCV farmers who are inclined to shift to other crops.
- Ministry of Health and Family Welfare and Ministry of Agriculture in collaboration with State Agriculture Departments, Agriculture Universities and Krishi Vigyan Kendras to initiate sensitization and awareness programmes for tobacco farmers as well as policymakers on health and environmental impacts of tobacco farming, and long-term benefits of shifting to other crops.

Suggestions on Bidi Rolling

- Ministry of Labour and Employment to draw a roadmap for gradually phasing out bidi rolling in the next 20 years and the bidi rollers to be provided alternative sources of livelihood.
- Ministry of Labour and Employment to launch training programmes on alternative vocations across states for bidi rollers who want to shift to other occupations.
- Ministry of Labour and Employment to utilize the bidi cess to launch pilot initiatives in bidi rolling districts, upscaling/replicating NGO pilots that have been successful.
- The National Rural Livelihoods Mission, Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA) and other poverty-reduction programmes to provide a viable

umbrella to support bidi rollers and tobacco workers for shifting to alternative vocations/ sources of livelihood.

- Enforcement of labour laws to be increased for bidi manufacturing; all provisions for workers/labours under industrial laws in formal sector to be made applicable to the informal bidi sector.

Suggestions for Tendu Leaf Pluckers

- Ministry of Environment and Forests and Ministry of Tribal Affairs in consultation with State Governments to develop clear policies for protecting the rights of tribals and forest dwellers.
- Tendu leaf plucking is a seasonal occupation and leaf pluckers have no alternative vocations for most part of the year. State Governments to provide support for them to move to alternative forest produce/alternative livelihoods.

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Crop Diversification Efforts in FCV Tobacco Growing Areas – Tobacco Board's Experiences

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Agriculture, which contributes 14 per cent to the country's gross domestic product and employs 55 per cent of the country's population, is the priority sector for development in India. The Government believes that the rural and agricultural development can only be complete when the welfare of the farmer is ensured. Present agrarian crisis shaped by an increase in cultivation costs and a decline in agricultural income, pushing farmers into a debt trap and suicides. Renaming the seven decades old Agriculture Ministry as 'Ministry of Agriculture and Farmers' Welfare' shows the commitment of the Government of India to take care of the farming community's needs as well as to address the personal problems faced by them for overall growth of the agro-sector. Government of India is thus committed to increase agricultural productivity and to boost crop yields and thereby ensure sustainability and profitability of agriculture. In this direction, the Agriculture Ministry is mandated to devise schemes to incentivize crop production. The Government also recognized that there is an urgent need for ushering in a second agricultural revolution and is stressing on integrated farming, which includes the cultivation of two or more crops along with animal rearing, pisciculture and api-culture with a focus on achieving "per drop, more crop". The Ministry of Agriculture is implementing several flagship schemes in this direction and the new initiatives like National Food Security Mission (NFSM), National Mission on Oilseeds and Oil Palm (NMOOP), Rashtriya Krishi Vikas Yojana (RKVY), National Mission for Sustainable Agriculture (NMSA), Mission of Integrated Development of Horticulture (MIDH) are potential options for increasing farm productivity and for putting the agricultural economy on a sustained growth path. Crop Diversification Programme (CDP), a sub scheme of Rashtriya Krishi Vikas Yojna (RKVY) is one important scheme among them. This scheme is first implemented in the original Green Revolution States of Punjab, Haryana and Western Uttar Pradesh from 2013-14 to diversify the area from water guzzling crops like paddy to alternative crops like maize, pulses, oilseeds, cotton & agro-forestry plantation and is now extended for promoting alternative crops to tobacco. In fact, the concept of crop diversification is also embedded in other schemes like National Mission on Oilseeds, National Mission for Horticulture etc.

Indian farmers had been following 'Crop Diversification' from the times immemorial. This is not a new concept entirely. Traditionally, farmers were following crop rotation to reduce economic risk associated with unfavorable weather or pest damage in any one crop, to break insect and disease cycles, reduce weeds, curb erosion, supplement soil nutrients, improve soil structure, conserve soil moisture, reduce market risk and to maximize revenue. With the advent of green revolution and commercialization of agriculture, mono cropping became the order of the day. Years of mono cropping culminated in stagnant yields, reduced returns, depletion of soil and water resources and other environmental problems. Added to this, the increased crop risks because of climate change and more exposure to market risks have thrown the Indian agrarian economy into crisis. In this background, crop diversification is seen as an important mechanism for economic growth.

I. Crop Diversification

Crop Diversification refers to the shift from the regional dominance of one crop to regional production of a number of crops, to meet ever increasing demand for cereals, pulses, vegetables, fruits, oilseeds, fibers, fodder, fuel, etc. Its aim is to improve the soil health and to maintain dynamic equilibrium of the agro eco system. The main objective of crop diversification is to promote technological innovations for sustainable agriculture and enable farmers to choose crop alternatives for increased productivity and income, i.e., "Sustainable Agriculture with Increased Productivity & Profitability". With globalization of the market, crop diversification in agriculture means to increase the total crop productivity in terms of quality, quantity and monetary value under specific and diverse agro-climatic situations of the country.

a. Advantages of Diversification

Diversification can soften the impacts on environmental resources and spread farmers' economic risk, exploit profitable niche markets, create new industries based on agriculture, strengthen rural communities, aid the domestic economy, enable producers to grow crops that would otherwise be imported. Crop diversification will also expand markets and offset commodity price swings and ensure profits. Overall, the economic picture improves with strategic diversification. Gross income for an alternative crop may be higher and production costs may drop. Diverse rotations also reduce economic risk associated with un-favorable weather or pest damage in any one crop.

b. Factors Driving Crop Diversification

Agricultural diversification can be facilitated by technological break-through by changes in consumer demand or in government policy or in trade arrangements, and by the development of irrigation, roads, and other infrastructures. Conversely, it can be impeded by risks in market prices and crop-management practices, by degradation of natural resources, and by conflicting socioeconomic requirements – perhaps, for employment generation, or for self-sufficiency or foreign-exchange-earning capacity in particular crop or livestock or fishery or forest products.

Crop diversification may occur as a result of government policies. The schemes / programmes undertaken by "Technology Mission on Oilseeds", "Spices Development Board", "Coconut Development Board" etc., are examples where the Government of India created policies to thrust change upon farmers and the food supply chain at large as a way to promote crop diversification. Crop Diversification Programme (CDP) in original green revolution states initiated in 2013-14 is another example of policy driven crop diversification. Under this programme, assistance provided to the states for conducting cluster demonstrations on alternative crops, promotion of water saving technologies, distribution of farm machinery, setting up of value addition facilities, awareness through trainings etc.

II. Government Policy Regarding Replacing Tobacco with Alternative Crops/ Cropping Systems

India is a signatory to the Framework Convention on Tobacco Control (FCTC) which entails demand and supply reduction strategies. As a signatory to the FCTC, Government of India is obligated to reduce the area under tobacco and wean away the farmers to other economically viable alternative crops and cropping systems following the specific recommendations of the

working group. On the other hand, as per the Tobacco Board Act, Tobacco board is mandated to ensure remunerative prices to the FCV tobacco growers by regulating the production and work for the development of industry. Tobacco Board is balancing these conflicting objectives by undertaking suitable measures for crop regulation as per the demand and supply for FCV tobacco in domestic and international markets, subject to maximum ceilings of crop size fixed by the Government of India.

III. WHO's Framework Convention on Tobacco Control (FCTC)

As one of measures relating to the reduction of the supply of tobacco, Article 17 of FCTC had recommended that Governments shall promote economically viable alternatives for tobacco growers and workers which are current and relevant, and based on scientific, technical and economic considerations to help farmers cope with a reduction in demand. The FCTC's thrust was, therefore, not about supply reduction, but was about helping farmers cope with a reduction in demand and improved farming conditions. This had been stated explicitly in several documents of the FCTC.

The Sixth Conference of the Parties (COP) of the Frame Work Convention on Tobacco Control held in Moscow in October 2014 has approved the working groups' report on the policy options and recommendations on economically sustainable alternatives to tobacco growing (in relation to article 17 & 18 of the WHO's FCTC), which are now available for adoption by the parties to the Frame Work Convention. This document discusses in detail the manner for developing and implementing strategies for alternative livelihoods.

In this document, it was declared that the WHO-FCTC does not aim to penalise tobacco growers and workers for cultivating tobacco, but aims to promote economically viable alternatives for those who will be affected by the reduction of tobacco consumption. It is also stressed that the policies for implementing alternative livelihoods should be 'holistic' and encompass not just the economic and productive diversions or mere substitution of one crop with another, but includes the welfare and quality of life of farmers and workers as well as environmental protection. The recommendations also highlight that the diversification strategies should be both agricultural and non-agricultural, market demand driven and promote sustainable development of the agricultural sector stressing that policies for crop diversification shall be developed by engaging tobacco growers and workers in policy formulation. The working group also recommended for mainstreaming alternative crops / livelihood options into Government rural development programmes and this also calls for a large coordinated effort on the part of all Government departments for promoting livelihood alternatives.

It has taken more than 10 years for FCTC just to agree on an appropriate methodology for how countries should begin to deal with this objective. Given the vast scope of recommendations, it is likely to take some more time before the recommendations are fully implementable. There are no time frames mandated by the FCTC for phasing out of tobacco cultivation.

IV. Role of Ministry of Commerce / Tobacco Board

Ministry of Commerce and Industry, Government of India / Tobacco Board has not announced any specific policy to compulsorily/forcefully move the FCV tobacco growers from tobacco cultivation. However, Tobacco Board as per the mandate given by the Tobacco Board Act, 1976 is regulating the production and marketing of FCV tobacco in India based on market dynamics to ensure fair and remunerative prices to tobacco farmers.

The crop regulation by the Tobacco Board is demand driven and the increase/ decrease in crop size is as per the demand and supply of FCV tobacco in domestic and international markets, subject to ceilings fixed by the Government of India. Government of India had already fixed upper ceiling of crop size for FCV tobacco in Andhra Pradesh and Karnataka at 170 and 100 million kg respectively and Tobacco Board is regulating the cultivation in and around these limits.

Specific supply reduction measures or a plan for gradual shifting of farmers from FCV tobacco cultivation is not included in the production policy of the Tobacco Board as the Tobacco Board is strictly implementing stringent restrictions on extent of area planted, quantity of tobacco produced and cured to avoid large scale increase/ variation in FCV production. Tobacco Board is mainly concentrating on prevention of excess/ unauthorised production of tobacco.

The Tobacco Board, however, is concentrating on vertical expansion of tobacco by increasing the productivity of tobacco and thereby releases some of the area under tobacco to other alternative food crops. Tobacco Board has restricted horizontal expansion of the area under tobacco by not granting registration to new growers, and not issuing any licenses for construction of new barns, creating additional curing infrastructure and not expanding FCV tobacco cultivation to new areas. Tobacco growers are being encouraged to divert at least 25-30% of their holdings to alternative crops every year instead of mono-cropping under tobacco. Tobacco Board is implementing several extension and development programmes to improve the yield and quality of tobacco grown so as to maximize the yields and returns to the growers.

To sum up, the alternative crops / cropping systems are being recommended for the areas that will be released from FCV cultivation because of increasing yields or because of regulation in case of reduction in demand and area under tobacco.

V. Role of Ministry of Agriculture & Farmers' Welfare and Ministry of Health & Family Welfare

The Ministry of Health & Family Welfare, Government of India in its correspondence with the Ministry of Agriculture & farmers' Welfare and Ministry of Commerce had been suggesting for development of new schemes / programmes for establishing a mechanism for supporting alternative crops / alternative livelihoods to tobacco growers and also showing viable options for them to shift to other crops in the coming years so as to meet the obligations under the WHO-FCTC. The Ministry of Health & Family Welfare also requested the Ministry of Agriculture & Farmers Welfare and Ministry of Commerce to assume responsibility for implementing the project, stating that it is the responsibility of other concerned Ministries to look at the demand and supply reduction strategies as envisaged in WHO-FCTC and COTPA 2003. Ministry of Commerce, while clarifying that FCV tobacco production accounting for 37% of total tobacco production only is under its control, requested the Ministry of Agriculture & Farmers' Welfare to assume the responsibility of implementing the project on crop diversification from the tobacco as the Ministry has research and extension resources to plan and implement the programmes of crop substitution.

In pursuance of these requests, the Department of Agriculture, Cooperation & Farmers' Welfare, Ministry of Agriculture & farmers' Welfare had decided to encourage tobacco farmers to shift to alternative crops/cropping systems in 10 major tobacco growing states in the country viz., Andhra Pradesh, Bihar, Gujarat, Karnataka, Maharashtra, Odisha, Tamil Nadu, Telangana, Uttar Pradesh and West Bengal as a part of ongoing Sub Scheme of Crop Diversification Programmes

(CDP) under Rashtriya Krishi Vikas Yojana (RKVY) w.e.f., 2015-16. The Ministry Agriculture & Farmers Welfare had allocated Rs.50.00 crores additionally to diversify tobacco and this expenditure of tobacco diversification is to be shared on 50:50 basis between Central and State Governments.

Ministry of Agriculture & Farmers' Welfare requested the State Governments to prepare an action plan for the Crop Diversification Programme (CDP) under RKVY for replacing tobacco farming indicating physical/ financial targets on realistic basis based on tobacco area and for providing incentives/assistance in terms of machinery/ equipments or other appropriate inputs as per the guidelines of existing centrally sponsored schemes.

VI. Crop Diversification in non-FCV Tobacco Growing Areas

Non-FCV tobaccos viz., Bidi, Hookah, Chewing, Cigar & Cheroot, Burley, Oriental, Sun cured Country, Dark Western Fire Cured, Mothihari, Jati, Lanka etc., are grown in about 2.50 lakh hectares and account for 63% total tobacco production (450-500 million kg). No institutional mechanism is available to oversee the regulation of non-FCV tobaccos. In fact, the accurate data on area and production of non-FCV tobaccos is not readily available. As such, there is no policy on crop diversification from tobacco in these areas as of now. Though the respective State Governments are caretakers of this production, no interventions are in place to regulate the production of non-FCV tobaccos. Recent direction of Ministry of Agriculture and Farmers Welfare to major tobacco growing states to prepare action plans for reducing the area under tobacco and diverting the farmers to alternative crops from 2015-16 under Rasthtriya Krishi Vikas Yojana (RKVY) Scheme is the only initiative for crop diversification in non-FCV tobacco growing areas.

VII. International Experiences on Crop Diversification Efforts in Tobacco Growing Areas

Examples do exist in which tobacco cultivation has been partially replaced by another crop around the world. During last ten years, several countries have attempted to adhere to Article 17 without the guidance of the FCTC. The details sourced from an article published in Tobacco Journal International on "The best alternative to tobacco is still tobacco" are as follows:

Brazil: In 2005, Brazil launched a National Program for Activities on Diversification in Tobacco Growing Areas under the coordination of the Ministry of Agrarian Development (MDA). In 2014, the country reported that BRL 12 million (EUR 3.5 million) had been invested in 60 such projects, believed to be benefiting 80,000 family farmers in the country. These projects helped farmers switch from tobacco to other products such as grapes for wine as well as dairy farming. This programme is seen as an experiment and financed by the government.

Malaysia: According to figures reported to FCTC, number of tobacco growers plummeted from around 6,000 in 2009 to around 1,600 in 2014 in Malaysia because of crop diversification efforts. Kenaf, a hemp-like plant which can be turned into fibre for jute, has partially replaced tobacco production. It is reported, more tobacco growers have been switching to Kenaf every year. According to reports, Government provides for the majority of farmers' needs including the supply of fertiliser and seeds. The Government also purchases the final product. For this reason, 'Kenaf' does not represent a real market and cannot really act as long-term alternative to tobacco.

Argentina: Perhaps, the only example of genuine success in finding an alternative crop to tobacco has occurred in Argentina. Big tobacco cooperatives in the Misiones Province of the country experimented successfully with the production of the natural sweetener, Stevia. Due to the introduction of a new variety of popular soft drink which contains this ingredient, stevia now has a potentially huge global market. The production of stevia now represents a complementary and possible alternative. This product has not entirely replaced the production of tobacco in the region, as per the reports.

Greece: Greece is a prime example of what can happen if tobacco farming is given up without a real alternative. In 2005, 100 per cent of EU tobacco subsidies were decoupled. Then, a large number of farmers gave up not only tobacco cultivation, but agricultural activity altogether and moved to the cities to pursue careers in other sectors. Tobacco volumes dropped from 130 thousand tonnes to 18 thousand tonnes in one year, and FCV tobacco varieties were totally abandoned. Only Classic Oriental remained. When the financial crisis hit, however, many Greek farmers moved back to the countryside to produce FCV varieties of tobacco without subsidies. 8,000 tonnes of FCV tobacco is now produced in Greece. This represents that the best alternative to tobacco is still tobacco. This is especially true in areas where there is no irrigation.

Despite these local successes, tobacco farmers still lack a large-scale, long-term alternative. For tobacco growers all over the world, switching to an alternative crop is more than just changing the seed they are sowing. It is not enough for the new crop to bring revenue equal to that of tobacco. The new crop must have a proven demand, as well as an organised infrastructure to deliver it from farm to market. To maintain the socio-economic standing of the growing region, the alternative crop must provide a similar number of jobs taking care of farm labour displaced by the shift from tobacco cultivation.

VIII. Crop Diversification Efforts in FCV Tobacco Growing Areas of India

a. Obstacles in diversifying the tobacco farmers to other alternative activities are as follows

- Unlike any other agricultural crop in India, FCV tobacco cultivation is being taken up under the direct and intensive supervision of able institutions- Tobacco Board and ICAR-CTRI from the Government side and M/s. ITC, GPI and other major tobacco companies in the private sector. All these institutions extend door step services to the FCV tobacco farmers' right from the soil and seed, cultural practices, Post-Harvest Product Management to marketing, for a hassle free cultivation of tobacco.
- With the institutionalisation of the crop and its marketing combined with a guarantee for repayment of loans, bankers obviously are pampering the tobacco farmers with higher amounts of loans and no other crop enjoys that much credit facility as tobacco.
- FCV tobacco production is infrastructure intensive and therefore once the investment is made on requisite infrastructure (barns, bulking sheds etc), farmers will have no other choice and thereby attached to tobacco cultivation.
- FCV tobacco production is labour intensive. All through from seed to marketing, tobacco cultivation requires a lot of human labour and farmers enjoy the top of the social echelon in the society by managing the activities of huge labour force.
- Under the existing auction system, sales of tobacco are implemented by Tobacco Board, in an e- auction mode, which is a well organized and state of the art market system. The

tobacco farmers having experienced the benefits of organized market structure of tobacco hesitate to bring down the tobacco cultivation and not willing to go for alternative crops since the marketing of alternative crops is witnessing problems periodically and also is disorganized.

- With all the craze, type of social status & financial assistance, the fellow farmers who does not have barn license are envy of the farmers having registered barns and whenever opportunity comes they take over the tobacco cultivation on lease basis despite known threats of higher lease and non-remunerative prices.

This is how the tobacco cultivation is continuing unabatedly despite the availability of several other alternative crops which can be taken up with much ease than the FCV tobacco.

IX. Experiences of Tobacco Board

a. Crop diversification from FCV tobacco before establishment of Tobacco Board

Crop diversification from FCV tobacco has been happening naturally with the passage of time over the years. There were shifts in the cultivation of tobacco from one area to another. One noteworthy example is the shift of FCV cultivation from Guntur to Prakasam district. FCV tobacco cultivation was first introduced in Guntur district of Andhra Pradesh in 1933 and by the 1960s, majority area in Guntur district was under cultivation of tobacco with thousands of barns constructed for curing of FCV tobacco. However, due to mono-cropping of tobacco for many years, there were certain problems related to leaf quality. Further, lack of assured market facilities motivated farmers to shift to cotton cultivation in 1976, which seemed remunerative. Within a decade's time, the entire area was shifted from tobacco to other crops, mainly cotton and the barns were abandoned. The shift was permanent as the growers preferred a change due to non remunerative nature of tobacco cultivation. The crop diversification continued even in the 1980s and 1990s and was complete with the decline in demand for tobaccos grown in Guntur district due to disintegration of the USSR. At present 228 barns are left in Guntur district.

b. FCV tobacco crop holiday during 2000-2001

Following the unprecedented market crisis in 2000 auctions and on consideration of huge piled up stocks in the Indian market and growers' demand for declaring a crop holiday. The Tobacco Board declared a crop holiday for the 2000-01 crop season in Andhra Pradesh and Maharashtra. With this, about 1.28 lakh hectares were available for alternative crops from tobacco area. The board had given extensive publicity and also organized meetings with participation of scientists from Acharya NG Ranga Agricultural University / extension officers of the State Agricultural Department to guide the farmers.

During 2000-01 crop season, Tobacco growers in light soils of Prakasam district have grown black gram, red gram and castor and realized remunerative returns. The growers in the black soil areas of Prakasam and Nellore districts achieved good yields in bengal gram, black gram, red gram, maize, coriander, sunflower and groundnut. The tobacco growers of the central belt (Guntur and Krishna districts) also had good yield from black gram, sunflower, green gram, maize, jute and soya bean. The growers in East and West Godavari districts in the northern belt had taken up paddy, sugarcane and banana cultivation. The tobacco farmers in Bhadrachalam area of Northern belt received better returns from black gram besides diversifying to cotton and chillies. The growers from Karimnagar district of northern belt diverted lot of tobacco area to cotton and chillies. The shift is temporary as most of the tobacco farmers once again reverted to

growing of tobacco in subsequent years with the improvement of market conditions and returns from tobacco.

However, the shift has demonstrated to the farmers and policy makers, that there are alternatives for tobacco and crop diversification from tobacco is possible if the same is facilitated properly. In the subsequent years, tobacco farmers in A.P utilized their surplus lands for growing alternative crops. Thus, the farmers continued the cultivation of red gram and other pulses in SLS area along with tobacco. While in SBS, bengal gram and social forestry are taken up by the farmers. Cultivation of maize and eucalyptus continued to be the alternative crop for tobacco in NLS.

c. Phasing out of FCV tobacco cultivation in Central Black Soils/Northern Black Soils

Tobacco produced in Central Black Soil (CBS) areas is categorized as filler tobacco and is exported to East European countries at lower prices. Disintegration of former USSR in the early 1990s and changes in global tobacco industry necessitated the use of quality tobacco which led to sharp decline in demand for these tobaccos. Due to this, tobacco farming in Central Black Soils/Northern Black Soils area became increasingly unviable for most of the farmers. Spiralling input costs and labor wages coupled with shortage of labor on one hand and highly volatile farm prices on the other hand, caused a severe squeeze in farm incomes and pushed farmers into debt traps. Farm prices for tobacco no longer were meeting the cost of production in these regions. The farmers voluntarily shifted from tobacco cultivation and sold their barns. Subsequently, Kanchikacherla and Keesara auction platforms were clubbed into one and operated from Keesara. Tadikonda auction platform was closed. The crop marketed in CBS was down from 24.0 m.kg in 1992 to 1.31 m.kg in 2012. Majority of the farmers started cultivation of cotton and subabul. Farmers were also raised two crops of pulses viz., black gram/ green gram in *Kharif* and bengal gram in *Rabi*. In assured irrigation area, maize was cultivated. Farmers in NBS areas diverted to Cotton and Chillies cultivation. The growers in Bhadrachalam area were allowed to sell their barns for shifting (during 2007-08, 2009-10 and 2012-13) to other soils. A total of 1905 barns were permitted for sale/ shifting across the soil region for a consideration of Rs.4-6 lakhs which served as compensation. Thus, tobacco cultivation in CBS was stopped since 2013-14 and a permanent shift from tobacco crop.

d. Reduction of FCV tobacco area and shift to alternative crops during 2015-16

FCV tobacco farmers experienced market crisis during 2014-15 crop season. Tobacco Board reduced the crop size from 170 million kg to 120 million kg during 2015-16 crop season in Andhra Pradesh taking into consideration the gloomy situation in the world tobacco market and carryover stocks, declining demand for tobacco in both international/domestic markets and growers' demand for reduction of crop size for ensuring remunerative prices to their produce. As a result, around 48,000 hectares of land was released from FCV tobacco cultivation for taking up alternative crops.

During 2015-16 season, FCV tobacco farmers in SLS grown alternative crops like red gram, cotton, chillies, bajra and cowpea while black soil farmers grown blackgram, redgram, cotton, chillies and social forestry. In NLS sugarcane, eucalyptus, maize, cotton, groundnut and vegetables are the alternative crops grown. Farmers of Karnataka also started to grow alternative crops like ginger, maize, potato, cotton and turmeric.

e. Crop diversification efforts in non-FCV tobacco areas and experiences

A case study on tobacco cultivation and alternative crops in bidi tobacco growing regions of Sidnal village of Karnataka, and Gujarat (1997-2000) reported by Dr Vinayak M Prasad, Director (Public Health), Ministry of Health & Family Welfare indicated that the farmers were provided with seeds for alternative crops and bank credit for starting dairying under the intervention programmes.

In Karnataka, the initial response was quite good with 50% reduction in tobacco area. In the immediate next year, the reduction of tobacco was only 15%, due to lack of sustained financial assistance and institutional support. In Gujarat, it was observed that diversified farmers (intercropping with cotton) obtained higher net return per hectare.

Above studies indicated that the willingness of tobacco farmers to change their crop preferences and continued assistance offered in the initial years of crop shift is very important for the success of crop diversification. The experience on crop diversification suggested that any major deviation from established practices in agriculture requires a forceful intervention and comprehensive coverage of all related aspects.

X. Conclusion

Crop diversification from FCV tobacco is possible and essential from public health point. However, the process and strategies for making it happen are not as easy as said. The success of crop diversification depends on opportunities for diversification and on farmers' responsiveness to those opportunities. Farmers who are actual players in the field have a definite mindset and conditioned behaviour and they are to be offered practical and workable strategies. It must be understood that diversification is a dynamic phenomenon and can be multidimensional. Accordingly, planning and implementing strategies for crop diversification are to be crafted. Hence, conducive conditions play a decisive role.

Tobacco is no longer the most profitable crop as claimed. Tobacco has now become a more risky crop with increasing crop and market risks. Since 2010-11, the production of tobacco was affected by weather calamities like drought, heavy unseasonal rains and cyclones in 4 out of 6 years. The farm prices are subjected to heavy fluctuations. Losses from tobacco cultivation during last four seasons in southern light soils prompted the farmers to shift to red gram and other pulses. Other constraints in the cultivation of tobacco viz., shortage of labour and fuel are slowly killing the farmers' enthusiasm for cultivating tobacco. Farmers' desire to continue with tobacco is being challenged by socioeconomic changes like increased value of land, availability of high amounts of fluid cash and changing lifestyles in tobacco growing villages. On the other hand, with the increase in the prices of alternative crops like cotton, chillies and pulses, they are emerging as formidable competitive crops to tobacco. However, the alternative crops are also facing problems in cultivation and in market. In these circumstances, growers are more confused and are not ready to accept change and to adapt to the new circumstances.

A clear national policy on crop diversification from tobacco followed by action plans for area wise diversification drawn in consultation with farmers are the pre-requisities. Huge research effort, large scale financing and big government initiative is necessary to wean away farmers to alternative crops. This is a multi-sectoral subject as there are a number of cross-cutting issues falling under domains of many government departments/ministries (issues like alternative crops (Ministry of Agriculture) and alternative livelihood for bidi rollers (Ministry of Labour/Ministry of

Rural Development)). There is a need to bring on-board these stakeholder Departments / Ministries as the crop diversification from tobacco is policy driven. Adequate incentives need to be given and may have to be heavily funded by the government. In order to support diversification, the Government should provide a level playing field in terms of policy support like long term policy for diversification with incentives, remunerative prices for the crop, assured marketing for alternatives, value addition and processing.

The recommendations of the working group on economically sustainable alternatives to tobacco growing areas (in relation to article 17 & 18 of the WHO's FCTC), developing a comprehensive database on the economics of tobacco production by region and by variety; conducting baseline analysis of the problem before formulating policy and understanding of profile and main features of tobacco sector in India and comprehensive analysis of how the tobacco production chain in each area is organised is necessary before proceeding for formulating strategies of alternative crops/cropping systems to tobacco in those regions.

Other major recommendations are, conducting research to find potential alternatives to tobacco growing and designing a strategic plan for its implementation; defining the role of each and every government department involved in tobacco cultivation in developing and implementing these strategies; conducting field trials in different tobacco growing zones to validate long term sustainability of the identified substitute crops; extensive farmer training programmes to impart knowledge/skills regarding cultivation of the substitute crops and phase wise introduction of the substitute crops/subsidised inputs need to be considered in right earnest for area-wise crop diversification from tobacco crop.

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Support for Crop Diversification

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Need of Crop Diversification

Crop diversification will address issues connected with exhaustive use of natural resources under single cropping system, diminishing productivity and economic returns, environment protection, policy interventions, social needs, climate change, international obligations etc. and help in maintaining sustainable agriculture. Major issues related to crop diversification from tobacco are higher economic return, huge foreign exchange and direct or indirect employment to millions of people. The government will not push farmers but support the gradual diversification from tobacco. The government has balanced coordination between ministries dealing with the issue. It is working in tandem with different ministries and line departments and taking up the programme through a step by step process.

Major Issues that Needs Attention for Crop Diversification from Tobacco

- Higher economic return to tobacco growers in comparison to other crops
- No single crop is profitable than tobacco
- Tobacco and its products provide employment to millions of people directly or indirectly
- Provide huge foreign exchange through export of tobacco particularly FCV tobacco
- Health hazards by tobacco use
- Environmental hazards by use and production of tobacco
- Providing profitable crops/ cropping systems to replace tobacco

Different Centrally Sponsored Programmes/Schemes on Crop Production and Diversification:

Department of Agriculture, Cooperation & farmers' Welfare, Government of India is implementing following Missions/Schemes.

- National Food Security Mission (NFSM) on rice, wheat, pulses, coarse cereals, sugarcane, cotton, jute.
- National Mission on Oilseeds & Oil palm (NMOOP)- oilseeds, oil palm & tree borne oilseeds
- Mission for Integrated Development of Horticulture (MIDH)
- Rashtriya Kirshi Vikas Yojana (RKVY)

Crop Diversification Programme (CDP) of DAC & FW

- CDP is a sub scheme under RKVY which provides support to the farmers to shift from paddy to low water requiring crops in Punjab, Haryana & Western UP and from tobacco to other alternative crops/ systems in tobacco growing states.

- Earmarked an outlay of Rs.25.00 Crore (Central Share) for tobacco growing states during 2015-16.
- States covered under Crop Diversification Programme on Tobacco are Andhra Pradesh, Bihar, Gujarat, Karnataka, Maharashtra, Odisha, Tamil Nadu, Telangana, Uttar Pradesh and West Bengal.
- Crop Diversification Programme on Tobacco is being implemented on 60: 40 sharing basis between Government of India & State Governments from 2015-16.
- GOI has already approved the programme for the State of Andhra Pradesh for 2015-16 which include both agriculture & horticultural crops with a central share of Rs.10 crore.
- Action Plan for Telangana State is under consideration.

Role of DAC&FW, Govt. of India in Diversification from Tobacco

- To supplement the efforts of the State Government, DAC&FW is providing support under Centrally Sponsored Schemes to the farmers to grow alternative crops in all tobacco growing states
- Increased awareness creation on harmful effects of tobacco consumption and directives of legislature / courts to provide alternative crops/ cropping systems to tobacco growers
- Ministry of Health & Family Welfare, Government of India to act as a nodal agency to monitor international obligations made under FCTC

The following activity and interventions are planned for effective implementation of crop diversification in tobacco growing areas.

1 Provision of incentives/assistance in terms of machinery/ equipment/ critical inputs will be planned as per the guidelines of the existing centrally sponsored schemes so as to motivate the farmers.

2 Organising farmers study tours/ exposure visits and campaigns for highlighting the harmful effects of tobacco and long term benefits of alternative crops.

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Possible Alternative Crops and Cropping Systems for Diversification in Tobacco Growing Regions of Andhra Pradesh

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Demarcation of low productive and non-remunerative tobacco areas is the first step for initiating crop diversification. The area under a particular crop depends on price of the previous year. Government of Andhra Pradesh is working out mandal level plans with the help of village level data for identifying the best alternative crops that are to be grown in tobacco growing areas.

Year wise Area, Production and Yield of Tobacco in Andhra Pradesh

Year	Area (Lakh Ha)	Production(Lakh Tonnes)	Yield (Kgs/Ha)
2010-11	1.49	2.60	1752
2011-12	1.23	1.56	1268
2012-13	1.30	2.55	1962
2013-14	1.43	2.76	1930
2014-15	1.40	3.58	2565

In Andhra Pradesh, the area under tobacco cultivation is decreased from 1.49 lakh ha (2010-11) to 1.4 lakh ha (2014-15), while tobacco production increased from 2.60 lakh tonnes (2010-11) to 3.58 lakh tonnes (2014-15) due to productivity enhancement from 752 kg/ha (2010-11) to 2565 kg/ha (2014-15).

Area Coverage of Tobacco in Different Districts of Andhra Pradesh, 2014-15

S. No.	District	Area in ha
1	Srikakulam	53
2	Vizianagaram	1042
3	Visakhapatnam	180
4	East Godavari	4000
5	West Godavari	28000
6	Krishna	2000
7	Guntur	5000
8	Prakasam	81000
9	Nellore	12000
10	Kurnool	6286
11	Ananthapur	258
12	Kadapa	84
13	Chittoor	97
14	**TOTAL**	**140000**

Though, the tobacco crop is being grown in all the thirteen districts of Andhra Pradesh, 3 districts namely Prakasam, West Godavari and Nellore occupied 86 % of tobacco area in A.P.

Tentative area (ha) to be Diverted from Tobacco to Alternative Crops

S. No	District	Normal area (ha)	Tentative area to be diverted (ha)	% of area to be diverted
1	Prakasam	74598	31000	42
2	West Godavari	27061	13000	48
3	Nellore	10958	3100	28
4	Guntur	4523	3000	66
	Total	117140	50100	43

Tobacco Board, Ministry of Commerce, GOI reduced the crop size of FCV tobacco in the state of Andhra Pradesh from 172 M. kgs to 120 M.kgs for the year 2015-16. It is against this background, an extent of 50,100 ha which accounts for 43% of the FCV tobacco growing area can be diverted for growing other crops in FCV tobacco growing areas of A.P. District wise FCV tobacco growing area that can be spared for growing other crops is 66%, 48%, 42% and 28% from Guntur, West Godavari, Prakasam and Nellore districts respectively.

In this backdrop, suggested following crops/cropping systems as an alternative to tobacco in various districts of Andhra Pradesh. Maize, jowar, bengalgram, blackgram, greengram, cowpea and groundnut are alternative cereal/ pulse/oil seed crops recommended for cultivation in FCV tobacco growing areas of Andhra Pradesh. Pulses are the best crop options for diversifying FCV tobacco, especially in Prakasam district where red gram area increased with an estimated production of 1.14 lakh metric tonnes.

Alternative Cropping Systems Recommended for Andhra Pradesh

S.No	District	Alternate cropping systems
1	Prakasam	Redgram+Jowar Greengram -Jowar Redgram+Maize Bengalgram
2	West Godavari	Greengram/Groundnut, Fodders Jowar, Maize-Pulse, Maize, Bengal gram
3	Nellore	Redgram+Jowar Greengram -Jowar Bengalgram
4	Guntur	Redgram+Jowar Greengram -Jowar Redgram+Maize Bengalgram

Profitability of Alternative Crops over FCV Tobacco in Andhra Pradesh

Crop	Cost of cultivation/ ha	Yield (Kgs/ha)	Price/ Qtl	Gross income/ ha	Net profit/ ha	C: B ratio
Tobacco	103553	7.5	11606	88630	- 14923	1: 0.14
Greengram	20344	8.5	7000	59500	39156	1: 1.92
Blackgram	21734	10.0	6000	60000	38266	1: 1.76
Bengalgram	35284	15.0	4000	60000	24716	1: 0.70
Maize	44537	75.0	1325	99375	54838	1: 1.23

The Cost Benefit ratio was highest for greengram (1:1.92) followed by blackgram (1:1.76), maize (1:1.23), bengalgram (1:0.7) and tobacco (1:0.14).

Crop Diversification Programme for Replacing FCV Tobacco Farming with Alternative Crops/ Cropping System during 2015-16 in Andhra Pradesh

State department of agriculture, Govt. of AP selected Prakasam, West Godavari, Nellore and Guntur districts for implementation of Crop Diversification Programme (CDP) with an outlay of Rs. 15 crores. Keeping in view the profitability, crops like bengalgram, blackgram, greengram, cowpea, jowar, maize and groundnut were selected for its promotion in tobacco growing areas of A.P.

Sl.No	Component	Target	
		Physical	Financial (Rs. in lakhs)
1	Demonstrations on alternative crops	149106	15.96
2	Farm implements	2740	130.50
3	Efficient water application tools	6177	671.30
4	Farmer trainings and exposure visits	575	67.24
5	Contingency		15.00
	Total		1500.00

Crop Diversification Programme Implemented by Dept of Horticulture, AP

Prakasam, West Godavari, Nellore and Guntur districts were selected for implementation of Crop Diversification Programme (CDP) with an outlay of Rs. 1.53 crores. The crops selected for its promotion in tobacco growing areas were vegetables and oil palm with a financial assistance of Rs.135.00 lakhs and Rs.18.00 lakhs respectively.

Suggestions

- Fixing production targets for each year considering the demand and area under cultivation of tobacco in each district.
- Identification of low productivity areas and suggesting remunerative alternative crops.
- Developing data base on area, yield and production of tobacco crop for last five years.
- Double crop sequences systems are to be identified which are more remunerative to replace tobacco.
- Popularizing best management practices for yield enhancement in diversified crops. Existing centrally sponsored programmes on cereals and pulses have to be efficiently utilised in order to promote crop diversification.

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Prospects and Constraints of Available Options for Crop Diversification in *Bidi* Tobacco Growing Areas of Gujarat

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Tobacco (*Nicotiana tabacum* L.), an important non-food narcotic cash crop, belongs to the family Solanaceae, is believed to be introduced in India from its native Central America by Portuguese in 1603. The word *Nicotiana* as well as nicotine was named in honour of Jean Nicot, French Ambassador to Portugal, who sent it as a medicine to the court of Catherine de Medicine in 1559.

Amongst the 66 known species of *Nicotiana*, *N. tabacum* and *N. rustica* are the cultivated ones. *N.tabacum* is grown all over the country, while *N. rustica* is confined mainly to the northern and north eastern areas of the country. Various types of tobaccos grown in the country are mainly Flue Cured Virginia (FCV), bidi, hookah, chewing, snuff, lanka, cigar-wrapper, cigar-filler, cheroot, oriental, pikka, natu, burley and HDBRG.

India is one of the principal tobacco producing countries in the world. The crop occupies less than 0.23 per cent of the net cultivated area and earns sizable amount of Rs 21919 crores to the nation, i.e. Rs. 5869 crores as foreign exchange (Anon. 2015c) and Rs 16050 crores as central excise (Anon. 2015b) to the national exchequer, besides providing direct and indirect employment to 36 million people including 6 million farmers and workers.

In India, tobacco is grown mainly in Gujarat, Andhra Pradesh, Karnataka, Uttar Pradesh, West Bengal, Tamil Nadu, Orissa, Bihar and Maharashtra. Gujarat occupies first place from productivity view point followed by Andhra Pradesh. During 2014-15, tobacco production in the state was 236 m kg from about 1.66 lakh ha area under cultivation and productivity was 1421 kg per ha (Anon. 2015d). The quinquennial average (2010-11 to 2014-15) is 1.47 lakh ha area, 250 m kg production and 1702 kg productivity occupying only 1.49 percent cultivated area of the state (Table 1). Majority area of tobacco grown in the state is accounted by *bidi* tobacco. Anand, Kheda, Mehsana, Banaskantha, Vadodara, Sabarkantha, Gandhinagar, Patan, Arvalli, Mahisagar and Amdavad are important tobacco growing districts of the state. Among all, Anand district stands first in production as well as area.

Table 1: Per cent area under tobacco in *Anand*, *Kheda*, *Vadodara and Mehsana* dts of Gujarat

District	Total cultivated area in ha	Average area under tobacco in ha (2010-13)	Per cent area under tobacco
Anand	2,20,262	71,900	32.60
Kheda	3,24,384	42,400	13.07
Vadodara	5,09,144	11,900	2.33
Mehsana	3,65,000	8,300	2.27
Gujarat State	98,01,000	1,46,600	1.49

(2010-11 to 2014-15)

Tobacco is grown extensively as a commercial non-food crop throughout the world by both large and small holder farmers. However, it is abused by number of organisations like NGOs, WHO, Social as well as Religious including Government because of health hazards.

Looking to the anti-smoking campaign and threat of phasing out of tobacco for human consumption, the scientists are working on alternate crops/cropping systems to diversify the tobacco cultivation to other food and field crops. The results are as under.

In non-tobacco based alternative systems, castor-groundnut (summer) and cotton-groundnut (summer) (Table 2 and 3); in tobacco based systems, tobacco-groundnut (summer) and tobacco-bajra (summer) (Table 4 and 5) and as companion crop, tobacco-groundnut (Table 6) have been found to be the best/next best remunerative systems for *bidi* tobacco, which is a major crop. For *rustica* tobacco, paddy (*kharif*)- *Amaranthus* (*rabi*) as alternative crop (Table 7) and cowpea or mung (Table 8) as vegetable found to be the best/next best remunerative systems. However, in rain fed *bidi* tobacco, which is grown in about 35-40 % area, there is no substitute crop as remunerative as tobacco.

Table 2: Tobacco Equivalent Yield (TEY) and net realization with alternative crops in *bidi* tobacco (1996-2000)

No.	*Kharif*	*Rabi*	Summer	TEY kg/ha	Net realization Rs/ ha	Reference
1	Tobacco	Tobacco	-	3356	48,606	Patel
2	Tobacco	Tobacco	Groundnut	5162	74,089	*et al.*,
3	Castor	Castor	Groundnut	4438	68,887	(2004).
4	Cotton	Cotton	Groundnut	4730	68,351	
5	Pigeonpea	Pigeonpea	Groundnut	3131	44,351	
6	Paddy	Mustard	-	2109	19,384	
7	Paddy	-	Okra	3642	43,379	
8	Chilli	-	-	2956	38,211	
9	Bajra	Potato	Bajra	4756	50,588	

Table 3: Additional income due to rotational studies in *bidi* tobacco (1967-71)

No.	Crop rotation (3 Years)	Average Income Rs/ ha	Additional Income Rs/ ha	Refe-rence
1	Tobacco(Tob.)-Tob.- Tob. (Control)	2872	—	Patel
2	Tob. -Bajra(S)-Mung(K)-Wheat(R) –Tob.	2005	-867	*et al.*,
3	Tob.-Bajra(S)-Mung-Castor (KR)Choli (S)- Tob.	2285	-587	(1977)
4	Tob.\-Bajra (S)-Hy Cotton (KR)- Tob.	5815	+2943	
5	Tob.-Bajra(S)-Guar (K), Wheat(R), Choli (S)–Tob.	2067	-805	
6	Tob.- Guar(S)-Brinjal (KR)-Tob.	2006	-866	
7	Tob.Kodara+Til +Tur (KR), Til (S) GM (S) – Tob.	1845	-1027	
8	Tob.- Kodara - Tur (KR), Veg. (S), GM (S)- Tob.	2414	-458	

S=Summer, K= *Kharif*, R=*Rabi*

Table 4: TEY and net returns due to summer crops in *bidi* tobacco cv. GT 5 (1986-90)

No.	Summer	*Kharif*	*Rabi*	TEY, kg/ha	Net return, Rs/ ha	Reference
1	Groundnut	Tobacco	—-	2235	12259	Anonymous (1990)
2	Bajra	Tobacco	—-	1320	1464	
3	Maize (F)	Tobacco	—-	1914	3932	
4	Maize (G)	Tobacco	—-	1797	3841	
5	Jowar (F)	Tobacco	—-	1717	6859	
6	Fallow	Tobacco	—-	2369	7184	

F=Fodder, G=Grain

Table 5: TEY and net income due to cropping sequences for *bidi* tobacco (2012-14)

No.	Treatments	TEY kg/ha	Net income Rs/ ha	Reference
1	Tobacco alone	2763	106414	Anonymous (2015a)
2	Tobacco- Bajra	3244	113461	
3	Cotton- Bajra	2175	61519	
4	Castor- Bajra	1598	38250	
5	Pigeon pea – Bajra	1438	30388	
6	Maize – Mustard – Bajra	2147	56784	
7	Bajra – Wheat – Bajra	1877	25950	
8	Maize – Wheat – Bajra	1948	26677	

Table 6: Total income due to groundnut as a companion crop with *bidi* tobacco

No.	Treatments	Yield (kg/ha)			Total income Rs/ ha	Reference
		Tobacco	Pod	Haulm		
1	Tobacco 90 x 60 cm	3180	—	—	11496	Anonymous (1990).
2	Tobacco 90 cm + Groundnut = (1+1)	3035	630	1434	15800	
3	Tobacco 120 cm + Groundnut = 2+2 with 60 cm	3057	867	1493	17131	
4	Tobacco 120 x 60 cm	3089	—	—	10955	

Table 7: Paddy Equivalent Yield (PEY) and net return in different cropping systems grown with *rustica* tobacco

No.	Summer	*Kharif*	*Rabi*	PEY kg/ha	Net return Rs/ ha	Reference
1	—	Paddy	*Rustica* Tob.	9920	40143	Anonymous (2011).
2	—	Paddy	Wheat	5888	24235	
3	—	Paddy	Maize	6497	31107	
4	—	Paddy	*Amaranthus*	6900	41015	

Table 8: Average gross realization due to monsoon crops with *rustica* tobacco (1979-82)

No.	*Kharif*	*Rabi*	Average gross realization Rs/ ha	Reference
1	Sesamum	*Rustica* tobacco	14846	Anonymous (1982).
2	Cowpea(GP)	*Rustica* tobacco	17761	
3	Bajra	*Rustica* tobacco	15347	
4	Mung(GP)	*Rustica* tobacco	17930	
5	Fallow	*Rustica* tobacco	13995	
6	Paddy	*Rustica* tobacco	14488	

GP= Green pod

I. Following alternative crop/crop sequences are under investigation at BTRS, AAU, Anand at present:

Bidi tobacco

1. Tobacco (*Kharif-Rabi*) alone
2. Ground nut (*Kharif*) – Potato (*Rabi*)
3. Maize (*Kharif*) – Potato *(Rabi)*
4. Pigeon pea + Bajra (*Kharif-Rabi*) – Clusterbean (Summer)
5. Sesamum *(Kharif*) – Potato (*Rabi*)
6. Tobacco (*Kharif-Rabi*) – Bajra (Summer)
7. Okra (*Kharif*) – Potato *(Rabi)*
8. Cotton (*Kharif-Rabi*) – Cluster bean (Summer)
9. Cotton (*Kharif-Rabi*) – Green gram (Summer)
10. Castor (*Kharif-Rabi*) – Green gram (Summer)

***Rustica* tobacco**

11. Groundnut + *Rustica* tobacco
12. Sunflower + *Rustica* tobacco
13. Soybean + *Rustica* tobacco
14. Paddy + *Rustica* tobacco

II. Prospects for bidi tobacco

- Suitable soil & climate
- Low input cost
- Highly remunerative crop
- Flexible planting period
- Drought tolerant crop
- No alternate crops for rain-fed areas
- No animal hazards
- Storage potentiality
- No risk of theft
- No requirement of labour everyday

III. Constraints in diversifying crops

- Other crops are not remunerative as tobacco
- Profuse vegetative growth of other crops with low productivity.
- No alternative crops for rain-fed areas
- Other crops require plant protection measures
- High input cost and needs daily attendance
- Fear of stealing of the produce
- Labour problems
- Severe damage due to wild animals such as *Nilgai* (Indian blue bull) and Wild boar

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Farmers Perspective on Crop Diversification in Tobacco Growing Areas of Andhra Pradesh

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In earlier days, in black soils, bengal gram, pulses and jowar used to be grown under rainfed conditions with meagre yield. The cultivation was rainfed with farmer looking at the sky for a good rainfall to cultivate few crops. The villages were with small dwellings and land preparation was only with the help of bullocks. There used to be no handful of work for labour and their livelihood was at stake. Tobacco was introduced in black soils of upland region about 100 years back. It was grown on residual soil moisture with no need of additional irrigations. Under good weather conditions, tobacco yields were between 15-17.5q/ha. Due to good relations between India and Russia, around 40 M kg of tobacco used to be purchased by Russian manufacturers. This augured well for all the stakeholders-traders, farmers and labour in realising their share of benefit. This gave a fresh lease of life to the farmers and labour in black soils. Black soil tobacco was only grown in India and couldn't compete with light soil tobaccos of the world. In this context, light soil tobacco cultivation was started at different places of Mysore region in Karnataka and West Godavari region in Andhra Pradesh.

Before 1980, light soil region farmers did not have even a bicycle for conveyance. After introduction of tobacco, they purchased cows, bullocks and prepared their land with bullocks. As tobacco cultivation provided good returns, the life style of the farmers changed and they purchased tractors, constructed pucca houses, educated their children and could afford good clothing. There was handful of work to the labour in the region and even their children got educated. Till 2002, government also encouraged the cultivation of tobacco by extending the subsidy to the barns.

FCV tobacco cultivation was successful on a large scale and could sustain only in Andhra Pradesh, Telangana and Karnataka as compared to other states. Out of 800 M kg of tobacco production in the country, 300 M kg is of FCV type and the rest of 500 M kg is of Non-FCV type. Cigarette has a filter, covered by a paper and is less harmful than other forms of tobacco consumed. In India, of the total tobacco consumption, only 11-12% is consumed in the form of cigarettes, while more than 85% is consumed through other forms of use. When Tobacco Board fixed crop size of FCV as 270 M kg, the crop size of non-FCV was only 300 M.kg. But today Non-FCV crop size is 500 M kg. It is only this year; we have seen farmer suicides due to problem in marketing the FCV crop. To exhaust the carryover stocks, the crop size of FCV tobacco was regulated. Government should look at other harmful types of tobaccos and also bring them under purview of some regulatory body.

In 2003, around 150 countries have signed tobacco regulatory policy (FCTC) under WHO. Most of the other countries have not signed. India is quite proactive in implementation of the guidelines than other countries. Taxation on cigarettes is high in India. About 87% is imposed as tax on the legal cigarettes while only 13% on other tobacco products. Lot of illegal smuggling of cigarettes through sea is reported. Around 25% of the cigarettes sold are smuggled and the estimated revenue loss to the government is Rs 9000 crore. This translates to a loss of 25 M kg of tobacco leaf demand to the Indian farmer's produce.

I went along with my friend to Khan Market in Delhi during one of my visits and was surprised to find more than 100 varieties of foreign brands of illegal cigarettes with the vendors there. There were no pictorial warnings on these brands. When we asked a vendor for a legal brand he took us somewhere inside. Instead, the smuggled brands are prominently displayed outside. The vendor will not have much margin from legal brands while he is making Rs. 30 or more per packet from these smuggled cigarette packets. This indicates that no justice is done for the legal brands. Article 17&18 of FCTC suggests for provision of alternative crops to the tobacco farmers. These alternative crops should be equal or more remunerative than tobacco. Scientists from CTRI and some farmer leaders are advising the tobacco farmers to go for oil palm or maize or sugarcane as alternative crops. When the international price of crude palm oil is $ 1200/T, the farmers' price is down to Rs 5200/T of oil palm fruit. Moreover, Oil palm requires 200 litres of water/plant/day. Under these circumstances farmers are cutting down the oil palm orchards.

Around 4 to 5 years back, to facilitate export of white refined sugar; brown coloured sugar was imported to India. This was not achieved and the piled up of stocks of sugar resulted in a market glut and as a result sugar industry collapsed. As an example, the *Chagallu* sugar factory which is in NLS region of A.P, used to process 12 lakh tonnes per season. At present, it is processing only 3 lakh tonnes per season. In case of Maize crop, it is more suitable for cultivation in clay and loamy soils than sandy soils. Further, the members from National Egg Coordination Committee (NECC) represented to the Minister of Agriculture indicates that poultry feed cost is increasing due to domestic maize prices and requested for import of maize for poultry feed. Consequent to the import, the local prices of maize are going to be effected downward from existing Rs 1400/q.

When we question the tobacco farmers about the alternatives, there is no response from any one. It is clear why the farmer is not going for the above alternatives. As per FCTC Article 17 & 18, viable alternatives are to be suggested for shifting from tobacco. During 2000-2001, due to the declared tobacco crop holiday to liquidate carryover stocks, the farmer without any option, for one season took up other crops even though they were not proven viable alternatives. Tobacco farmers have tried alternative crops like medicinal & aromatic plants and Bengal gram.

It is not only the alternative crop. It is also about 1) Govt. partnership with the farmer 2) Support of financial institutions and 3) Marketing facilities. This is what we have through tobacco board. After Tobacco board came into existence, systems were streamlined, crop is being regulated in line with the demand, farmers benefitted through accuracy in weighment and timely payment of sale proceeds to farmers, facilitating timely input supply and more importantly there is a mechanism in place for farmer, trade and Govt. bodies to meet periodically so as to review the issues pertaining to the tobacco crop. These are the strengths of the current marketing system of FCV tobacco. When suggestions are made to switch to other crops, all these facilities are to be provided so as to drive the farmers towards crop diversification.

In NLS area, there is no option of any alternative crop that offer returns closer to that of tobacco. Hence we are not ready to shift from tobacco cultivation without any alternative crop in sight.

PLEASE DO NOT PUSH US BACK FROM PROSPERITY TO POVERTY.

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Industry's Perspective on Crop Diversification in Tobacco Growing Areas

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I. Scenario of Indian Cigarette Tobacco and Characteristics

Indian tobacco landscape: Indian tobacco consists of nine different types in which four are cigarette type and remaining are non-cigarette type. Out of the total tobacco production of 802 M.kg (2015) cigarette type is 318 M.kg and non-cigarette type is 484 M.kg. Among non-FCV tobacco types Chewing tobacco type (256 M.Kg) is having major share followed by *Bidi*. FCV tobacco is the major cigarette type tobacco grown in Karnataka and Andhra Pradesh.

Indian cigarette tobacco landscape

Indian cigarette tobacco landscape in different major growing areas

Particulars	Northern	Southern Light Soils LightSoils (NLS)	Mysore & Black Soils	Vinukonda Burley (VB)
No. of farmers	12,000	35,000	60,000	10,000
No. of villages	300	900	1000	300
Area (ha)	30,000	90,000	100,000	8,000
Production (M kg)	60	110	100	15

Ecosystem of Indian FCV tobacco industry:

Indian FCV tobacco industry comprises of five major components. These components are interwoven in the production and marketing of the commodity.

1. Tobacco Board: Tobacco board works under Commerce Ministry, GOI and acts as a Policy making body, Crop regulator, Auctioneer and facilitate in Rxport Promotion.

2. Indian Tobacco Association acts as an apex body regulating and assisting trade and farmers.

3. Central Tobacco Research Institute works under Indian Council of Agricultural Research, Ministry of Agriculture & Farmers Welfare, GOI mainly involved in fundamental research on different types of tobacco and alternative products.

4. Tobacco Industry in India involves 162 tobacco exporters, 700 registered traders and about 100 other trade participants.

5. Farmers: The farmers of cigarette tobacco are mainly small / marginal farmers with huge farmer base in Andhra Pradesh and Karnataka. The cigarette tobacco production involves large number of farm labourers and their livelihoods depend mainly on tobacco crop in these two states.

Tobacco and it's demographics in the country

The tobacco crop is the life line for 46 million tobacco farmers, farm labourers, rural poor, women and tribals which contribute around 4.5% of countries population. Around 0.3% of arable land occupied by tobacco under rainfed conditions is marginal and low fertile. Tobacco being hardy crop withstands weather vagaries and generates three times more income compared to other crops providing decent livelihood to the dependents. Cigarette tobacco contributes 85% exchequer and 10% excise earnings in every year to the government.

FCV tobacco growing regions in India are characterised by:

- Low and erratic rainfall with uneven distribution (700 – 1000 mm)
- Marginal & low fertile soils with low water holding capacity
- Small & marginal farmers with less than 1 ha land holdings
- Inadequate farm infrastructure, lack of product handling and storage facilities at local level
- No viable alternative crops to FCV tobacco because of consistent & assured returns from FCV tobacco. Non exploitation by middle men and structured marketing support in FCV tobacco. In-consistent prices and meagre marketing support for alternative crops

II. Factors Influencing Tobacco Exports

Crop competitiveness is mainly influenced by volume consistency, price competitiveness, quality, crop deliveries and regulation compliance. Volume consistency is depending upon crop volumes and crop regulation. Crop regulation and crop volumes should always be consistent. Price competitiveness can be ensured by enhancing farmer profitability which results in sustained price competitiveness. Quality of the tobacco can be improved with less NTRMs. Compliance of the international regulations regarding minimising CPA residues (Benzopyrenes/ Heavy Metals Reduction) must be monitored in order to boost the exports.

Inconsistency in authorized crop volumes results in poor economy and brings farmers in to a debt trap. Further, about 21% of market share of illicit cigarettes in India ranking 5th in the world resulting in 51% reduction in domestic volumes. However the unfair taxation levied on the organised and regulated cigarette industry has not reduced consumption instead increased illicit trade. This also led to inconsistent volumes making us a less preferred zone for international buyers and severe fluctuations in market prices. The fluctuations in the market price and effect of illicit cigarette trade without taxation is severely affecting millions of livelihoods of tobacco farmers and also loss of exchequer to the nation.

Price Competitiveness: Price competitiveness is being influenced by the major factors related to production and quality.

Criteria for ensuring price competitiveness

Productivity Enhancement	Production Cost Optimisation	Quality & Integrity Improvement
Role of CTRI is critical	Role of CTRI & Tobacco Board is critical	Role of CTRI & Tobacco Board is critical
Robust R&D towards developing high yielding varieties & hybrids	Development of cost effective mechanisation, customised inputs, energy saving curing techniques.	Focussed interventions on crop quality, grade standards, foreign matter elimination and toxicants reduction.
Collaborative agricultural extension (CTRI + Tobacco Board + Trade) in true spirit for dissemination of technologies	Collaborative agricultural extension (CTRI + Tobacco Board + Trade) in true spirit for deployment of cost optimisation initiatives.	Collaborative agricultural extension (CTRI + Tobacco Board + Trade) in true spirit for deployment of product quality & integrity initiatives.
Critical for farmer profitability & price competitiveness	Critical for farmer profitability & price competitiveness	Critical for customer preference & brand image

III. Problems Faced by Stakeholders: Problems faced by different stakeholders involved in FCV tobacco production and trade were discussed in the following table.

Stakeholder wise problems faced in FCV tobacco production

Farmer	Domestic Manufacturers & Exporters	Customer
Economy of scale (Authorised volume inconsistency)	Indiscriminative taxation (Targeting the organised & regulated industry rather than curbing illicit cigarettes)	Price inconsistency (Fluctuation in purchase costs)
Weather uncertainty (Volume & quality loss)	Significant growth in illicit cigarettes (Impacting domestic volumes & increasing consumption)	Volume inconsistency (Fluctuated volumes leading to demand supply instability)
Reduction in domestic demand (Price fluctuation & less market support)	NGO's driving anti-cigarettes policy (Works in favour of money with no actual focus on health)	Quality inconsistency (Fluctuations in crop quality due to weather)
No or Less subsidies compared to other crops (In spite of farming in marginal lands)	Inconsistent crop quality profile (Weather/other issues posing fluctuating crop chemistries – Nicotine & Sugars)	Product integrity (Issues of foreign matter & chemical residues)
Lack of Government support (No loan or penalty waivers even in crisis)	Ever increasing customer specifications (Narrow chemistries, consistency, foreign matter & toxicants)	Sustainability compliance (Origin sustainability compliance is an eligibility)
Lack of Infrastructure (Poor post- harvest infrastructure affecting product integrity & quality)	No Government support (Export incentives not being provided in spite of major contribution)	
No alternative crop comparable to tobacco (NGO's deceiving policy makers)	Inconsistent crop volumes (Leading to fluctuations in demand & prices)	
Increasing cost of production (Fluctuating purchase cost)	Opportunistic source (India being branded as opportunistic source driven by price)	

IV. Major Issues in Indian Tobacco Industry

- Unfair/ indiscriminative taxation of tobacco products
- Excessive and illogical crop regulation especially on FCV tobacco
- Allowing illicit cigarettes and trade without taxation
- No further export promotion policies by the government
- No government support to farmers

The above issues resulted in domestic manufacturers helpless.

V. Suggested Interventions

Interventions involving different players in FCV tobacco production are:

Farmers	Trade	Tobacco Board & CTRI
Involve farmer groups in key policy decision processes	Involve trade members in key policy decision processes	Provide financial & material assistance in enhancing farm infrastructure
Government support to enhance farm infrastructure	Collaborate with CTRI & Tobacco Board for developing improved technologies	Organize exposure visits to other countries to appreciate practices & policies
Robust crop advisory to registered growers	Active involvement of trade to minimize NTRM & toxicants	Take up in-depth research on viable alternative crops
Optimising the penalty mechanism	Curb illicit cigarette entry & sales in the market	To supply authorised CPAs
Stable authorised volumes	Provide export incentives	Work intensively on export promotion

VI. Conclusions

The research efforts on viable alternative crops are to be made systematically by the concerned organisations. Crop diversification efforts are to be initiated in un-regulated non-FCV tobacco crop having less export potential. Support should be given to regulate FCV tobacco crop till the stage comes to demonstrate economically viable crops that can provide sustainable livelihood. Involve Farmers, Trade, CTRI and Tobacco Board in dialogue and deliberations while promoting crop diversification interventions.

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Crop Diversification in Tobacco Growing Areas of Andhra Pradesh - Suitable Alternative Crops for various Cropping Situations

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Tobacco is an important commercial crop grown in India. It occupies the third position in the world with an annual production of about 800 Million Kg. Of the different types grown, flue-cured tobacco, country tobacco, burley, bidi, rustica and chewing tobacco are considered important. India stands third in production of tobacco and in exports. Brazil and USA are ahead of India. Tobacco and tobacco products earn approx Rs.20,000 Cr. to the National exchequer by the way of excise duty, and approx.Rs.5000 Cr. by way of foreign exchange every year. Flue Cured Virginia (FCV) tobacco (is produced in the states of Andhra Pradesh and Karnataka. Belgium is the largest market for Indian FCV tobacco, followed by Russia and Germany. India exports unmanufactured tobacco primarily to Western Europe, South & South-East Asia, East Europe and Africa accounting for about 86 percent of exports. India is now considered to be the world's most dependable source for quality tobacco. This is because of its low pesticide residues and heavy metals, low/negligible Tobacco Specific Nitrosamines (TSNA) levels, its consistent volumes, reliable supplies and availability of an amazing range of tobaccos at competitive prices.

Andhra Pradesh occupies the first place in area and production particularly in FCV tobacco. It is mainly grown in four distinctive soil zones in A.P VIZ., Northern Light Soils (NLS), Southern Light Soils (SLS), Northern Black Soils (NBS) and southern black soils (SBS). Besides to its economic potential and labour absorption, area under tobacco has been decreasing significantly due to diminishing market prices, high cost of production, decline in tobacco demand and prices in international market. In addition to this, the government policies particularly health policies at international level has been one of the main reasons for the decline of tobacco area in India. Tobacco Board has fixed a crop size of 172.0 million kg for the crop season 2014-15 in Andhra Pradesh (**1,39,159** ha) taking into account all the domestic and international factors that influence demand and supply position.

Tobacco growers in Andhra Pradesh are facing several problems in recent years in respect of growing tobacco in more area than their limit, high cost of production, private finance at higher interests, low market price due to less export facilities resulting in huge losses thereby heavy debts which finally forced some farmers to commit suicides. About 100 million deaths were occurred in 20th century due to the ill effects of tobacco and it is expected to be 500-700 million deaths in 21st century. It is also estimated that, due to tobacco consumption about 3000 cancer deaths and 46,000 cardiac disease deaths due to heart diseases recorded in USA every year. Out of 1.22 billion smokers, 1.0 billion is in developing countries, where as the rest of 0.22 billion is in developed countries.

Therefore, it is quite alarming as the developing countries have been spending 10-15% of their total expenditure for tobacco consumption. About 45 persons are getting suicide every day and of late it has been touched tobacco growers also due to non remunerative price which is really shocking to the civilized society. At this juncture, it is time to think that is it necessary to stick on to tobacco cultivation where both consumer and grower are ending their lives due to

tobacco. On the other hand, the Tobacco Board, Ministry of Commerce, Government of India has reduced the crop size to 120 million kg during the year 2015-16 as against 172 million kg in 2014-15 due to declining demand for FCV tobacco both in international and domestic market. Due to reduced crop size, about 40% of the tobacco area is left to cover with other crops in different FCV tobacco growing zones in Andhra Pradesh during the years to come.

In view of the above, it is essential to evaluate the performance of different crops suitable for rabi season in place of FCV tobacco and also to select a crop/cropping system which is scientifically sound, economically viable, practically feasible, ecologically desirable and socially acceptable so as to have a right alternative to FCV tobacco for different farming situations in Andhra Pradesh.

In a study of alternative crops to tobacco cultivation in rabi season in two locations of Prakasam district in Andhra Pradesh, it is observed that late kharif or early rabi rice and bengalgram are more profitable crops than the tobacco as the tobacco crop cultivation requires more investments than paddy and bengalgram. Further, the study suggested to take precautions for preservation of labour employment as the tobacco is more labour intensive crop than bengalgram and paddy. Research studies conducted at Regional Agricultural Research Station, Lam farm, Guntur during 2001-2002 also found that bengalgram and soybean crops are best the alternatives for FCV tobacco in black soils of Andhra Pradesh.

The limited intervention studies indicate that tobacco is not the only crop that can bring good returns, but sugarcane, onion, maize and other vegetables under irrigated conditions and groundnut and soybean under rain-fed conditions, could also be possible alternatives to tobacco. It was observed that mixed non-tobacco cropping patterns may perhaps be a good substitute strategy for tobacco cultivation.

There is a scope in tobacco growing regions for cultivation of maize and soybean during kharif on rainfed vertisols. The experimental results revealed that fallow-tobacco is most profitable. However, kharif maize with minimum tillage in rabi crops viz. redgram, chickpea and horsegram is next best option in Vertisols of Andhra Pradesh .

Cotton also became a remunerative crop both under irrigated and rainfed conditions as the major risk of bollworm is was overcome with BGI & BGII hybrids. Millets also can be important alternatives because of their resilient nature to withstand adverse conditions. Millet cultivation also gaining ground because of the increased use of millets in animal feed formulations and increased human consumption as partial replacement for rice by the health conscious urban population. Hence, all these crops can be included in formulating alternative crops and cropping systems to tobacco depending on the agricultural situations.

Based on the above knowledge and information the following crops and cropping systems can be proposed as suitable alternatives to tobacco for different farming situations in Andhra Pradesh.

Alternate crops / cropping systems suggested for FCV tobacco in different farming situations in A.P

1. **Northern Light Soils (NLS) - Irrigated:** (East Godavari and West Godavari districts)
   Sugarcane
   Green manuring -Chilli
   Soybean/Groundnut- Maize
   Foxtail millet -Groundnut/Sunflower/Soybean
   Soybean/Groundnut – Blackgram- Maize
   Soybean/Groundnut - Blackgram/ Greengram -Vegetables

2. **Southern Light Soils (SLS)-Rain fed:** (Guntur, Prakasam and Nellore districts)
   Redgram sole crop
   Castor sole crop
   Cotton sole crop
   Redgram intercrop with groundnut/cowpea
   Bajra/Korra- Cowpea/ Castor
   Korra- Variga/ Ragi

3. **Northern Black Soils (NBS) - Rain fed:** (East Godavari and West Godavari districts)
   Cotton
   Maize/Fox tail millet - Bengalgram
   Groundnut/Soybean -Bengalgram

4. **Southern Black Soils (SBS) - Rain fed:** (Nellore, Prakasam and Guntur districts)
   Cotton
   Redgram sole crop
   Redgram + Greengram/Cowpea/Maize/Bajra
   Green manure -Chilli
   Soybean /Korra/Bajra-Bengalgram/ Coriander

The FCV tobacco farmers can take up the above crops and cropping systems as an alternative, in order to improve their economic viability of land holdings. The above cropping sequences which were scientifically evaluated are recommended to left over tobacco area after cut down of crop size from 172 million kg (2014-15) to 120 million kg for the year 2015-16. This brings not only crop diversity but also increased production in non traditional crops in tobacco growing areas. Hence, switching over to alternative crops from tobacco would need a systematic approach, wide propaganda and need based extension activities for crystallising labour employment and to get beneficial results both for farmers and traders.

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Prospects for Expansion of Oil Palm Cultivation in India

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Introduction

Oil palm (*Elaeis guineensis* Jacq.) is known to be the highest edible oil yielding perennial crop and produces two distinct oils, i.e., palm oil and palm kernel oil, which have culinary and industrial uses. Palm oil is derived from fleshy mesocarp of the fruit, which contains about 45-55 per cent of oil. The palm kernel oil, obtained from the kernel of stony seed, is a potential source of lauric oils. Oil palm is the crop that has a greater advantage in terms of productivity that is much higher than that of other oil seed crops. Oil palm produces 4 to 6 tonnes of crude palm oil and 0.4 to 0.6 tonnes of palm kernel oil per ha per year from 4^{th} to 30^{th} year of its productive life span. Oil palm is the crop of the present and future vegetable oil economy of the world as well as for India. Palm oil has good consumer acceptance as a cooking medium because of its price advantage. It is an ideal raw material for manufacturing oleo chemicals used in making cosmetics, pharmaceuticals, neutraceuticals etc. Broadly, it could be mentioned that palm oil is a source of health and nutrition, value addition, waste utilization, eco-friendly, diversification, import substitution, co-generation and sustainability.

Oil Palm – Global Scenario

Oil palm is a native of West Africa, but is grown extensively in South-East Asian countries (Indonesia, Malaysia, Thailand and Papua New Guinea), African countries (Cameroon, Ghana, Ivory Coast, Liberia, Nigeria, Republic of Congo, Sierra Leone and Zaire) and South American countries (Brazil, British Guyana, Columbia, Costa Rica, Ecuador, Panama, Peru and Venezuela). There are 13.5 million hectares planted with oil palm in the world with a total production of over 52 million tonnes of palm oil (2012), which is expected to increase substantially due to growth in demand for oil by the food industry and use of bio diesel in Europe and other countries. Although, it is planted in little fewer than seven per cent of the total world vegetable oil acreage, palm oil accounts for 30 per cent of world edible oil and fat requirements. Malaysia, Indonesia and Nigeria are the leading producers of palm oil in the world.

Oil Palm – Indian Scenario

India is one of the major producers and consumers of vegetable oils, accounting for 12 to 15 per cent of the area under oilseeds and 6 to 7 per cent of production of vegetable oils in the world. Despite production of over 9.64 million tonnes of vegetable oils during 2013-14 in the country, the domestic availability continues to remain inadequate to meet the demand. The gap between demand and availability of edible oils is being met by imports and palm oil constitutes bulk of these imports. During 2013-14, India has imported 11.72 million tonnes of edible oils valued at US $ 7.58 billion. In terms of volume, it was 54.86 percent of domestic availability. The quantum of import is likely to go up with increase in per capita consumption and population pressure resulting in higher future demand.

During the last two decades, efforts have been made to introduce and exploit a number of new oil bearing crops. However, only oil palm has shown promise for commercial cultivation under Indian conditions. Oil palm has established as a successful crop in a number of states in the country and productivity levels up to 6-8 tonnes oil per ha could be achieved. As on 2012, various Expert Committees constituted by Ministry of Agriculture, Government of India have identified a total of 1.93 million hectares in 18 states of the country as suitable for oil palm cultivation. The FFB yields obtained by progressive farmers of Andhra Pradesh and Karnataka, under optimum cultural and irrigated conditions, are between 20 and 25 tonnes of FFB/ha/yr i.e. 4-5 tonnes of oil per ha per annum from fourth year onwards. The highest yield of 30-35 tonnes FFB ha^{-1} yr^{-1} during the seventh year was also recorded in many plantations. One farmer in Karnataka State could achieve a record yield of 52.3 tonnes FFB ha^{-1} yr^{-1}.

There are ample opportunities for the development of oil palm in India which has diversified agro-climatic conditions and vast stretches of land with untapped underground water potential. Though Oil Palm Development Programme in the country is progressing well, area coverage is not taking place as per targets envisaged. There were two instances of price fall (1999-2000 and 2008-09) that played an important role in slowing down the oil palm development programme in the country. However, accelerated pace of oil palm cultivation is recorded when the support price and additional promotional activities were undertaken.

Govt. of India has constituted various committees to study the feasibility for oil palm cultivation in different states of India and also to reassess the additional potential areas. The committees expressed that area under oil palm could be enhanced, if critical assessment is made for ground water potential and soil type at micro-level. Potential area has been identified in new States like Arunachal Pradesh, Bihar, Meghalaya and Nagaland in addition to the additional potential area in the 'already identified' States of Andhra Pradesh, Assam, Chhattisgarh, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Mizoram, Odisha, Tamil Nadu, Tripura and West Bengal.

In the State of Andhra Pradesh, an area of 1.6 lakh ha is under oil palm cultivation. Of the total area covered in ten districts, West Godavari district tops in area coverage followed by East Godavari and Krishna districts. Farmers in Andhra Pradesh have an increasing appreciation for the Oil Palm crop because of the various advantages like assured marketing, proper price fixation, less labour requirement *etc*. Some of the tobacco growing areas are also replaced with oil palm cultivation.

The Department of Agriculture and Cooperation (DAC) has taken up the Oil Palm Development Programme (OPDP) during 1991-92 under the "Technology Mission on Oilseeds and Pulses" (TMOP) for area expansion in the potential states. Subsequently, the oil palm development programme was supported through "Integrated Scheme of Oilseeds, Pulses, Oil Palm & Maize" (ISOPOM) from 2004-05 and "Oil Palm Area Expansion" (OPAE), a sub-scheme of Rashtriya Krishi Vikas Yojana (RKVY) from 2011-12 to 2013-14. From 2014-15 onwards, oil palm cultivation is being supported under Mini Mission-II of "National Mission on Oilseeds and Oil Palm" (NMOOP). These developmental efforts have resulted into area expansion under oil palm and by March 2014, an area of 2.69 lakh ha is under oil palm cultivation in the country. During 2012-13, the Fresh Fruit Bunches (FFB) production was 8.62 lakh tonnes and palm oil production was 1.45 lakh tonnes from the existing adult oil palm plantations, which is meager with respect to its requirement. Mini-Mission-II aims to bring additional area of 1.25 lakh ha under Oil Palm cultivation by the end of 2016-17 with increased productivity of Fresh Fruit Bunches (FFB) from 4.90 tonnes /ha to 15.00 tonnes/ha. The strategy includes augmenting availability of planting material; use of

waste land for oil palm plantation; support for maintenance and intercropping during gestation period for sustainability and encouraging oil palm growers for area expansion; productivity enhancement through effective water management; transfer of technology through demonstration and capacity building of extension functionaries and farmers with participation of private sector in setting up oil palm processing unit to ensure buyback of FFBs, which are perishable in nature.

Pattern of Assistance for Mini Mission-II (Oil Palm) of NMOOP

S.No	Components	Sharing	Rate of Assistance
1	Planting Material	75:25	85% of the cost of planting material limited to Rs. 8,000/- per ha.
2	Maintenance Cost	75:25	50% of the cost during gestation period for 3 years with a ceiling of Rs. 16000 per ha up to 25 ha @ Rs.4000 per ha.
3	Drip Irrigation	As per NMSA Guidelines	As per National Mission for Sustainable Agriculture (NMSA) guidelines.
4	Distribution of Pump sets	75:25	@ 50% of the cost limited to Rs.15000/- per pump set with 10 hp as per the norms of SMAM.
5	Bore well at oil palm farm / water harvesting structure /ponds.	75:25	Assistance @50% limited to Rs.25000/- per unit of bore well, tube well subject to condition that these are not installed in critical, semi-critical and over exploited ground water zones. In case of water harvesting structures/ ponds/tanks for individual farmer, 50% of cost (construction cost - Rs.125 for plain/ plain/ Rs.150 per cubic meter for hilly areas) limited to Rs. 75,000 for plain areas and Rs.90,000 for hilly areas including lining is proposed under NMSA. For smaller size of the ponds/dug wells, cost admissible on pro rata basis. Cost for non-lined ponds/ tanks will be 30% less and assistance will be given @ 50% of the cost limited to Rs.50,000/ per dug-well/ ponds/ water harvesting tanks/structure per farmer only for oil palm garden/field of the farmer.
6	Establishment of Seed Gardens	75:25	(i) One time assistance for a maximum amount Rs.10.00 lakh as subsidy for setting up a new seed garden in 15 ha area by oil palm farmers association/co-operative etc. through State Government. (ii) Revolving Fund Scheme with an assistance of Rs.30.00 lakh, with a breakup of Rs.10 lakh in the first year and Rs.2 lakh each for 2nd, 3rd,4th,

			5th and 6th year. In 7th year, a block grant of Rs. 10 lakh be provided.
7	Inputs for Intercropping in oil palm	75:25	@ 50% of the cost limited to Rs.3,000/ha for purchase of seeds/fertilizers/ INM/ IPM/ fertigation/tree guards and PP chemicals etc (75% funds for procurement of fertilizers/seeds and 25% for production/protection inputs for inter crop fields).
8	Construction of vermi-compost units	75:25	@50% of the cost limited to Rs.15000/unit of 15 metre length, 0.9 metre width and 0.24 metre depth at oil palm field/garden of the farmers.
9	Machinery & tools	75:25	Assistance upto 50% of the cost subject to ceiling given below: (i)Manually handled/high reach oil palm cutter - Rs.1500/- per unit,(ii)Oil Palm protective wire mesh- Rs.15000/- per unit, (iii)Motorized Chisel- Rs.10,000/- per unit (iv)Aluminium Portable ladder- Rs.3,000/- per unit (v)Chaff cutter for chaffing of oil palm leaves (oil palm farmers only) - Rs.7,000/- per unit.(vi)Small tractor upto 20 HP along with trolley: 25% of the cost of procurement subjected to a ceiling of Rs.0.75 lakh. Additional 10% assistance to SC/ ST/ Small/ Marginal farmers/ women, groups >5 members FPOs and NE States to a ceiling of Rs.1.00 lakh per unit.
10	Special component for NE/Hilly States/LW Areas/regions	75:25	(i) 50% of the actual cost estimated by PWD/ CPWD limited to 20% of total outlay of the state under AAP for MM-II on Oil Palm for roads from oil palm field to nearest FFB collection/ processing centre.(ii) 50 % of the cost limited to Rs.250.00 lakh for a unit of 5.00 MT/Hr for newly planted Oil Palm areas to the State Government agencies/ Cooperative sector/ Government Recognized Farmers Associations through State Governments. (iii) For addition of capacity of crushing of FFBs at least by 1MT/ Hr @25% of the cost limited to Rs.25.00 lakh to existing units of State Government/ Government agencies
11	Farmers' Training	75:25	Rs.24,000/- per training for a batch of 30 farmers for 2 days (@ Rs.400/- per participant per day).

12	Training of Extension Workers/ Officers/ input dealers	75:25	Input dealers included Rs.36,000/- per training for a batch of 20 officers for 2 days. (@Rs.900/- per participant per day).
13	Demonstrations	75:25	Support to the State Department of Agriculture/ Horticulture as under:(i) 5 demonstrations of 1 ha each in a block of new plantation of 500 ha or above being taken up on farmers' field.(ii) @ 85% of the cost of planting material limited to Rs.10,000/- per ha for planting material and maximum @50% of the maintenance cost during gestation period of demonstration field for 4 years with a ceiling of Rs.16,000 per ha.
14	Research & Development (R&D) Schemes	100%	Need based support will be given for ongoing schemes of ICAR for maintenance of existing seed gardens, leaf analysis lab, training of staff/ officers and testing of genotype etc approved in X and XI plan period.
15	Training infra-structure support to ICAR	100%	Need based support to the ICAR Institutes on project basis to strengthen training infrastructure for oil palm growers/farmers.
16	Local Initiatives, Contingency including monitoring & evaluation and Operational costs	75:25	States/Agencies will be allowed to utilize upto 5.0 % of the total allocation under MM-II on Oil Palm for contingency including monitoring & evaluation and Operational Costs including consultant services including Publicity, Exposure visits of farmers and/or officers / Seminar/ Conference/ Workshop/ Mela *etc.*,

Oil Palm Production and Productivity

In India, oil palm is a small holder's crop under irrigated conditions. Corporate plantations could not achieve desired results due to various reasons. Though the present yield levels in progressive districts like West Godavari in Andhra Pradesh is about 20 tonnes of Fresh Fruit Bunches of oil palm per ha (on par with Indonesia and Malaysia), other districts in Andhra Pradesh as well as remaining oil palm growing states continue to record productivity levels of less than 10 tonnes per ha. Improvement of oil palm productivity through better planting materials and efficient management of water, nutrients and labour would be of crucial importance for achieving higher yields.

Potential of Oil Palm for Sustainability and Livelihood Security

Oil palm crop offers great opportunities to all the stakeholders involved in oil palm sector. Oil palm is a high yielding crop (more than 5 tonnes of oil per hectare per year) as compared to

other oil yielding crops that are yielding around one tonne of oil per hectare. Oil palm farmers are assured with a remunerative price, as decided by Government of India/State Governments. Payment for the produce is made to farmers within 15 days as per the Oil Palm Act. To meet the increasing per capita consumption of vegetable oils as well as population growth, there is an urgent need to increase the production of vegetable oils in the country. Thus, the farmers as well as the processing units in India would not face any constraint with reference to the marketing of the produce. Government of India supports Oil Palm Development Programme with high budget allocations to improve the production of vegetable oils for import substitution. The sector also offers vast employment potential in rural areas for oil palm cultivation and in processing industries that include product diversification and value addition enterprises. The crop has an appreciable level of carbon sequestration potential that makes the crop attractive with reference to climate change management. Oil palm besides improving biological productivity and nutritional standards also has enormous scope for enhancing profitability as well as employment potential.

Irrespective of area or state, farmers are growing the location specific crops (which are normally grown as sole crops) as inter crops in oil palm gardens during juvenile phase. Crops like maize, tobacco, vegetables, oil seeds, pulses, flowers, fodder crops etc, are being grown, out of which banana and seed maize are found as the most remunerative ones with more than Rs.25,000 per hectare. Cocoa is a major mixed crop grown in oil palm gardens and in fact it is becoming popular among the farmers of Andhra Pradesh. At IIOPR, Pedavegi, oil palm has been integrated with dairy (1 buffalo and 1 calf), poultry and fodder crops. The concept of integrating farming system with oil palm plantations is a feasible and practical proposition under Indian conditions.

Oil Palm Research in India

Oil palm research in India started with the establishment of a Research Station at Thodupuzha by Department of Agriculture, Kerala during 1960. Indian Council of Agricultural Research (ICAR) started oil palm research at Central Plantation Crops Research Institute Research Centre at Palode in 1975. Oil palm was included as one of the crops in the All India Coordinated Research Project on Palms during VII Five Year Plan period with the establishment of four Coordinating Research Centres at Vijayarai (Andhra Pradesh), Mulde (Maharashtra), Aduthurai (Tamil Nadu) and Gangavathi (Karnataka). ICAR established the National Research Centre for Oil Palm at Pedavegi in Andhra Pradesh in 1995, which was later renamed as Directorate of Oil Palm Research in 2009 and subsequently upgraded as Indian Institute of Oil Palm Research (IIOPR) during the year 2014. Two more Coordinating Centres for oil palm research were established in 2009 at Pasighat (Arunachal Pradesh) and Madhopur (Bihar) representing North East and Eastern Regions. Thus, a well established research system with the required infrastructural facilities is available in the country for oil palm research.

At IIOPR, research programmes have been formulated to initiate need based and action based research for meeting the future targets and challenges. New programmes are identified mainly in the areas of development of improved oil palm hybrids with high yield potential, efficient nutrient and water management technologies, integrated farming system models for enhancing the returns from oil palm gardens, use of bio-control agents for pest and disease management in oil palm and harvest and processing technologies for effective utilization of oil palm products. Emphasis is also given on achieving self sufficiency in quality planting material and production of improved hybrids from different centres. The new technologies are expected to play a critical role in improving oil palm production and increasing the oil palm sector efficiency

in the country. Indian Institute of Oil Palm Research (IIOPR) is involved in taking R&D activities, supply of quality planting material and capacity building of extension functionaries and farmers. Self Help Groups/ Women Groups/Cooperative Societies *etc* may be involved by the State Governments in establishment of seed gardens and oil palm processing units.

It could be optimistically expected that the well established oil palm research system along with intensive efforts through Oil Palm Development Programme as well as research and development efforts in annual oil seed crops and other sources, India would be able to achieve self sufficiency in vegetable oil production at the earliest.

Fig.1: Intercropping of oil palm and FCV tobacco in NLS area

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Crop Diversification in Tobacco Growing Areas of Karnataka

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Introduction

Flue Cured Virginia (FCV) tobacco is an important commercial crop grown in the rain fed conditions of the Southern Transitional Zone (STZ No.7) of Karnataka. This high export value crop is cultivated in an area of around one lakh hectares annually covering more than 1000 villages and 42,000 growers, who are mostly small and marginal farmers. Mysore District alone contributes to 80% of the total area cultivated followed by Hassan District with 16%. Officially there are 56,000 registered barns apart from around 25,000 unregistered barns in KLS (Karnataka Light Soils) Zone. FCV tobacco grown in KLS is considered as superior quality neutral filler in the international market and has high export potential value.

Table 1: Area planted and the production in KLS for the last five years period.

Particulars	2010-11	2011-12	2012-13	2013-14	2014-15
Area planted (ha)	1,17,924	1,06,843	93,000	97,760	85,689
Quantity marketed (m.kg.)	127.8	104.3	93.8	102.0	103.4
Average price (Rs./kg)	92.3	92.7	115.8	129.2	107.5

FCV Tobacco Crop Profile in KLS

The crop is mainly grown as rainfed crop under rainfed farming situations in *Kharif* season. Majority of tobacco is grown in six taluks in the Southern Transitional Zone No. 7 of Karnataka (Hunsur, Periyapatna, HD Kote and KR Nagar in Mysore district and Arakalgud and Holenarasipura in Hassan district.). The total geographical area of Mysore district is 6,76,382 ha out of which cultivable land consists of 3,68,528 ha. The cultivable area includes 1, 37, 569 ha of irrigated and 2,30,959 ha of non irrigated/ rainfed area. The total cultivable area of Arakalgud and Holenarasipura in Hassan district is around 83,042 ha out of which 28,545 ha is irrigated and 54,497 ha are under dry farming. Since major area comes under rainfed conditions, FCV tobacco plays a crucial role in farm family income in these two districts. In the recent past, it has been proved that the tobacco has given a fair income to the framers in both severe drought and also under heavy rainfall situations.

Virginia tobacco cultivation has been highly successful and economical in this part of the Southern Transitional Zone (STZ in Karnataka due to superior quality of the tobacco produced known as 'Mysore style' in international market and export potential of the crop). The availability of ideal soil types and climatic conditions have greatly contributed for superior quality leaf production with ideal leaf chemistry and other leaf quality parameters required for sustainable export. The tobacco cultivation has also been found to be an economically viable proposition under the rainfed farming situations of these two districts in this STZ.

Table 2 : FCV tobacco growing area in different districts of Karnataka (2015-16)

Sl No.	District	Area in Ha	Percentage
1	Mysore	62320	82.0
2	Hassan	12236	16.1
3	Kodagu	532	0.7
4	Chamarajanagar	152	0.2
5	Chikkamagalore	76	0.1
6	Shimoga	152	0.2
7	Davanagere	532	0.7
	Total	**76000**	**100.0**

Socioeconomic Profile of the Region

FCV tobacco is the major commercial crop grown under rainfed situations in this zone on red sandy loams followed by cotton, maize, finger millet and pulses. The gross cropped area of STZ is around 7.0 lakh ha with more than 70% under rainfed farming situations. In general, farmers are mostly small and marginal with a land holding of 1-2 ha. Being transition zone with congenial agro-climatic conditions, different crops such as cereals, pulses, oil seeds, vegetables and commercial crops are being cultivated in this region both under rainfed and irrigated farming situations. The main cereal crops like paddy, hybrid maize, finger millet, oil seeds and pulse crops like groundnut, sesame, redgram, blackgram, greengram, horsegram, field bean and commercial crops like tobacco, cotton and chillies (Green) are grown in different microclimatic regions of this zone. While paddy is exclusively grown under irrigated conditions, (Irrigation command area and tank fed areas) rest of the crops are grown mostly under rainfed situations. Hybrid maize, finger millet, turmeric and potato are also raised under irrigated situations in some areas under upland situations. Sugarcane, coconut, arecanut, banana, ginger are the other main crops raised in irrigated situations under garden land conditions. The subsidiary activities mostly involve cattle rearing and animal husbandry with milch animals. The three major tributaries of Cauvery (Kabini, Harangi and Laksmana Theertha) passes through the KLS Zone which serves for paddy production in low lands and tank fed areas while coconut and arecanut plantations dominate the uplands/garden land conditions. Majority of the farmers in the region are small and marginal (<2.0 ha).

Table 3 : Land holding particulars of the farmers in the region

Sl No.	Land holdings	No. of farmers	Area in Hectares
1	Marginal (1.0 ha)	260109	125363
2	Small farmers (1-2 ha)	86446	118000
3	Small medium farmers (2-4 ha)	32180	82984
4	Medium farmers (4-10 ha)	6518	34535
5	Large farmers (10 ha and above)	472	7634
	total	385725	368528

Existing Crop Profile in Tobacco Growing Regions of KLS

Table 4 : Details showing the prevailing cropping systems in tobacco growing areas of KLS

	Area / Taluk	*Kharif* season - *Rabi* season
1	H. D. Kote	Tobacco - Horse gram / Field bean / Cowpea Cotton - Fallow Redgram + Cotton - Fallow Redgram + Finger millet - Fallow Sugarcane - Paddy
	-	
2	Hunsur	Tobacco - Finger millet/Cowpea/ Field bean Finger millet - Horse gram/Cowpea Sesame - Finger millet (Transplanted) Cotton - Fallow Redgram + Finger millet - Fallow
3	K.R.Nagar	Tobacco - Finger millet Finger millet - Fallow Paddy * - Paddy* Sugarcane* - Sugarcane*
4	Periyapatna	Tobacco - Hybrid maize/Finger millet/Cowpea/field bean Tobacco - Fallow Maize - Fallow Maize - Bengal gram/Coriander (black soil) **Under garden land** Ginger & Turmeric
5	Shimoga, Shikaripura and Tarikere	Paddy* - Paddy* Hybrid jowar - Horse gram Maize - Horse gram Red gram - Fallow Cowpea - Fallow Groundnut - Horse gram Cotton - Fallow/Horse gram Tobacco - Horse gram/Fallow Sugarcane* - Sugarcane* **Under Garden lands** Arecanut, Coconut, Banana, , Ginger

* Under Irrigation

Table 5 : Area (ha) under other major crops in FCV tobacco growing taluks of Mysore district (2015-16)

Sl. No.	Crops	H.D.Kote	Hunsur	K.R.Nagar	Periyapatna
1.	Paddy	7480	10020	23137	8305
2.	Hybrid maize	5775	12985	694	11985
3.	Finger millet	7502	4660	1806	5700
	Cereals	**20757**	**27575**	**25637**	**25990**
1.	Red gram	1150	310	43	63
2.	Horse gram	1859	750	1923	-
3.	Black gram	1480	355	3200	-
4	Green gram	1705	322	3000	-
5	Cow pea	6880	8100	12015	5875
6	Field bean	492	8950	241	-
	Pulses	**13566**	**18820**	**20422**	**5938**
1.	Ground nut	145	700	27	-
2.	Sesame	935	2820	5300	8
3.	Castor	950	43	14	17
	Oil seeds	**2030**	**3563**	**5341**	**25**
1.	Cotton	29270	1780	-	-
2.	Sugarcane	870	49	220	30
	Commercial crops	**30140**	**1829**	**220**	**30**

Majority of paddy is grown in K.R. Nagar taluk followed by Hunsur area under irrigated low land conditions in both *kharif* and *rabi* seasons. While, Finger millet is the major crop in H.D.Kote, Periyapatna and Hunsur taluks. Hunsur and Periyapatna stand first in hybrid maize cultivation followed by HD Kote taluk. The area under total pulse production is more in K.R.Nagar followed by Hunsur and H.D.Kote taluks. The area under pulses was relatively low in Periyapatna area except for cowpea. Red gram is mainly concentrated in HD Kote followed by Hunsur.

Among the oil seed crops, Gingelly is the major crop and the area under this crop is highest in K.R.Nagar followed by Hunsur and H.D.Kote respectively. Castor is mostly grown in HD Kote. Among the cash crops, cotton crop is predominantly grown in H.D. Kote region, a traditional cotton belt followed by Hunsur taluk. Sugarcane also cultivated to some extent in H.D.Kote and K.R. Nagar area (under river irrigation).

In Ramanathapura tobacco growing region (Arakalgud and Holenarasipura Taluks) of Hassan district, Maize is the dominating crop grown to an extent of 14,500 ha, while potato is cultivated in an area of around 4850 ha.

Studies on Economic Viability of Crop Diversification with Other Crops

The economics of major dry land crops along with FCV tobacco is given in Table 6. The net returns were found to be the highest in Cotton followed by Maize and Finger millet. In the evaluation of alternative cropping systems, high density intercropping systems involving Hybrid cotton + chilies + ground nut or french bean were found to be economically viable with fairly higher net returns compared to FCV tobacco. However, market stability for these crops is likely to be a limitation factor.

Table 6: Economics of FCV tobacco and other alternative crops in KLS (2003-04)

Sl. No.	Crop	Yield q/ha	Gross returns (Rs/ha)	Cost of Cultivation (Rs./ha)	Net returns (Rs/ha)
1	Cotton	14	25200	14900	10300
2	Maize	41	19680	10200	9480
3	Finger millet	20	12400	5900	6500
4	FCV Tobacco	14	60200	34550	25650

Table 7: Economics of alternative cropping systems at AINRPT- Shimoga centre (2003 -04)

Cropping Systems	Av. Productivity (kg/ha)	TEY* (Kg/ha)	C:B ratio	Gross returns (Rs/ha)	Net returns (Rs/ha)
FCV Tobacco Sole	1116	1116	1:1.98	49505	24778
Hy-Cotton + Chillies + Groundnut	856+1052+620	1032	1:2.68	44758	27686
Hy-Cotton + Chillies + French bean	875+635+3472	1021	1:2.77	46032	28713

CTRI RS Hunsur initiated field studies on alternative crops or cropping systems to FCV tobacco during 2001-2004. Among the different crops evaluated under rainfed situations over three seasons, cotton and chillies were found to be the next best alternative crops to FCV tobacco from the economics point of view. FCV tobacco recorded maximum gross returns as well as the net returns because of the higher average price realized (Table. 8).

Table 8: Economics of alternative cropping systems at CTRI RS, Hunsur (2001 – 2004)

Crops / Cropping Systems *kharif - rabi*	Yield (Q/ha)			Gross returns (Q/ha)			Cost of cultivation (Rs./ha)			Total gross returns (Rs./ha)	Total cost of cultivation (Rs./ha)	Total Net returns (Rs./ha)	TEY* (Kg/ha)
	Main crop	Inter crop	Rabi crop	Main crop	Inter crop	Rabi crop	Main crop	Inter crop	Rabi crop				
Maize - Red gram	41.0	-	9.7	20211	-	15136	11090	-	9891	35347	21115	14232	701
G nut+Redgram - Fallow	14.0	7.2	-	16840	11120	-	12477	2690	-	27960	15167	12793	552
Finger millet - Red gram	26.8	-	10.7	14400	-	16950	9660	-	9891	31350	19550	11800	639
Cotton - Fallow	17.3	-	-	34360	-	-	17920	-	-	34360	17920	16440	680
Cotton + Soybean - Fallow	16.4	5.0	-	31780	9360	-	18986	2160	-	41140	21146	19994	815
Chillies (G)- Fallow	69	-	-	43315	-	-	23900	-	-	43315	23900	19415	855
Bajra + Red gram - Fallow	24	6.8	-	12000	11220	-	5620	4800	-	23220	10420	12800	487
FCV tobacco - Fallow	15.6	-	-	79375	-	-	42614	-	-	79373	42614	36759	1560

Table 9 : Economic analysis of integrated farming system under rainfed ecosystem of KLS (2005-06 to 2009-10)

Components/systems (Each system 0.2acre)	Cost of cultivation (Rs.)	Gross returns (Rs.)	Net returns (Rs.)	C: B ratio
Agri-Horti system	500	1115	615	2.23
Silvipasture system	100	268	168	2.68
Cropping system: Hybrid Cotton and Red gram+ groundnut (2:8)	1290	2150	860	1.66
Cropping system : Maize + Cowpea (2:2)- Niger &Finger millet - Field bean	1300	1771	471	1.36
Subsidiary components: Vegetable/nutrition garden animal husbandry, vermi-compost unit, farm pond, banana, drum stick etc.,	4080	15280	11200	3.74
Total from 1.0 acre	7270	20584	13314	2.83

Case Study with Tobacco Based Integrated Farming System Model in CTRI RS Hunsur

A study on tobacco based integrated farming system (with organic approach) was also studied at CTRI Research Farm during 2007-2010 for efficient resource management and sustainability of tobacco based farming system for sustained farm income in KLS. The components of farming system model with an operational area of 2.0 ha consisted of crop components (FCV tobacco a base crop, Red gram + Finger millet at 2:8 ratio and Hybrid cotton), agri-horticulture system, energy plantation and silvipasture model, vermi-composting unit, biogas production, animal husbandry, nutrition garden, fodder production and farm pond etc., under rainfed farming on red sandy loam soils. Sunhemp/ horse gram were raised as green manure crops in all the cropping system blocks for soil fertility improvement. An average farm income of Rs. 0.70 lakhs/ ha was observed during the two years of the study.

Table 10: Revenue generation in tobacco based Integrated Farming System Model (2.0 ha)

Cropping systems/ components	Area (Ha)	Monetary returns (Rs.) (2008-09)	Monetary returns (Rs.) (2009-10)
Cropping systems: (FCV Tobacco, Red gram+ Finger millet, Hybrid cotton)	1.60ha	1,13,900	1,28,294
Subsidiary systems:Diary, Goat rearing, Vegetables	0.05 ha	21,760	13,729
Agri-Horti system: (Guava, Papaya etc.,)	0.15 ha	530	1,400
Total receipts from 2.0 ha		1,36,190	1,43,423

Possibility of Shift to Alternative Crops and Crop Diversification

Soil types, climatic conditions, availability of resources and socio economic conditions vary across the different micro zones of FCV tobacco growing areas in the Southern Transitional Zone of Karnataka, where FCV Tobacco is mainly grown under rain fed conditions, shift to the other alternative crop primarily depends on the availability of natural resources, socio economic conditions of the farmers in the zone, economics of the chosen crops and marketing infrastructure availability. Based on these factors, suggestions on the selection of alternative crops can be made for different areas of the FCV Tobacco growing areas of STZ in Karnataka.

Table11: Possible alternative crops to FCV tobacco under different tobacco growing areas

FCV tobacco growing areas	Possible alternative crops
Hunsur	Maize, Cotton, Field bean (under rainfed) Green Chillies (under rainfed/ supplemental irrigation) & Horticultural crops like Banana, Turmeric, Ginger and Vegetables (under irrigation)
H.D.Kote	Cotton, Maize (under rainfed) Chillies (under rainfed/supplemental irrigation) and Banana, Sugarcane, Ginger, Turmeric and Floriculture (under irrigation)
K.R.Nagar	Finger millet, Pulses, Field bean (under rainfed) Sugarcane, Paddy, Banana, Coconut based farming and Vegetables (under irrigation)
Periyapatna	Maize, Cotton (under rainfed) Chillies (under rainfed/supplemental irrigation) and Ginger, Turmeric, Banana(under irrigation)
Ramanathapura	Potato, Maize (under rainfed) and Paddy, Ginger, Turmeric, Arecanut and Coconut based farming (under irrigation)

Suggested Alternative Crops Across FCV Tobacco Growing Areas (based on soil type and resource/management potentiality)

1. Cotton, Chillies, Maize, and Potato can be profitably cultivated under fertile soils with good management practices.
2. Legume based double cropping systems like Finger millet-Field bean, Maize-Field bean, Cowpea – Finger-millet is more sustainable and remunerative than single cropping under medium soils types, low rainfall and average management practices.
3. Intercropping systems like Red gram+ Finger millet or Red gram + Ground nut ((2:8 ratio) are more productive and profitable under low fertile and low input management situations
4. Annual crops like Ginger, Turmeric, Banana, Sugarcane etc. can be viable option for assured irrigated situations under wet lands/ garden land situations in high rainfall zones
5. Various horticulture and dairy based farming systems can be encouraged and promoted for minimizing the risks and stabilising the farm income in the different FCV tobacco growing areas in KLS.
6. There is a need to encourage and develop remunerative and sustainable farming system models in different agro ecological regions of KLS for efficient resource utilization and sustainable farming and farm income.

Table 12 : Economic analysis (estimated) of possible alternative crops in KLS area

Crops	Yield q/ha	Current Market price (Rs.)	Gross returns Rs in lakhs/ha	Cost of cultivation Rs/ha	Net returns Rs in lakhs/ha
Maize	75-80	1000/q	0.75-0.80	30,000	0.45-0.50
Chillies	75-80	1000-1200 /q	0.80-0.95	35,000	0.55-0.60
Cotton	15-16	4500-5000/q	0.68-0.80	35,000	0.325-0.455
Ginger	280-300	1800-2000/q	5.00-5.50	2,50,000	2.55- 3.0
Potato	100-120	1000-1200 /q	1.00 –1.20	40,000	0.6-0.80
Banana	25 t/ha	15-16/kg	3.75- 4.0	2,00,000	1.75-2.00
FCV Tobacco	12-15q	130/kg	1.56- 1.95	1,00,000	0.60- 0.95

*Maize,Potato,Cotton,FCV Tobacco (rainfed conditions), Chillies (under rainfed /supplemental irrigation; Ginger, Banana (under assured irrigation)

Scope for Perennial Based Farming Enterprises: (New ventures)

Sericulture Farming:

There is good scope for mulberry cultivation and sericulture farming in this area as the soils with acidic to neutral PH, well drained nature and red sandy loams are very much suited for the same. About 1200 ha (especially in HD Kote and KR Nagar) area is under mulberry in KLS region. As per the information obtained by CSRTI, Mysore, a farmer with one acre irrigated mulberry can produce 750 kg cocoon from 5-6 rearings in a year with the possible net income of Rs. 1.00 lakh.

Prospects for Sericulture in Tobacco Growing Areas in Mysore District - Views of Farmers Sericulture seems to be profitable enterprise in the area. Labour requirement is less compared to tobacco and 5-6 crops /year is possible. Good marketing facilities are available with good crop supportive schemes. However, more capital for initial establishment is required especially for rearing house etc. Area is slowly increasing over the years.

Vegetable Farming

There is very good avenue for taking up commercial vegetable production in the area which can be exploited. The major vegetables like tomato, brinjal, chillies and cucumber are already being cultivated in KR Nagar area utilizing canal and well irrigation and chillies (green purpose) is becoming popular in Hunsur and Periyapatna area. As the soil is very much suitable for most of the common vegetables, vegetable farming can be successfully ventured in KLS zone. In Hassan district, potato cultivation is already in practice in the tobacco growing area. About 4850 ha is under potato crop in two taluks, Arakalgud and Holenarasipura where FCV tobacco is cultivated. This can be further extended to Periyapatna and parts of HD Kote and Hunsur especially for the red sandy soil types which are also suitable for successful cultivation of potato.

Horticulture Production

At present Ginger crop is coming in a big way in all the FCV tobacco growing areas of KLS followed by banana and green chillies. Ginger seems to be highly profitable in this region under

assured irrigation. But requires assured marketing facilities. Stem rot is a major problem noticed and needs care and high dose of pesticides. While, Mango is also grown to smaller extent especially in dry belts of Hunsur taluk. There is a good scope for further extension of these crops in KLS area as there is very high potential. Since many farmers are taking up tree farming with silver oak and farmers with arecanut plantations, Pepper crop can be ventured especially in Ramanathapura and Periyapatna areas under assured rainfall and irrigated situations.

Integrated Farming and Agroforsetry Systems

Scientific agro forestry systems like agri-horti, silvipasture, social forestry along with field crops can be very good option especially for rainfed farming situations. Timber crops like Silver oak, Teak, *Acacia auriculiforms*, *Melai dubia*, Sandal wood and Neem can be very successfully grown in these areas in well-designed agro-forestry models for long term sustenance of the farm income. In fact, Hunsur is known for Teak and Timber industry and well established marketing facilities are available for these wood trees. As fodder and food crops can also be grown successfully by adopting scientific agro forestry packages, there is good scope for dairying and sheep/goat rearing in an integrated farming system approach for minimizing risk and increasing the farm income to a greater extent. Integrated farming system approach has already been under evaluation at CTRI RS Hunsur and can act as nodal centre for popularizing this concept in the area.

Cultivation of Jack Fruit and Tamarind (Arid Horticulture)

From good olden days, Hunsur and Periyapatna regions are known for Jack fruit and Tamarind production. However, they have not been commercially exploited due to lack of appropriate grafted seedlings, new high yielding varieties and marketing facilities. As Jack and Tamarind fruits are being commercially exploited for innumerable value added products, they offer very good scope for cultivation on commercial basis.

Floriculture

KLS Zone with cool climate and good soil type can be exploited for commercial cultivation of several flower crops like rose, jasmine, marigold, crossandra, chrysanthemum etc. under field conditions/poly house situations. In parts of tobacco growing areas of HD Kote, several farmers have taken up the cultivation of marigold recently and the produce is marketed to neighbouring Tamilnadu through tie up /buyback arrangements.

Farmers' Perception and Views on Alternative Crops in KLS

Tobacco growing regions	Other crops grown in the region	Availability for water resources	Farmers' views on growing of other crops	Remarks
Hunsur/ KR Nagar	Paddy, Finger millet, Field bean, Chillies, Tomato, Banana, Ginger	250-300" (Bore well) Canal source – Harangi Dam water available in pockets during season	Banana, Vegetables, Coconut, Sericulture, Floriculture (under irrigation), Redgram + Groundnut/Finger millet under rainfed situations and Dairy as subsidiary	1.Credit and Marketing facilities are required 2.Dairy activity should be supported by KMF 3.Cold storage and processing facilities are required

HD Kote	Cotton, Sugarcane, Banana, Paddy, Chillies (G), Maize, Finger Marigold, millets Ginger, Turmeric	300-350" (Borewell) Kabini river canal available during season	Ginger, Banana, Turmeric, Chillies, Marigold,Vegetables (under irrigation), Sericulture is another	1. Local market available presently for Ginger, Banana and Cotton. 2.Chia is a new millet, upcoming crop. 3. Credit and organised market are required 4. Dairy activity should be supported by KMF. 5. Cold storage and processing facilities are required.
Periyapatna	Ginger, Maize, Paddy, Vegetables, Potato, Coconut, Arecanut, Pepper	200-250" (Borewell) Harangi canal irrigation is available during season, Tank fed irrigation also available	Ginger,Maize, vegetables, (irrigated Potato, Sericulture and Dairy as subsidiary	1.Local marketing facility available for Maize. 2.Dairy activity should be supported by KMF. 3.Cold storage and processing facilities are required. 4.Credit and organised market facilities are required.
Ramnath-pura under Arakalgud	Potato, Banana, Arecanut, Maize, Sugarcane, Ginger, Paddy, Vegetables	200-250" (Borewell) Hemavathi river canal irrigation available during season, Tank fed irrigation available	Banana, Coconut and Arecanut, (irrigation) Potato	1. Local marketing facility available for Potato and Maize. 2. Dairy activity should be supported by KMF. 3. Cold storage and processing facilities are required. 4.Credit and organised market required.

Conclusions

1. FCV Tobacco cultivated by nearly 45,000 farmers in Mysore and Hassan districts has revolutionized the socio-economic conditions of people in this part of STZ with reliable and consistent income levels compared to any other crop especially in the rainfed ecosystem. In addition, the crop has been ecologically suitable producing superior quality tobacco to cater international market demand.
2. Studies conducted at CTRI RS Hunsur as well as AINRP (T) Centre at Shimoga in Karnataka have revealed that there is no other economically viable alternative crop to FCV tobacco under rainfed farming situations in this zone.
3. The next best crop under rainfed farming is Cotton, which has become more popular and consistent in HD Kote taluk of Mysore district. The area can be extended to semi wet/dry belts of Hunsur and Periyapatna taluks.
4. Hybrid maize is another agro industry based crop which is being cultivated in almost all the taluks of Mysore and Hassan districts both under *kharif* and *rabi* (rainfed situations). The

crop has become popular due to short duration (120 days), less pest and disease incidence and relatively easy post harvest management especially due to use of dehulling machines.

5. Potato is another important cash crop largely grown in Arakalgud taluk of Hassan district under early kharif rainfed farming situation. This crop can be extended to neighbouring Periyapatna and parts of Hunsur and HD Kote where the soil and climatic situations are quite favourable for successful production.

6. Ginger is one crop which is catching up very fast in KLS area due to its high yield potential, 450-500 q /ha and relatively good demand from the neighbouring Kerala State for its medicinal value. However, the crop requires assured irrigation facilities and fertile soils as well as intensive care (pest /disease management) for successful production.

7. Green chillies can be a potential commercial crop especially in the dry and semi dry regions with minimum irrigation facilities.

9. Sericulture: Mysore district part of KLS area (HD Kote, Hunsur and parts of Periyapatna) is very much suitable for mulberry cultivation for raising good quality cocoons due to prevailing conducive climatic situations in this area. Few farmers have already taken up mulberry cultivation and engaged in Silk worm rearing and same can be further expanded to other farmers in these areas as an additional enterprise.

10. Red gram is one of the pulse crops which has great potential under rainfed farming in this zone. The crop hitherto is being grown as intercrop with finger millet in small scale as subsistence crop. Raising redgram as sloe crop under rainfed can be considered for cultivation by introducing high yielding varieties and suitable crop production practices.

11. Dairy as a subsidiary enterprise with suitable agro-forestry systems /fodder production can be integrated with the above crops in a farming system mode.

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Important Recommendations of National Seminar to be included

1. The farmer representatives participating in the Seminar are of the opinion that with the prevailing market prices, the tobacco crop has been fetching them highly remunerative returns over the years as compared to other crops grown in respective tobacco growing areas. Further, they expressed their interest unequivocally to continue with the tobacco and recognised least scope for the crop diversification in tobacco growing areas. The efforts on the Crop Diversification in the tobacco growing areas should, therefore, duly consider the present and future interest of the tobacco farmers and enlist their willing support for success.

2. At present, the FCV tobacco fetches relatively more returns to the farmers than non-FCV tobacco in the country and is mainly meant for export purpose. Unlike FCV tobacco that is under regulation by the Tobacco Board, the non-FCV tobacco represents unorganised and unregulated crop vulnerable to income fluctuations to the farmers. Crop diversification initiatives need to be taken up first in the non-FCV tobacco growing areas so as to ensure stable and high returns to the farmers.

3. There are instances where FCV tobacco is grown on areas that are otherwise unsuitable or unproductive. There is a need to discourage such practice immediately. In such areas, there is need to promote crop diversification by taking up suitable non-tobacco crop/ cropping system options.

4. Crop diversification in tobacco growing areas by going in for next best crop/cropping system options should be looked at as a part of the emerging greater national policy in the national interest. But, this should appropriately address the needs and concerns of the tobacco farming community for effective implementation of diversification plans in a gradual and phased manner. A concrete road map for viable crop/ cropping system options needs to be prepared with a focus on requisite special assistance like crop insurance and proofing the price fluctuations, and special incentives for the tobacco farmers opting for diversification.

5. Tobacco, particularly FCV tobacco, enjoys the advantage of institutional and market support that is put in place over the years. The farmers often complain about non availability of the similar support for other crops viz., pulses, cereals, etc. There is, therefore, a need to look at the possibilities of strengthening the institutional, marketing and other support systems for other crops as well, so as to motivate the tobacco growers take up crop diversification.

6. Majority of the stakeholders in the tobacco sector held the overwhelming view that the institutions like CTRI and Tobacco Board should continue to provide R&D backup for tobacco to ensure the increased and stable farm returns to the tobacco farming community. Nevertheless, research institutes like CTRI need to work on all possible alternative crop/ farm enterprise and livelihood diversification options that the tobacco farmers can switch to in the event of decline in tobacco demand and consequently returns. Accordingly, the house felt that the mandate of the CTRI needs to be enlarged and broad based so as to include other crops/ farm enterprises in addition to the tobacco.

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