CMDR Monograph Series No. - 34

SOME ASPECTS OF TOBACCO CULTIVATION :
EMPIRICAL EVIDENCE FROM VILLAGE LEVEL DATA

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Some Aspects of Tobacco Cultivation : Empirical Evidence From Village Level Data*

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The production and consumption of tobacco are harmful from many points of view. These have been fairly publicized now. The main harmful aspects of tobacco are health hazards through pollution. In view of this attempts have already been made by the Government, NGOs and the public to discourage the consumption of tobacco through various measures. But the attempt to discourage the production of tobacco seems to be not done yet. This may be due to the fact that it is considered as one of the major source of revenue of the Government. We need to make special efforts to reduce the production of tobacco which might possibly help to reduce its consumption. Micro level initiatives might be helpful in this connection. With this background we have planned interventions to discourage the production of tobacco in a selected region on an experimental basis. For this purpose we have covered Belgaum district of Karnataka which is a major tobacco producing area. It produces mainly Bidi tobacco which is largely the poor men's consumption. This affects the economic condition of the family and also ultimately leads to health hazards.

In order to motivate the farmers who are growing tobacco to shift from tobacco cultivation, we have tried to identify the factors which are responsible for growing tobacco with the help of a field survey. We conducted such a field survey in 50 different villages of three talukas of Belgaum district which covered 2000 households. These three talukas are purposively selected because more than 80 % of the cultivators are tobacco producers and also more than 50 % of their cultivable land is devoted to tobacco cultivation. Before going into the details of household survey we collected the information of the villages covered under our study. Here we have discussed the general socio-economic characteristics of the studied villages and also have tried to identify the factors responsible for the cultivation of tobacco vis-a-vis other major crops.

The Geographical Profile

We have covered 50 villages from three talukas of Belgaum district for the purpose of household survey. Three talukas selected foe such purpose are Chikkodi, Hukkeri and Gokak. We have selected 41 villages from Chikkodi, 7 villages from Hukkeri and 2 villages from Gokak. These villages were chosen simply for the reason that there is highest concentration of tobacco cultivation in terms of area devoted to

tobacco cultivation in these villages. The area covered under tobacco cultivation was 83.64 %, 12.23 % and 4.13 % of the total tobacco area in Chikkodi, Hukkeri and Gokak respectively. The total geographical area in Chikkodi is 135885.81 acres, 20204 acres in Hukkeri and 4478.38 in Gokak . The Hukkeri taluka covers highest cultivable area i.e. 91 % followed by Chikkodi (85 %) and Gokak (67 %). The Geographical profile of the three talukas is given in Table 1.

Table 1
Taluka - Wise Geographical Profile of the Selected Villages

Taluka	No of Villages	Total Area in acres	Total No.of HHs	Total Cultivable area	% of Culti area to tot area	% of area under tobacco
Chikkodi	41	135885.81	51339	115232.27	84.61	83.64
Hukkeri	7	20204.00	4700	18373.87	90.94	12.23
Gokak	2	4478.38	1042	3005.02	67.10	4.13
Total	50	160568.19	57081	136611.16	84.92	100.00

Source: District Census Handbook,1991, Belgaum.

The Demographic Profile

The demographic profile of the villages of three talukas indicate that the sex ratio was 985 in Chikkodi, 909 in Hukkeri and 989 in Gokak while the same is 954 in Belgaum district. The sex ratio in all the 50 villages is 976. In Hukkeri villages we found a low sex ratio indicating disadvantageous position of the women population in the villages of this taluka. The density of population of Belgaum district is 267 (1991) while the same is 375, 337 and 366 respectively in Chikkodi, Hukkeri and Gokak. It indicates that all the three talukas are densely populated.

The average family size of Chikkodi is 4 while the same is 6 in both Hukkeri and Gokak talukas. The average size of the family in Belgaum district is found to be 6 as per 1991 census. The family size of Chikkodi Taluka is found to be lower than the district average. This information is presented in Table 2.

Taluka - Wise Demographic Profile of the Selected Villages

Taluka	Total Populaiton			Sex Ratio	Density of Population per sq.km	Family size
	Male	Female	Total			
Chikkodi	102417	100842	203259	985	375	4
Hukkeri	14289	12989	27278	909	337	6
Gokak	3298	3263	6561	989	366	6
Total	120004	117094	237098	976	370	4
Belgaum District	1834005	1749601	3583606	954	267	6

Source: District Census Handbook,1991, Belgaum.

Literacy Profile

Literacy may be considered as one of the important component of human infrastructure which is a key to economic development. We looked into the literacy profile of the selected talukas. The literacy rate of the three talukas are presented in Table- 3. It is found that Chikkodi taluka has the highest literacy rate both among males and females. Even it is higher than the district average. The literacy rate of Hukkeri and Gokak taluka is lower than the district average as well as Chikkodi taluka.

Infrastructural facilities

The infrastructural facilities are considered as the crucial factor of development of a region. The infrastructure may be physical and human. Here we have examined the availability of physical infrastructure in different talukas. It is found that the Chikkodi taluka is relatively more developed in infrastructure. Infrastructure includes irrigation, roads, post offices, health centres, educational institutions, marketing facilities etc. Chikkodi taluka has the advantage of enjoying the highest number of infrastructural facilities. Table 4 presents the details of infrastructural facilities.

Table 3
Taluka - wise Literacy Rate , 1991

Taluka	Literacy Rate (%)		
	Male	Female	Total
Chikkodi	70.59	39.65	55.55
Hukkeri	60.34	30.21	45.47
Gokak	55.02	23.29	39.42
Belgaum District	66.65	38.69	53.00

Source : District Census Handbook , Belgaum

Table 4
Taluka - wise Infrastructural Facilities in the selected villages

Taluka	% of irri area to tot culti area	Type of Irrigation					Total Number of Post office	Health centre
		Borewell	Well	Pipeline/ River	Canal	Others		
Chikkodi	20.10	20 (80.00)	39 (82.98)	16 (94.12)	1 (100.00)	2 (100.00)	35 (83.33)	19 (70.37)
Hukkeri	11.69	4 (16.00)	7 (14.89)	1 (5.88)	0 (0.00)	0 (0.00)	6 (14.29)	3 (11.11)
Gokak	13.32	1 (4.00)	1 (2.13)	0 (0.00)	0 (0.00)	0 (0.00)	1 (2.38)	5 (18.52)
Total	18.82	25 (100.00)	47 (100.00)	17 (100.00)	1 (100.00)	2 (100.00)	42 (100.00)	27 (100.00)

Taluka	Educatinal Institutions	Road Facility			Market facility		
		Katccha	Pucca	Semi- Pucca	Regulated	Wholesale	Local/ Retail
Chikkodi	56 (76.71)	22 (81.48)	4 (100.00)	15 (78.95)	3 (75.00)	2 (66.67)	8 (72.73)
Hukkeri	14 (19.18)	4 (14.81)	0 (0.00)	3 (15.79)	0 (0.00)	1 (33.33)	3 (27.23)
Gokak	3 (4.11)	1 (3.70)	0 (0.00)	1 (5.26)	1 (25.00)	0 (0.00)	0 (0.00)
Total	73 (100.00)	27 (100.00)	4 (100.00)	19 (100.00)	4 (100.00)	3 (100.00)	11 (100.00)

Area under Cultivation and the Crop Calendar

If we observe the crop calendar of different crops in different talukas, it is found that there is not much variation in the sowing and harvesting months for different crops in the respective talukas (Table 5). Further, it is observed that both in terms of cropped area and cultivable area, tobacco covers the highest area among all the crops. All other crops have shown mixed pattern in terms of area in different talukas. One interesting feature to note here is that tobacco occupies the highest area under cultivation and keeps the land engaged for longer times than other crops with exception to sugarcane.

Table 5
Talukawise Area and Crop Calender for Different Crops

Crops / Taluka	Area (acre)	% to Total Cropped Area	% to Total Cultivable Area	Sowing period	Harvesting period
Chikkodi					
Paddy	1501	1.82	1.3	JUN	OCT
Tobacco	34086.32	41.4	29.58	AUG	MAR
Sugar cane	9258.2	11.24	8.03	AUG	JULY
Jowar	1533.08	1.86	1.33	JUNE	AUG
Soyabean	7462.75	9.06	6.48	MAY	SEPT
Groundnut	15751.79	19.13	13.67	MAY	OCT
Others	12744.47	15.48	11.06	-	-
Total Cropped Area	82337.61		71.45*		
Total Cultivable Area	115232.27				
Hukkeri					
Paddy	0	0	0	JUN	OCT
Tobacco	4982.93	34.73	27.12	AUG	FEB
Sugar cane	1926.67	13.43	10.49	OCT	SEP
Jowar	2758.7	19.23	15.01	JUN	OCT
Soyabean	1358.46	9.47	7.39	JUN	OCT
Groundnut	2690.68	18.75	14.64	MAY	OCT
Others	632.08	4.4	3.44	-	-
Total Cropped Area	14349.52		78.10*		
Total Cultivable Area	18373.87				
Gokak					
Paddy	0	0	0	-	-
Tobacco	1682.18	63.47	55.98	AUG	FEB
Sugar cane	335.9	12.67	11.18	OCT	SEP
Jowar	632.11	23.85	21.04	JUNE	OCT
Soyabean	0	0	0	-	-
Groundnut	0	0	0	-	-
Others	0	0	0		
Total Cropped Area	2650.19		88.19*		
Total Cultivable Area	3005.02				

* indicates % to total cultivable area for total cropped area.

**Prices and Wages Prevailing
in the study villages**

In order to study the socio - economic status of the study villages it is equally important to know the prevailing prices of the agricultural products as well as the agricultural wage rates. It is found that there is a great variation in prices for the same product in the villages in different talukas (Table 6). For example the price of paddy varies from Rs 7.63 per kg in Hukkeri taluka to Rs 15.11 in Chikkodi taluka. Also the price of jawar varies from a low of Rs 3 = 50 paise per kg in Gokak to a high of Rs. 5 = 94 paise in Chikkodi. The price of tobacco is found to highest in Chikkodi taluka and lowest in Gokak taluka. This price variation within a small geographical area may be due to the variations in quality of the produce.

Also there is a variation in wage rate by area and by sex. The wage rate both for human and bullock has increased marginally in the present year over the previous year. The wage rate for both males and females varies. The wage rate for males is found to be lower (Rs 22.50) in Gokak Taluka and higher (Rs 30.00) in Hukkeri taluka. The wage rate for females has also shown a similar pattern. But when we examine the wage rates by gender it is found that the disparity is highest in Hukkeri taluka and lowest in Chikkodi taluka. Also the **disparity has increased in the present year over the last year in Hukkeri taluka while the same has declined in Chikkodi**. This may be due to the higher level of literacy rate among the females of Chikkodi taluka than other two talukas which has made them conscious for not accepting a lower wage rate than their male counterparts. This is presented in Table 6 .

Table 6
Taluka - wise prevailing price and wage rate (for two years)

Crops / Taluka	Price (per Kg) Rs Previous	Present	Wage Rate (Rs.) Human Male Previous	Present	Female Previous	Present	Sex Disparity in wage Rate (Rs.) Previous	Present	Bullock (Hired) Previous	Present
Chikkodi			22.8	26.34	17.9	21.46	4.9	4.88	125.49	142.8
Rice	14.83	15.11								
Tobacco	22.92	23.74								
Sugar cane	692.83	733.97								
Jowar	5.37	5.94								
Soyabean	9.41	9.75								
Hukkeri			27.14	30	21.43	23.57	5.71	6.43	122.14	133.57
Rice	6.88	7.63								
Tobacco	21.44	23.25								
Sugar cane	836.27	800								
Jowar	4.67	4.83								
Soyabean	8.35	8.75								
Gokak			22.5	22.5	17.5	17.5	5	5	90	90
Rice	-	-								
Tobacco	20	20								
Sugar cane	850	800								
Jowar	3.5	3.5								
Soyabean	9	-								

Area and production of different crops

Major crops grown in the study villages are: paddy, tobacco, sugarcane, jawar, groundnut and soyabean.   Area under tobacco is the highest while the yield rate of sugarcane and the unit price of sugarcane seem to be the highest among the crops. The yield of sugarcane is as high as 39.29 tons in Hukkeri taluka and the lowest yield is 30 tons in Gokak. The lowest yield is seen for groundnut in all the Talukas. It varies from 2.25 quintals in Gokak to 5.33 quintals in Chkkodi taluka(Table 7).

Table 7
Taluka - wise Area and Production of Different Crops

Taluka	Total Cultivable area	Total Cropped Area	% of Total Cropped Area to Culti Area	Yield of Major Crops			
				Tobacco	Soyabean	Groundnut	Sugarcane
Chikkodi	115232.27	82337.61	71.45	11.48 (B)	6.97 (Q)	5.33 (Q)	38.61 (T)
Hukkeri	18373.87	14349.52	78.10	11.81 (B)	7.00 (Q)	3.79 (Q)	39.29 (T)
Gokak	3005.02	2650.19	88.19	9.25 (B)	6.00 (Q)	2.25 (Q)	30.00 (T)
Total	136611.16	99337.32					

Crop -Wise Area and Irrigation:

The talukas in the study area are predominantly agricultural. The cultivable area in the villages of the three talukas varies from 67.1 % to 90.9 %. The cultivable area is found to be the highest in Chikkodi and lowest in Gokak. The percentages of the total cropped area to cultivable area are 71.5 %, 78.1 % and 88.2 % respectively in Chikkodi, Hukkeri and Gokak(table 5). The area under tobacco in all the talukas is found to be the highest. About 63 % , 41 % and 35 % of the total cropped area are respectively under tobacco cultivation in Gokak, Chikkodi and Hukkeri talukas.

The area covered under irrigation is very low in all the Talukas. Highest area under irrigation is found in Chikkodi followed by Gokak and Hukkeri. The area under irrigation varies from 11.7 % in Hukkeri to 20.1 % in Chikkodi. It indicates that the villages largely depend on rainfall for their agriculture (Table 8).

Table 8
Taluka - wise Crops and Source of Irrigation

Crops / Taluka	% of cropped area to total Cropped Area	% of cropped area to total Cultivable Area	Sources of Irrigation					
			Well	Borewell	Canal	River/Pond	Others	Total
Chikkodi			39 (50.00)	20 (25.64)	1 (1.28)	16 (20.51)	2 (2.56)	78 (100.00)
Paddy	1.82	1.3						
Tobacco	41.4	29.58						
Sugar cane	11.24	8.03						
Jowar	1.86	1.33						
Soyabean	9.06	6.48						
Groundnut	19.13	13.67						
Others	15.48	11.06						
Hukkeri			7 (58.33)	4 (33.33)	0 (0.00)	1 (8.33)	0 (0.00)	12 (100.00)
Paddy	0	0						
Tobacco	34.73	27.12						
Sugar cane	13.43	10.49						
Jowar	19.23	15.01						
Soyabean	9.47	7.39						
Groundnut	18.75	14.64						
Others	4.4	3.44						
Gokak			1 (50.00)	1 (50.00)	0 (0.00)	0 (0.00)	0 (0.00)	2 (100.00)
Paddy	0	0						
Tobacco	63.47	55.98						
Sugar cane	12.67	11.18						
Jowar	23.85	21.04						
Soyabean	0	0						
Groundnut	0	0						
Others	0	0						

Production, Cost and Net Return of major Crops

The details of yield, cost and net return are presented in Table 9.

Table – 9

Approximate cost and yield and Net Return of Major crops (per acre)

Crops / Taluka	Yield per acre (Units)	Yield per /acre (in Qtl)	Price per Kg.* (Rs)	Total value of the Produce(Rs)	By Product value (Rs)	Total Prod Per Acre (Rs)	Cost of Prod per acre(Rs)	Net Ret Per acre (Rs)	Net return per rupee of investment
CHIKKODI									
Tobacco (B)	11.48	6.89	22.92	15787.3	437.73	16225.03	6090.24	10134.79	1.66
Soyabean (Q)	6.97		9.41	6558.77	341.9	6900.67	2225	4675.67	2.1
Groundnut (Q)	5.33		8.56	4562.48	550	5112.48	3059.72	2052.76	0.67
Sugarcane (T)	38.61	386.1	692.83	26750.17	868.18	27618.35	9397.22	18221.13	1.94
HUKKERI									
Tobacco (B)	11.81	7.09	21.44	15192.38	125	15317.38	5857.14	9460.24	1.62
Soyabean (Q)	7		8.35	5842.86	362.5	6205.36	2071.43	4133.93	2
Groundnut (Q)	3.79		11.38	4314.29	400	4714.29	2071.43	2642.86	1.28
Sugarcane (T)	39.29	392.9	836.27	32857.14	850	33707.14	9714.29	23992.85	2.47
GOKAK									
Tobacco (B)	9.25	5.55	20	11100	550	11650	3750	7900	2.11
Soyabean (Q)	6		9	5400.1	225	5625.1	2600	3025.1	1.16
Groundnut (Q)	2.25		10	2250	300	2550	1250	1300	1.04
Sugarcane (T)	30	300	850	25500	900	26400	12000	14400	1.2

It is found that the yield of sugarcane is the highest among all the crops and there is a great variation in the yield rate between different talukas. It is about 38.61 tons in Chikkodi taluka while 39.29 tons and 30.00 tons in Hukkeri and Gokak respectively. The yield rate of tobacco has occupied the next position after sugarcane uniformly in all the talukas. One interesting trend is clearly discernible here. That is the area under tobacco is found to be the highest while the yield of sugarcane is found to be the highest and this pattern is found in all the talukas.

When we estimate the return to these crops, it is found that the **return to sugarcane is the highest in terms of money value in all the talukas.** The cost estimates also indicate that the cost of cultivation of sugarcane is the highest. Inspite of the higher cost, the net return to sugarcane is the highest. But when we estimate the net return per Rupee of investment, the highest net return of sugarcane per rupee of investment is found in Hukkeri taluka only, and not in other two talukas.

Determinants of Tobacco Production

After finding out the general pattern of village level information, we have attempted to examine the influential variables which affect the production of tobacco vis-a-vis other crops.

Literacy

First of all we have examined the relationship between educational background of the population and the cultivation of some major crops. This we did assuming that the people with better educational attainment are in a position to appreciate the health hazards associated with tobacco. But at the village level we have the data only on literacy level and we have linked this with the cultivation of different crops. This is presented in Table 10.

Table 10
Literacy Rate and Cropping Pattern

Taluka	Literacy Rate	% of area under Major Crops			
		Tobacco	Sugarcane	Soyabean	Groundnut
Chikkodi	55.55	41.40	11.24	9.06	19.13
Hukkeri	45.47	34.73	13.43	9.47	18.75
Gokak	39.42	63.47	12.67	--	--

It is found that Chikkodi taluka has the privilege of having higher number of literates than the district average. The other two talukas have recorded lower literacy rate than the district average and Chikkodi taluka. **The inverse relationship between the literacy rate and the area under tobacco is found in the study villages.** In Gokak the literacy rate is the lowest and the area under tobacco is the highest. **It provides us a plea that with the increase in the level of education of farmers the tobacco production may likely to come down.**

Irrigation

Irrigation is considered to be one of the crucial factors for the improvement of the yield in agriculture. The proportion of irrigation is not very high in our study villages as the irrigated area is recorded as high as 20 per cent. The main sources of irrigation available are well, borewell, river/pond, and canal. The canal irrigation is very much negligible as there is only one canal in one of the talukas (Chikkodi). About 76 % of the area in Chikkodi, 92 % in Hukkeri and 100 % in Gokak are provided with water through well and bore well irrigation. The area covered under tobacco is found to be the highest in each taluka. But the combination of other crops do not show uniform pattern in different talukas. In Chikkodi it is groundnut and sugarcane , in Hukkeri sugarcane, Jawar and groundnut and in Gokak it is sugarcane and jawar which constitute the major proportion of land next to tobacco cultivation. It is clearly revealed that sugarcane is a common crop which is grown in all the three talukas which require irrigation facilities. Since there is no assured irrigation facilities, with the available irrigation they grow mostly jawar, groundnut and to some extent soyabean. These crops may be adopted as alternative crops to tobacco with the available irrigation (Table 8).

Land

Table 11 presents the details of area and return to different crops. The area under tobacco in Gokak taluka is the highest i.e. 63.47 % and the net return per rupee of investment is Rs 2.11 while the lowest area is 34.73 % and the return is also the lowest i.e Rs 1.62. It implies that there is a direct relationship between the area and net return per rupee of investment of tobacco. This

type of relationship is observed for all the crops. But if we examine the relationship more intensively it is not really the case. For instance, if we calculate the return for 1 % of land the picture is totally different. This is given below:

tobacco. It may be due to the fact that the land is utilised more efficiently for these crops or it is better responsive to these crops rather than to tobacco.

Table -11

Taluka	For 1 % land the return in (Rs)			
	Tobacco	**Sugarcane**	**Soyabean**	**Groundnut**
Chikkodi	0.040	0.173	0.232	0.035
Hukkeri	0.047	0.184	0.211	0.068
Gokak	0.033	0.095	NA	NA

Here Soyabean is found to be the most profitable crop followed by sugarcane. **Since soyabean and tobacco both are dryland crops, soyabean may be considered as an alternative to tobacco where there is no irrigation facilities. But with assured irrigation facilities, sugarcane may be taken up in the selected villages as an alternative to**

Infrastructure (Roads, Marketing Facilities) and Prices of Tobacco

It is assumed that if there is a good road and good market, the sale of the product in the area is facilitated. In view of this we have examined the price of some major crops and availability of roads and markets in the study area. This is presented in Table 12.

Table 12									
Roads and Marketing Facilities and Net Return to Major Crops									
Taluka	Types of Roads (%)			Type of Markets (%)			Net Return per rupee of investment			
	Kutchha	Pucca	Semi Pucca	Regulated	Wholesale	Retail	Tobacco	Soyabean	Groundnut	Sugarcane
Chikkodi	54.00	10.00	36.00	23.00	15.00	62.00	1.66	2.10	0.67	1.94
Hukkeri	57.00	--	43.00	--	25.00	75.00	1.62	2.00	1.28	2.47
Gokak	50.00	--	50.00	33.00	--	66.00	2.11	1.16	1.04	1.20

The villages in Chikkodi Taluka have the privilege of having better roads and better marketing facilities than the other two talukas. When we examine the prices of the products it is found that the price of tobacco is higher in Chikkodi villages. This may be due to the good quality of tobacco produced in this taluka. The price of soyabean is also higher due to these facilities in this taluka. But the price of groundnut and the price of sugarcane are not higher in this taluka. It is observed from the field experiences that the traders of tobacco play a vital role in reducing the price of sugarcane so that the producers of sugarcane will be discouraged and prefer to go for tobacco cultivation. It is noticed that the roads and marketing facilities in this area facilitate in fetching a good price for the product in the absence of other intervention.

Net Return to different Combinations of Crops

Since our main objective is to motivate the farmers for shifting from tobacco cultivation, we have examined the better alternative combination of crops. For this purpose we have estimated the net return for different combination of crops and presented the same in Table 13. Since we do not have the information on all the crops, we have estimated the return only for four crops, i.e. sugarcane, soyabean, groundnut, and tobacco. In all the three talukas, the combination of Soyabean and Sugarcane together yield highest net return per rupee of investment. But this combination in practice is not possible. In this case one crop requires lot of irrigation i.e. sugarcane and the other one is a dry land crop, i.e. groundnut. When we combine different crops with tobacco, it is found that tobacco with sugarcane in two talukas of Chikkodi and Hukkeri gives highest return while in Gokak tobacco with groundnut yields higher net return. But these combinations also are difficult to work because of the contrasting characteristics of the crops. The combination of tobacco and soyabean can only be possible as both are dry land crops. Also the net return per rupee of investment of this combination provides a good return in all the talukas.

Table 13
Net Return to different Combinations of Crops

Combinations	Net Return per rupee of investment		
of Crops	Chikkodi	Hukkeri	Gokak
Tobacco	1.66	1.62	2.11
Soyabean + Groundnut	1.27	1.63	0.97
Soyabean + Sugarcane	1.97	2.39	1.19
Groundnut + Sugarcane	1.63	2.26	1.18
Tobacco + Soyabean	1.79	1.71	1.72
Tobacco + Groundnut	1.33	1.53	1.84
Tobacco + Sugarcane	1.83	2.15	1.42

The Regression Models

In the above background we have tried to verify the influence of these factors on the production of different crops in the study area. For this purpose we run multiple regression equation which is as follows:

$$\text{Ln } Y = \alpha + \beta_1 \text{ Ln LAND} + \beta_2 \text{ Ln IRR} + \beta_3 \text{ Ln LIT} + \beta_4 \text{ Ln COST} + \beta_5 \text{ Ln INFRA} + U_i$$

This equation is in the log form. We also tried it first without log (Table 14). In this model the R^2 value as well as the coefficient values were very low as well as insignificant. The values of coefficients as well as the R^2 value showed improvement in the double log equation. So for interpretation purpose we have considered the double log equation.

In the above equation

Y = the output of the crop

LAND = total land area under the crop

IRR = Irrigated area as % to total cropped area

LIT = Total literacy rate

COST = The cost of cultivation of different crops

INFRA = The index of infrastructural facilities which includes the marketing and the road facilities. For this we have constructed a very crude index. Example: If regulated market exists then the weight = 3; wholesale market = 2 and retail market = 1. Similarly if road is pucca = 3, semipucca = 2 and Katcha = 1. Then we have added up the numbers and get one number which has been included in the equation.

α, β_1 .... β_5 are the intercept and respective coefficient values.

U_i is the error term.

The Regression Results

Taluka wise regression could not be done due to the small number of observations. So we estimated the regression equation for all the 50 villages.

The results of the equation for all crops are given in Table 14.(Regression without log)

Table 15 provides the results of double log regression model. The values of regression coefficients have expected signs. About 82 % variation in the production are explained by these variables. Of the coefficient values land is found to be the highest. That is if there is 1 % increase in the land the output increases by 0.83 %. and it is statistically significant at 5 % level. The other significant variables are irrigated area and literacy rate. We have run separate equations by including each variable (step - wise).

Table 14
Crop-wise Village level Regression Results
(Dependent Variable = Output)

Crops	Coefficient Values of different variables						R Square
	Constatnt	Land	Literacy	Irri.area	Cost	Infra.	
Tobacco	7.26	0.03	-0.024	0.008	0.0005	-0.035	0.35
	(5.849)*	(3.383)*	(-3.124)*	-0.415	(3.640)*	(-603)	(6.149)*
Sugarcane	11.47	-0.127	0.211	-0.039	0.0001	0.407	0.72
	(2.181)*	(-0.908)	(2.351)*	(-0.387)	(9.860)*	-1.49	(28.79)*
Groundnut	4.49	-0.037	0.112	-0.018	0.0001	0.019	0.013
	-1.352	(-0.590)	-1.11	(-0.289)	-0.418	-0.101	-0.143
Soyabean	-0.641	-0.075	0.235	0.164	0.0001	0.157	0.254
	(-0.205)	(-0.688)	(2.947)*	(2.942)*	(1.743)**	-0.91	(3.827)*

N = 50

* and ** indicate the level of significance at 1 % and 5 % level respectively

Table 15
'Village Level Regression Results(for all crops)
(Dependent Variable = Log of Output)

Equations	Regression Co efficients of						
	Constant	LAND	LIT	IRR	COST	INFRA	R Square
Equation 1	3.2587	0.5874	-	-	-	-	0.49
	(0.125)	(2.989)*					(49.00)*
Equation 2	1.0546	0.4957	0.3211	-	-	-	0.58
	(1.669)	(2.887)*	(2.668)*				(33.72)*
Equation 3	0.4587	0.3914	0.3847	0.1547	-	-	0.65
	(1.221)	(2.654)*	(3.558)*	(2.654)*			(28.51)*
Equation 4	2.154	0.3815	0.3547	0.2645	0.3344	-	0.69
	(5.157)*	(4.112)*	(3.994)*	(3.158)*	(3.998)*		(25.00)*
Equation 5	787.598	0.8331	0.5141	0.647	0.3978	0.3718	0.82
	(8.658)*	(3.998)*	(3.975)*	(2.968)*	(3.558)*	(4.110)*	(50.1804)*
D-W- Stat	1.7725	1.225	1.558	1.897	1.697	1.728	
N = 50							

* indicates the level of significance at 5 % .

It is found that 49 % of the variation in output is only due to land. This findings of our study is supported by many of the studies in India. Some of these are: Tadesse & Krishnamoorthy (1997), Ali and Chaudhury(1990), Bagi(1981), Battese & Corra (1977), Kalirajan (1981), Lau & Yotopoulos(1971), Meeusen & Broeck (1977).

We estimated the same regression model separately for each crop. This was done to examine the factors responsible for tobacco production vis-a-vis other crops. Since the information on all aspects for all the crops was not available at the village level we run the regression only for 4 crops i.e. Tobacco, Sugarcane, Soyabean and Groundnut. The results are presented in Table 16.

The R^2 value for sugarcane is found to be the highest followed by soyabean. The lowest value is found in the case of groundnut. The variable land is found to be negative in case of sugarcane and groundnut. The explanation for negative value of sugarcane may be that in the case of sugarcane irrigation, infrastructure and cost rather than land matters much. Mere increase in the size of the land may not increase the production of sugarcane if these crucial factors are absent. The value of coefficient for literacy rate is found to be negative in case of tobacco. It implies that if the level of literacy increases by 1 % the production decreases by 0.35 %. This obviously is significant result.

The regression models for each crop are found to be the best fit.

Table 16
Village level Crop-wise Regression Results (Log Linear)
(Dependent Variable - Log (Output))

Crops	Constant	Land	Literacy	Irr. Area	Cost	Infra	R square
Tobacco	-0.3407	0.533	-0.3524	0.008	0.3024	-0.072	0.3099
	(- 0.481)	(2.651)*	(-3.564)*	-1.115	(3.827)*	(- 0.113)	(5.0538)*
Sugarcane	0.3341					-0.079	
	-0.517	(-1.046)	(3.664)*	(3.0505)*	(13.695)*	(-0.0300)	-60.7011
Soyabean	-0.4254	-0.0311	0.3121	0.013	0.2286	0.1318	0.7337
	(- 0.921)	(-0.719)	(2.551)*	(3.103)*	(9.778)*	-0.834	(30.9934)*
Groundnut	-0.0431	-0.0134	0.271	0.0032	0.1762	0.0161	0.2649
	(- 0.070)	(- 0.283)	(2.968)*	-0.056	(3.815)*	-0.082	(4.0535)*

* Significant at 0.05 level of significanc

Conclusion

The main findings of the village level analysis are: i) the most significant factor influencing the production is land followed by irrigated area, literacy rate and infrastructure; ii) the intra crop comparison indicates clearly that tobacco is affected positively by land while negatively by the literacy level of the farmers. In contrast, sugarcane is negatively affected by land and positively by other factors.

To conclude, it may be said that the shifting from tobacco cultivation is possible if the farmers are provided with sufficient education individually. At the village level irrigation as well infrastructure development could be the factors with some significance to motivate the cultivators for shifting to other crops. Based on the village level information the suggestions are as follows: **If partial shifting is recommended, the village level information suggests that farmers may be encouraged to grow tobacco with sugarcane where irrigation is available and tobacco with soyabean where irrigation is not available. If full shifting is recommended then the combination of sugarcane with soyabean with irrigation and soyabean with groundnut without irrigation may be accepted as alternative to tobacco cultivation.**

These results have to be obviously counter checked with the household level information. Such a micro level study using household level data might provide further insight about the problem of shifting from tobacco cultivation.

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TOBACCO : NATIONAL AND INTERNATIONAL PERSPECTIVE

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