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Assessing the Factors Affecting the Yield of Dark Sun Cured Rustica Tobacco. A Case Study of Rajanpur, Punjab

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ABSTRACT

Tobacco crop is highly labor intensive and contributes a considerable part to the economy of Pakistan. Present study was designed to explore the cost, revenue and modeling of revenue with different inputs regarding the factors affecting the Tobacco productivity in Punjab. Multistage random sampling was selected for the collection of primary data. The regression results of tobacco growers showed a positive impact on revenue due to education, growing experience, land preparation cost, fertilizer cost and irrigation cost. The value of R^2 was 0.594. According to BCR, medium farmer received Rs. 1.22 by investing rupee one in this activity followed by large (Rs. 1.18) and small (Rs. 1.07) farmers. There is dire need to fulfill the coordination gap of agriculture researchers and extension department to guide the farmers about the efficient utilization of agriculture resources.

KEYWORDS: Smokeless tobacco, benefit cost ratio, Cobb-Douglas, gross income, net income.

1. INTRODUCTION

Agriculture occupied a major (19.5%) share in the gross domestic product of Pakistan, involving 42.3% labor force [9]. Total cropped area was 23.40 million ha in Pakistan [16]. Tobacco crop occupied only 35251 hectares with the production of total 86.22 million kg tobacco [7]. Tobacco products included price earnings ratio of top fifteen companies in Pakistan. Tobacco in Pakistan was on growing value trend throughout the review period but declining trend in value term from past five years because Pakistan exported tobacco 1233.86 million rupees in (2015-2016) which was less than half 2732.29 million rupees in (2011-2012) [8]. Pakistan export raw tobacco and fine cigarettes to twenty-one countries with a worth 12294831$ and biggest importing country was Paraguay in 2015-2016. Tobacco has witnessed decreased in production during 2016-17 by posting negative growth of 2.6 percent over the same period last year due to decrease in area [6].

Tobacco is only the crop in Pakistan whose yield is well above the average yield and matches per hectare yield in the US and other developing countries an average yield of 1900 kg per hectare. Internationally tobacco is used as cigarette, cigar, snuff, hookah and chewing purpose. Tobacco is supporting 1.2 million persons because this crop is highly labor intensive [2]. Internationally, tobacco is consumed as a wicked weed but still loved by many. Since 15 century, this crop is being utilized by human beings [21].

Dark Sun Cured Rustica tobacco is popular with a name of black leaf occupied an area of 7000 hectares with a production of 21 million kg [10]. Its product is consumed as snuffing and chewing. Black leaf is also called smokeless tobacco, spit tobacco, chewing tobacco and Naswar. Snuff is a fine-grain tobacco that often comes in teabag-like pouches that users "pinch" or "dip" between their lower lip and gum. Chewing tobacco comes in shredded, twisted, or "bricked" tobacco leaves that users put between their cheek and gum. [10].

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Recently [18] explored the economics analysis of tobacco in Malawi. All costs are included, whether they are independent or contract farmers. Tobacco is labor intensive crop sharing 13.4% in total cost. The average profit among all the farmers is 79$ per acre.

Similarly [23] designed the study to investigate profitability of smoked tobacco in Pakistan. Economic analysis revealed that average cost Rs. 348637.18 acre^{-1} with average tobacco output estimated to be 3244.73 kg acre^{-1} and average gross revenue of Rs 430348.54 acre^{-1} whereas the net profit was estimated to be Rs. 81711.36 acre^{-1}. The yield difference was observed in case of different farmers due to difference in the use of inputs. It indicates the existence of inefficiency in input usage [15].

In a study [11] performed the economics analysis of oriental tobacco in turkey. Average cost of tobacco production was calculated to be 4.71$/kg. Total gross revenue obtained from tobacco was determined to be 320.79 $. Net revenue obtained from a 1 kg was estimated to be 0.49$/kg. There is a strong association exists between agriculture and various climate factors like precipitation, temperature, floods which ultimately influence on the economy of a country. Increase in the production as well as yield of agricultural crops is a need of time. [5, 6].

Smokeless tobacco production is said to be an important contributor to livelihood in terms of labor and revenue generation in Pakistan. In the light of above facts, study is required to estimate the total production cost, total revenue, benefit cost ratio, grass margin, net income and determinant of revenue of smokeless tobacco. The study also designed to give policy implications in the light of results.

2. MATERIALS AND METHODS

This study was based on primary data, collected from 210 smokeless tobacco growers from districts Rajanpur and Dera Ghazi Khan, Pakistan. For large size population, a sample of 210 respondents was appropriate for better results [20]. Multistage random sampling was adopted because it was helpful when total population was distributed into various sub-groups and a sample was taken from each sub-group on random basis [22]. Respondents were divided into three sub-groups such as small, medium and large farmers. Total operational land was less than 12.5 acres for small farmers; more than 25 acres for large farmers; and between 12.5 and 25 acres for medium farmers [12]. Small, medium and large farmers were 59.52%, 25.72% and 14.76%, respectively for present study.

Total revenue (TR) and total cost (TC) were estimated for economic analysis of smokeless tobacco production. Total variable cost incurred in the form of nursery cost, land preparation, seed, transplantation, fertilization, earthling up, hoeing, irrigation, pesticides, picking and stick replacement cost. Total fixed cost was the sum of land rent (six months)[1]. Software like Microsoft Excel, SPSS-15, DEAP-2.1 and Stata 13.0 were used for empirical analysis. Benefit-cost ratio, gross margin and net income were calculated with given formulas [3].

2.1 Benefit Cost Ratio (BCR)

BCR is obtained by dividing total revenue (TR) with total cost (TC). It explains the amount of revenue for the investment of one rupee as total cost. BCR = $\frac{TR}{TC}$ (1)

2.2 Gross Margin

It is obtained by subtracting variable cost (VC) from total revenue (TR). $GM = TR - VC$ (2)

2.3 Net Income (NI)

It is obtained by subtracting total cost (TC) from total revenue (TR). $NI = TR - TC$ (3)

2.4 One-way analysis of variance (ANOVA)

ANOVA explained the difference in the mean values for various sub groups [19] by using following null and alternative hypothesis:

Null Hypothesis H_0: $\mu_1 = \mu_2 = \mu_3$

Alternative hypothesis H_1: $\mu_1 \neq \mu_2 \neq \mu_3$

Equality and the mean values of sub groups was explored by null hypothesis and alternative hypothesis, respectively.

2.4.1 Econometric Model Specification

Easy estimation and interpretation of results is a major advantage of Cobb-Douglas model [13], Later, [4] introduced the logarithmic transformed form of Cobb-Douglas model because of easy coefficient estimation in linear form as:

$$Y = a + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + U_i \quad (4)$$

Y = Average revenue (Rs.)

x_1 = Education

x_2 = Growing experience

x_3 = Total Nursery Cost

x_4 = Total labor Cost

x_5 = Land Preparation Cost

x_6 = Fertilizer Cost

x_7 = Irrigation Cost

x_8 = curing Cost

x_9 = Pesticide cost

a = constant

U_i = Error term which shows the effect of unexplained factors

β_1 ……. β_9 are the coefficient estimates

3. RESULTS AND DISCUSSION

Table 1 reveals the mean and ANOVA of socio-economic variables. On an average, large farmers had more education (5.38 years), operational land (33.94 acre), smokeless tobacco production area (30.84 acre) and experience of smokeless tobacco (21.38 years). Age (43.08 years) and family labor (2.95) was less than small and medium farmers. The difference in mean was insignificant for farming experience, but it was significant for age, education, farm size, land under tobacco and family labor of smokeless tobacco.

Table 1 mean and ANOVA of various socio-economic variables.

Particulars	Farm size Category			ANOVA	
	Large	Medium	Small	F-Value	Sig.
Age (years)	43.08	44.98	39.33	5.758	.004
Education (years)	5.38	2.96	3.15	4.430	.013
Farming Experience (years)	21.38	23.46	19.15	2.811	.062
Farm Size (Acres)	33.94	17.26	6.76	449.57	.000
Land under Tobacco (Acres)	30.84	15.39	6.31	324.09	.000
Family Labor	2.95	3.68	4.34	4.14	.017

Table 2 depicts the production cost incurred in per acre production for smokeless tobacco. On average, expenditures of small farmers were high in nursery growing cost (1428.12). On average, large farmers spend more financial resources on fertilizer and FYM cost (Rs.25982.99) and irrigation cost (Rs. 7131.08). On average, medium farmers spend less money on land rent (Rs. 17303.57), fertilization (Rs. 23724.95), irrigation cost (Rs. 6962.50). Total cost was more for small farmer (Rs. 76499.81) followed by large (Rs. 74110.44) and medium farmer (Rs. 71824.32).

Table 2. Total production cost acre^{-1} (Rs.) for smokeless tobacco

Production Practices/Costs	Sub Groups		
	Large	Medium	Small
Total Nursery Cost	**484.13**	**711.84**	**1428.12**
Uprooting and transportation cost	1727.03	1626.79	1658.12
Gap filling cost	58.51	73.45	148.34
Manual ridge making cost	245.95	244.64	270.94
Fertilizer and FYM application Cost	1009.38	1007.85	1085.78
Pesticide insecticide application charges	263.51	313.39	241.20
Total Hoeing Charges	2448.65	2548.21	2560.68
Manual Topping and de-suckering Charges	4059.46	4137.50	3973.50
Labor cost of irrigation and water course cleaning	711.62	574.85	730.66
Labor cost of Harvesting	1024.32	1057.14	1046.15
Cost of picking tying and loading	1278.38	1296.43	1251.28
Stick replacement cost	3732.43	3805.36	3637.61
Total Labor Cost	**16559.24**	**16685.61**	**16604.27**
Total Land Preparation Charges	4446.24	4841.19	6395.34
Total Fertilizer and FYM Cost	25982.99	23724.95	24473.78
Total Pesticide insecticide cost	1258.11	1030.36	984.19
Total Irrigation Cost	7131.08	6962.50	7027.78
Total Curing Cost (Plastic)	518.92	564.29	526.50
Land rent	17729.73	17303.57	19059.83
Total Cost	**74110.44**	**71824.32**	**76499.81**

Table 3 describes that BCR was high for medium farmers (1.22) followed by large (1.18) and small (1.07) farmer. It depicts that medium farmer received Rs.1.22 in return by investing rupee one in smokeless tobacco production. The small farmers get more leaf production (31.52 40kg/acre), also get more stick production 7.88 40kg/acre and price (Rs.3955.98/40kg). Total revenue was also more for small farmers (Rs.1276290.00 40kg/acre). GM (Rs.70189.02 40kg/acre) was more for medium (70160.06kg/acre) and large farmer (68433.55 kg/acre). Smokeless tobacco is a profitable activity and it was in line with the results of [11, 18, 23] and [16].

Table 3. Economic Analysis of per acre smokeless tobacco Production

Indicator/Unit	Sub-Groups		
	Large	Medium	Small
Leaf Production (40 kg/acre)	30.92	31.21	31.52
Average Price (Rs./40kg)	3945.95	3875.89	3955.98
Stick Production (40 kg/acre)	7.73	7.80	7.88
Stick Price (Rs./40kg)	303.11	292.86	294.66
Total Cost (40 kg/acre)	74110.44	71824.32	76499.81
Total Revenue (Rs.)	124814.26	124680.80	127629.00
Gross Margin (Rs.)	68433.55	70160.06	70189.02
Net Income (Rs.)	50703.82	52856.49	51129.19
BCR	1.18	1.22	1.07

Table 4 explains the acceptability of Cobb-Douglas model for smokeless tobacco according to R^2(59.4), adjusted R^2(57.5) and f- statistics (32.464). The regression results of tobacco growers showed a positive impact on revenue due to education, growing experience, land preparation cost, fertilizer cost and irrigation cost. The regression coefficient was significant and positive for education which shows 0.191% increase in revenue for 1% increase in education. Significant education coefficient was in line with previous studies [14, 17] and [16]. An educated farmer has the ability to understand new technology and learns about better production practices. The increase in revenue was 0.187%, 0.427% and 0.254% was due to 1% increase in land preparation cost, fertilizer cost and irrigation cost, respectively. Significant coefficient of extension services was in line with [17] and [16]. Positive coefficient of irrigation cost was in line with Khan & Ghafar (2013), [16] and Mwangi (2012). The revenue was decreased by 0.107% and 0.131% as a result of 1% increase in curing cost and growing experience respectively.

Table 4. Regression Results of Cobb- Douglass production function

Variables	Std. Error	Coefficient	t-value	p-value
Constant	13738.518		2.453	0.015
Education	304.144	0.191	3.704	0.000
Growing Experience	113.633	-0.131	-2.657	0.009
Nursery Cost	2.133	-0.071	-1.229	0.221
Total Labor Cost	0.92	0.013	0.201	0.841
Land preparation Cost	0.897	0.187	3.362	0.001
Fertilizer Cost	0.251	0.427	7.746	0.000
Irrigation Cost	1.159	0.254	4.505	0.000
Curing Cost	6.638	-0.107	-2.128	0.035
Pesticide Cost	3.69	-0.004	-0.081	0.936
R^2	**59.40**			
Adjusted R^2	**57.50**			
F Ratio	**32.46**			

4. CONCLUSION

Price instability, high middle man margin, expensive inputs, low quality inputs, lack of extension services and disease attack were the major issue as told by the respondents. Government should improve the services of extension department, to aware the farmers about optimum utilization of resources such as fertilizer, water and pesticides. Government should establish farmer field schools for the training of farmers about modern practices in agriculture. Monitoring teams should check the quality of agricultural inputs in retail market. Government should improve the technical education of farmers for the decrease in inefficiency score. Government should control the prices of various inputs like fertilizers, hybrid seed, electricity and chemicals. Government should also improve the quality of inputs like seed, sprays and fertilizers.

Conflict of interest

Authors would hereby like to declare that there is no conflict of interests that could possibly arise.

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