Research Article

Cost and Net Return of Tobacco Growers – A Case Study of District Mardan (KP- Pakistan)

Muhammad Nasrullah[1*], Liu Chang[1], Khurram Nawaz Saddozai[2], Asaad Osman Khalid[1], Rachel Bayisenge[1] and Gulnaz Hameed[3]

[1]Department of Agriculture and Management, Northeast Agricultural University, Harbin, China; [2]Department of Agriculture and Applied Economics, The University of Agriculture Peshawar, Khyber Pakhtunkhwa, Pakistan: [3]Department of Economics and Agriculture Economics, PMAS Agriculture University, Rawalpindi, Pakistan.

Abstract | The study focused the profitability of tobacco growers in one of the district of Khyber Pakhtunkhwa (Mardan). Tehsil Takht bhai was selected through purposive sampling among the three Tehsil of district Mardan. A sample of 120 growers was selected and interviewed randomly through a prepared well- structure questioner. Different practices were grouped into five parts. Land rent of the respondent area was 61,750 rupees per hectare; nursery raising cost was estimated at 11,828 rupees per hectare. The bed preparation cost for tobacco is 12,300 rupees per hectare while planting cost was 61,476.68 and processing cost was 95,535 rupees per hectare. The highest cost incurred was 61,750 rupees for land followed by Fuel wood which was 39,957 rupees per hectare. Total product of tobacco was calculated as 44 mounds per hectare. The total revenue was Rs. 405,636 per hectare while total cost incurred was 242,889.68 having a profit of Rs. 162,746.32 per hectare. The data were checked through VIF found free of multicollenearity problem. The analysis of profit function is prior to our expectation and economic theories. Factor affecting analysis shows that overall results of the regression are statistically significant except farm size and fertilizers used during production. The coefficients of seed are the highest among all variables which can highly affect the productivity of the growers.

Received | March 09, 2018; **Accepted** | March 20, 2019; **Published** | May 02, 2019
***Correspondence** | Muhammad Nasrullah, Northeast Agricultural University Harbin, China; **Email:** nasrullaheconomist@hotmail.com
Citation | Nasrullah, M., L. Chang, K.N. Saddozai, A.O. Khalid, R. Bayisenge and G hameed. 2019. Cost and net return of tobacco growers – a case study of district Mardan (KP- Pakistan). *Sarhad Journal of Agriculture,* 35(2): 565-571.
DOI | http://dx.doi.org/10.17582/journal.sja/2019/35.2.565.571
Keywords | Mardan, Profit function, VIF, Multicollinearity, Regression

Introduction

Pakistan is a country where agriculture has a significant role regarding food and fiber production. This production plays a dynamic role in the strengthening economic situation of country. Agricultural is mainstream for the people who drive their livelihood from agriculture. The total share of agriculture is 21 percent in the Gross Domestic Product (GDP) and employed half of the labor force directly or indirectly and is the largest source for the country in foreign exchange earnings. On average the contribution of major crop to the value addition in overall agriculture is 29 percent and 6.0 percent to the GDP. The overall contribution of major and minor crop to the value added reaches up to 41.9 percent (GoP, 2012).

Tobacco is counted in the category of cash crop and its production gives an excellent return per unit area. The position of tobacco in the economy of Pakistan is well recognized due to the fact that it contributes 40 percent in all excise tax to the government. Government generates 10 percent of their total revenue through

tobacco and its products. It is cultivated beyond than hundred countries, including round about eighty developing countries. China is the key producer of tobacco due to which they rapidly increasing their share in production. India is counted is third largest producer after Brazil which is followed by United States. These four countries are producing about two-thirds around the world. Pakistan occurs on ten numbers on worldwide tobacco production ranking.

During 2009 almost 3.9 million hectare is figured out through the world. During the same period, Global production of the crop crossed 7.1 million tones. In 2012 land cultivated in under tobacco was 47000 hectares. In the same year, collectively the total production of Pakistan's was approximately 105,000 tons. Pakistan has registered an overall growth of 21 percent since 1972. The growth in production is focused due to the reduction of land under tobacco production from 50,604 Hectares in the year 1972 which become reaches to 49,676 Hectares during 2009 (FAO, 2013).

The main producer of tobacco is Khyber Pakhtunkhwa among all the five provinces of Pakistan and act as a key role for all tobacco allied activities. 78 percent of tobacco grows in Khyber Pakhtunkhwa and the remaining 22 percent grows in other three provinces, which is the 3/4 of the tobacco produced in Pakistan. Tobacco requires a large number of labor due to which it engage 80,000 labors in cultivation, 50,000 of labors are involved in 26 industries of tobacco and round about one million of labors are indirectly engaged in marketing (Faraz, 2003). Among the various varieties of tobacco, farmer uses Flue Cured Virginia and White Patta which is best for the agro ecological zone of Khyber Pakhtunkhwa. The production of tobacco per hectare in KP is 14 percent greater than world average production while 22 percent from the domestic average production (Pakistan Tobacco Company, 2012).

Area cultivated under tobacco in Khyber Pakhtunkhwa is 36,016 hectares while their production is 93,080 tons which generate a profit of rupees 10090 million. Basic growing district of tobacco in KP province are Mansehra, Buneer, Charsadda, Mardan and Swabi while their yield is 5, 6, 15, 25 and 38 percent. Collectively sum of Rs 1,241.7 million was received as a foreign exchange during 2009-2010 (Pakistan Tobacco Bulletin, 2012).

Objectives of the study

1. To find out the total cost and net return of tobacco growers in Mardan.
2. Factors affecting the productivity of tobacco growers.
3. To recommend suggestion if possible.

Materials and Methods

Study universe

Khyber Pakhtunkhwa is the province which leads all four provinces in term of tobacco production and occupies large area having large production due to suitable environmental, agronomic and soil condition for tobacco crops. 78 % of the total production is produced in Khyber Pakhtunkhwa. 50000 hectare of area is cultivated in Pakistan which produce 108000 ton of tobacco. 36,016 hectare areas are cultivated for tobacco among the total cultivated land used for tobacco in the country which provides 93,080 tons of tobacco (GoP, 2012). Due to the limited time and financial resource, three villages Takar kali, Gharoshaah and Pasand kali were choosed purposely from district Mardan, tehsil Takhtbhai.

Sampling design and sample size

For the selection criteria the study uses multistage sampling technique. District Mardan is selected purposely in the 1st stage. Among the three sub district of Mardan, Thakhtbhai is again purposely selected in the 2nd stage due to large number of producing villages. Stratified sampling technique is used as a 3rd stage in the selection of producing villages which were considered as strata 1 (Gharoshaah), strata 2 (Pasand Kali) and strata 3(Takar Kali). At last proportional allocation sampling technique are used for selecting 120 respondents as follows:

$$ni = \left(\frac{Ni}{N}\right) \times n$$

Cost and returns of tobacco production

Simple budgeting technique is used to estimate the costs and returns of tobacco growers to identify the importance of every factor used in the tobacco yield and production. According to Debertin (1986) the farmer profit can be calculated by subtracting total cost used in production from the total revenue obtained from production.

Therefore:

$$\Pi = TR - TC$$

While;

$$TR = P \times Q$$
$$TC = V_i \times X_i$$

Where;
P and Q are the respective price and quantity of the output, while Vi and Xi denote the price and quantity of ith input respectively.

$$\Pi = PQ \times VX_i$$

Where;
Π= Profit (net Revenue); P= Output price at wholesale level (Rs/mound); C= Cost per unit produced (Rs/mound); Q= total production of tobacco (mound).

Empirical modeling of tobacco profit function

The empirical model of tobacco profit function is given as:

$$\Pi = \beta_0 + \beta_1 P + \beta_2 C + \beta_3 Q + e_i$$

The empirical model of tobacco profit function depicts that profit function (Π) depends on price per unit (P), cost per unit produce (C) and output of tobacco production (Q).

Factors affecting tobacco yield

A Cobb Douglas modified production function was incorporated in order to find the factors that are responsible for changes in productivity i.e. farm size, labor days, fertilizers, chemicals, number of irrigation, seed, farm yard manure and tractor hours were incorporated in the analysis. Many factors were left out to keep study within manageable limits. Cobb Douglas type production function was fitted, which is described as below:

$$\ln Y = L + \beta 3 \ln F + \beta 4 \ln C + \beta 5 \ln I + \beta 6 \ln S + \beta 7 \ln FYM + \beta 8 TH + ei$$

Where;
Y, FS, L, F, C, I, S, FYM and TH are the per hectare production in mounds, farm size, numbers of labor, fertilizers used in kilograms, chemical used in liter , number of irrigations, number of seeds used in grams, farm yard manure per hectare applied, number of tractor hours per hactare.

Results and Discussion

Personal attribute of sampled tobacco grower

Age of respondent: Age is noneconomic features which play an important role in adopting and rejecting new practices and technology during production on the basis of their experience. Collectively the average age of the interviewed villages are 49.09 years, ranges from 39 to 67 years having standard deviation of 5.98. 48.11 years is the mean age of Takar Kali with a minimum age of 40 years and maximum age of 59 having standard deviation of 5.13. The standard deviation of Pasand Kali was 7.23 with an average age of 50.46 years, ranged from 39 to 67 years. The range of Gharoshaah Village was 43 to 61 years having mean value of 48.70 years while their standard deviation was 4.45.

Table 1: *Proportional allocation sampling estimates.*

Villages	ni=(Ni/N) * n	Sample size
Takar Kali	215/653 * 120	39
Gharoshaah	140/653 * 120	26
Pasand Kali	300/653 * 120	55
Total		120

Source: *survey data 2014.*

Education level of respondent: The study shows that the literacy level of the respondent was enough for the awareness and participation of various agricultural trainings. The mean value of education level among these three respondent villages was 5.21 schooling year with a standard deviation of 3.99 ranging from 0 to 14 schooling years. Among the respondents village the average education level of Pasand Kali is higher than other village. The results of literacy level are shown below.

Table 2: *Age of respondents.*

Village	Mean	S.D	Min	Max
Takar Kali	48.11	5.13	40	59
Pasand Kali	50.46	7.23	39	67
Gharoshaah	48.70	4.45	43	61

Source: *survey data 2014.*

Experience of growers: Experience of grower is important non-economic factor which can affect the productivity of tobacco. The study shows that the average experience of the of the interviewed respondent are 31 years with a standard deviation of 3.21 ranged from 21 to 38 years. The village wise experiences are shown below in the Table:

Table 3: *Descriptive of education level of respondent.*

Village	Mean	S.D	Min	Max
Takar Kali	5.17	4.25	0	12
Pasand Kali	6.48	3.77	0	14
Gharoshaah	4.11	3.89	0	11

Source: *survey data 2014.*

Cost of tobacco production per hectare

Land rent per hectare: Land rent is an important unit of input and has a positive relation with production; cultivation of more land will increase the production. Mostly farmers are poor facing high charges of land which they have to pay to owner. In study area the rent of one hectare was Rs. 61,750 per hectare.

Table 4: *Descriptive of the experiences of growers.*

Village	Mean	S.D	Min	Max
Takar Kali	28.58	3.48	21	36
Pasand Kali	30.56	3.11	23	38
Gharoshaah	30.31	2.87	26	35

Source: *survey data 2014.*

Nursery rising cost per hectare: Table 5 below shows the mean cost of nursery rising cost for one hectare. The paper shows that the whole cost on nursery rising was Rs. 11,828 per hectare which pays 4.89 percent among the total cost during production.

Table 5: *Nursery rising cost per hectare.*

Inputs	Unit	Quantity	Price	Cost (Rs)	%
Tractor	Minutes	54	1000	900	7.61
Seed bed	M. days	3.5	300	1050	8.87
Fertilizers	Kgs	35	40	1400	11.84
FYM	Kgs	1235	3.75	4631	39.15
Frost Protection	Yard	90	10	900	7.61
Weeding	M. days	5	300	1500	12.68
Pesticides	Sprays	2.5	300	700	5.92
Labor for Irrigation	M. days	10	50.0	500	4.23
Abyana	Rs	-	-	247	2.09
Total	-	-	-	11,828	100

Source: *survey data 2014.*

Bed preparation cost per hectare: The study reveals the Bed Preparation contribute 5.06 percent among total cost which was Rs. 12300 per hectare. Deep plowing is the costly item in bed preparation which was Rs. 5000 per hectare followed by bullocks. The outcomes are declared in Table 6.

Table 6: *Bed preparation cost.*

Inputs	Unit	Quantity	Price	Cost (Rs)	%
Deep Plowing	Hours	5	1000	5000	40.65
Normal Plowing	Hours	2:30	1000	2400	19.51
Rotavator	Hours	2:30	1000	2400	19.51
Bullocks	Day	2.50	1000	2500	20.33
Total	-	-		12300	100

Source: *survey data 2014.*

Planting cost per hectare: Planting cost starts from the costs after plowing tell to leaves piking by growers. The plant cost is counted during study was Rs 61476.68 per hectare which was 25.31 percent of the total cost. During planting cost, irrigation is cheapest input while farm yard manure is the expensive input. Other inputs are mentioned below in the Table 7.

Table 7: *Planting cost.*

Inputs	Unit	Quantity	Price	Cost (Rs)	%
FYM	Kgs	7410	3.75	27,787.5	45.20
Transplantation	L. Days	5	300	1500	2.44
Hoeing	L. Days	8.5	300	2550	4.15
NPK	Kg	124.34	72	8952.48	14.56
Urea	Kg	61.75	20	1235	2.00
DAP	Kg	85.71	80	5856.8	9.53
Irrigation	-	-	-	1000	1.63
Pesticide	Liter	3.29	930	3059.7	4.98
Weedicide	Liter	2.80	500	1400	2.28
Triming	L. Days	7.50	300	2250	3.66
Trimming Masala	Kg	1.93	640	1235.2	2.01
Picking	L. Days	15.50	300	4650	7.56
Total	-	-	-	61476.68	100

Source: *survey data 2014.*

Processing cost per hectare: Processing cost includes those cost which are used after picking leaves tell to tobacco boards. It contributes 39.33 percent of the total cost. All cost in the processing costs is mentioned below in the Table 8.

Net revenue per hectare: After analyzing the data the results reveals that total cost incurred on land, nursery rising, bed preparation, planting, processing cost was Rs. 242889.68 per hectare while the total revenue is obtained from the product of price per mound and quantity which was Rs. 405636 per hectare. Net return obtained by subtracting total cost from total revenue which was 162746.32 per hectare. The results are given in Table 9.

Links Researchers

Table 8: *Processing cost.*

Inputs	Unit	Quantity	Price	Cost (Rs)	Percentage
Transportation	Rs	-	-	4029	4.22
Stringing	Stick	-	-	4520	4.73
Loading	Rs	-	-	2591	2.71
Depreciation	Rs	-	-	18480	19.34
Fuel	Kg	-	-	39957	41.83
Fireman	Rs	-	-	9319	9.75
Cavar	Rs	-	-	2329	2.44
Grading	Rs	-	-	9430	9.87
Loading	Rs	-	-	440	0.46
Transporting	Rs	-	-	4030	4.22
Unloading	Rs	-	-	410	0.43
Total	-	-	-	95535	100

Source: *survey data 2014.*

Table 9: *Net revenue.*

Item	Unit	Quantity	Rate	Total
Total Revenue	Rs	44	9219	405636
Total Cost	Rs			242889.68
Net Return	Rs			162746.32

Source: *survey data 2014.*

Table 10: *Detection of multicollinearity (factors affecting production).*

Variables	VIF	1/VIF
FS	2.49	0.40
L	2.32	0.43
F	1.58	0.63
C	1.50	0.67
I	1.38	0.72
S	1.35	0.74
FYM	1.15	0.87
TH	1.07	0.97
Mean	1.60	

Source: *Survey data 2014.*

Detection of Multicollinearity

The presence of perfect relation among independent variables which cause misleading of the result, such phenomenon is called multicollinearity. In the presence of multicollinearity it is difficult to measure the exact coefficient of the predictor variables accurately which cause the false prediction among dependent and independents variables. If the drive of regression is prediction, then it is not a serious problem because it gives high R^2, better will be the prediction but if one is interested to find the exact value of β and intercept then it is serious problem. The study use variance inflation factor (VIF). The VIF results of both models depict that the mean value of VIF for both models variables are less than 5 (1.60 and 1.01) which implies no multicollinearity (saddozai *et al.*2015). The estimated results of both models are given below in Table 10 and 11.

Table 11: *Detection of multicollinearity (profit function).*

Variables	VIF	1/VIF
P	1.02	0.98
C	1.02	0.98
Q	1.00	0.99
Mean	1.01	

Source: *Survey data 2014.*

Analysis of profit function

The estimated results are given bellow:

$$\Pi = -786720.1 + 182.73P - 217.67C + 5108.02Q$$
$$\text{S.E } (87992.24)\ (9.55)\ (5.35)\ (48.23)$$
$$\text{T ratio } (-8.94)\ (19.14)\ (-40.72)\ (105.92)$$
$$R^2 = 0.99,\ F = 4427.70,\ \text{D.W} = 1.99$$

The above results explain that one unit increase in price per mound will increase 182.73 rupees of profit. The increase in per unit cost of the grower can decrease 217.67 rupees the profit of tobacco growers while per unit increase in quantity can increase 5108.02 rupees of profit. The overall model are good fit because the estimated value of F statistic is greater than F-tabulated which is 4427.70, while the coefficient of determinant R^2 is 0.99 showing that 99 percent of changes in dependent variable has been explained by explanatory variables. The result are similar with the previous study of Qamar et al. (2006).

Analysis of factors affecting tobacco yield

The estimated results show the good results in terms of production. The F-statistics shows the whole fitness of the regression model. In this situation the Fcalculated is greater than Ftabulated which is 2.09 (Fcalculated > Ftabulated= 2.09) which indicate the overall model is significant. R^2 is the coefficient of determination which suggests 74 percent changes in regressond variable is due to regressor variable in the production of tobacco. The coefficients of labor, chemical, irrigation, seed, farm yard manure and tractor hours are 0.17, 0.19, 0.14, 0.25, 0.18, and 0.18 respectively which is statistically significant, implies

that percent change in input can affect the percent output of tobacco growers in Mardan which is prior to the expectation of the study the result are similar with previous study of Saddozai et al. (2015). The result shows that farm size and fertilizer is statistically insignificant which implies that there is no impact of farm size and fertilizer on the production of tobacco in district Mardan. There is no significant difference between poultry manure and fertilizer in their long term effect on productivity Douglas (2003). Among the entire variables, the coefficient of seed is highly significant in the model which implies that optimum use of seed rate play a vital role in the high level production. The estimated results are given below.

$R^2 = 0.74$; R^2adjusted = 0.73; F = 41.43

Y	Coefficient	SE	t-value	p-value
FS	-0.005	0.006	-0.91	0.366
L	0.176	0.058	3.04	0.003
F	-0.019	0.018	-1.09	0.280
C	0.197	0.086	2.30	0.023
I	0.145	0.067	2.15	0.034
S	0.250	0.049	5.07	0.000
FYM	0.184	0.050	3.69	0.000
TH	0.188	0.053	3.52	0.001
Cons	1.311	0.236	5.54	0.000

Source: *Survey data 2014.*

Conclusions and Recommendations

In the estimation of total cost fuel cost is considered is expensive in the production of tobacco, which was Rs. 39957 per hectare. The next expensive item was FYM which was 27787.5 Rs per hectare. Total revenue generated by the growers was Rs. 405636 per hectare while total cost during production was Rs. 242889.68 per hectare and net revenue was Rs. 162746.32 per hectare. Before analysis the data were checked through VIF for the problem of multicollinearity which shows no relation among the variables. The regression analysis of the profit function shows that overall model is significant and price per unit and quantity produced has a direct impact on profit while cost per unit has inverse relation with profit which mean increase in cost per unit can decrease the profit. The factors affecting productivity analysis show that overall model is statistically significant as required to the prior expectation of the economics theories. Labor, chemicals, irrigation, seed rate, farm yard manure and tractor hours are the main contributing inputs which can vitiates the productivities of the growers in selected area while farm size and fertilizer have no impact on the production of tobacco.

Man power is very important and a sensitive factor in the productivity of tobacco. Results indicated that labor is significant with coefficient of 0.17, which implies that one percent increase in labor force can increase 0.17 percent productivity. Considering the cost of labor that are used in whole production, starting from nursery raising to processing cost is Rs. 43,039 per hectare which is the highest cost among all input involved during production without including the labor used during plowing cost.

Further research studies should be conducted to improve the seed varieties of tobacco in order to increase the net return per hectare and prosperity among growers. Special training should be arranging by Extension workers to avail the use of fertilizers, which is help full to increase production. Wood used for curing is expensive, grower's needs to be substituted with some cheap fuel. Tobacco is a lucrative crop, so farmer should be encouraging increasing productivity.

Author's Contribution

Muhammad Nasrullah: Conducted the research and collected the data.
Liu Chang: Supervised the study and helped in writing up the manuscript.
Khurram Nawaz Saddozai: major supervisor who developed main theme of the study and approved the manuscript finally.
Asaad Osman Khalid: Wrote introduction and did date entry.
Rachel Bayisenge: Developed the model.
Gulnaz Hameed: Helped in data analysis and provided technical back stopping for research methadology.

References

Ahmad, S., T.Z. Chohan and K.N. Saddozai. 2008. An investigation into cost and revenue of onion production in Azad Jammu Kashmir. Sarhad J. Agric. 24(4): 737-743.

Cobb, C.W. and P.H. Douglas. 1928. A theory of production. The american economic review. Suppl. pp. 139-165.

Dash, J.K., R.P. Singh and R.K. Pandey. 1995. Economic analysis of summer rice production in Baharagora block of Singhbhum district, Bihar, A case study. J. Res. Birsa Agric. Univ. 7(2): 131-135.

Debertin, D.L. 1986. Agricultural production economics. Macmillan publ. Co. New York.

Douglas, C.E. 2003. The long-term effects of manures and fertilisers on soil productivity and quality: a review. Nutr. Cycling in Agroecosyst. June 2003, Volume 66. pp. 165–180. https://doi.org/10.1023/A:1023999816690

Faraz, K. 2003. Cash cultivation. The Daily Dawn, Dated October, 12, 2003.

FAOSTAT. 2013. http://faostat.fao.org (accessed on 20-04-2014).

Fuss, M., D. McFadden and Y. Mundlak. 1978. A survey of functional forms in the economic analysis of production, in Melvyn,

Fuss, M. and D. McFadden. Production Econ. A dual approach to theory and applications, 1, The Theory of Production, North-Holland Publish. Co. New York.

Gangwar, B. and R.P. Dubey. 1996. Production potential and economics of rice based cropping sequences in Andaman Islands. Bhartiya Krishi Anusandhan Patrika. 11(2): 85-90.

GOP. 2012. The economic survey of Pakistan. "Ministry of finance Islamabad".

Gubbaiah, R.H.P. and G.C. Kuberappa. 1993. Economics of rice brown planthopper management. Curr. Res. Univ. Agric. Sci. Bangalore. 22(6-8): 99-100.

Haq, Z.A., M. Khan and M. Ahmad. 2002. Role of farm size in input use and productivity of potato in Shigar Valley of Baltistan Area: an econometric analysis. Sarhad J. Agric. 18: 245.

Pakistan Tobacco Company 2012 Report.

Pakistan Tobacco Bulletin Vol. XXVI (1) 2012.

Qamar, W., N.P. Khan, M. Ashfaq, F. Ahmad and M. Idress. 2006. Economics of tobacco production in district Swabi, nwfp. J. Agric. Biol. Sci. vol. 1(3): 1990-6145

Rahman, Q.L, M. Sajjad, N.P. Khan, Shahenshah and M. Nazir. 2011. Costs and net returns of tobacco production in district Swabi (Khyber Pakhtunkhwa) Pakistan. Interdiscip. J. Contemp. Res. Bus. Vol. 3. No. 8.

Reddy, P.P. 1997. An analysis of inter-regional and temporal variations of costs, productivity and sources of growth of Paddy in Andhra Pradesh. India. J. Agric. Eco. 52(3): 406- 417.

Saddozai, K.N., M. Nasrullah and N.P. Khan. 2015. Stochastic frontier production analysis of tobacco growers in district mardan, Pakistan. Pak. J. Agric. Res. Vol. 28, No.4, 2015.

Said, A., A. Zada and M. Tahir. 2000. Improved cultural practices for profitable rice production in North West Frontier Province. Pakistan: Tasran Comput. Assoc. Mingora, Swat.

Santha, A.M. 1993. A comparative analysis of cost and returns of Paddy cultivation for different seasons in Trichur, Kerala. Madras Agric. J. 80(2): 41-44.

Upendra, K. 1999. Economics of rice cultivation under different Eco-system, A case study of Pusa block of North Bihar. J. Appl. Biol. 9(1): 97-99.