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Tobacco Farming and its Socio-economic Determinants in Kushtia District of Bangladesh

Anupam Roy[1], Sabrina Naz[2], M. G. Mostafa[3*]

[1,2,3]Institute of Environmental Science, University of Rajshahi, Rajshahi-6205, Bangladesh
*Corresponding author: mgmostafa@ru.ac.bd

Abstract: Tobacco farming is profitable, earning a lot of money at once, and using unpaid family labor were the main reasons for tobacco farming. The study was carried out to explore the basic socio-economic determinants that significantly influence farmers in tobacco farming in Kushtia district of Bangladesh. The study was exploratory, combining primary and secondary data. Data were collected through a well-structured questionnaire in face-to-face interviews. The acreage of tobacco cultivation in Kushtia district for the last 10 years is decreasing at a rate of 4.65% per year. Labor shortages, high input cost, and health problems are the main reasons for the decline of tobacco cultivation. Tobacco cultivation requires a large amount of fertilizer (645 kg/acre). Profit per acre of tobacco, boro rice, wheat, and winter maize ware US$ 505.20, US$ 297.90, US$ 235.20, and US$ 353.80, respectively, with a Benefit-Cost Ratio (BCR) of maize (1.33)>tobacco (1.31)>wheat (1.28)>boro rice (1.25). The age of farmers and size of their own cultivated land had no effect on tobacco cultivation; larger farm and family size were more important, but educated people were less inclined towards tobacco cultivation. Governments can diversify tobacco growers or switch to more profitable crops such as maize as an alternative to tobacco to improve farmers' livelihoods.

Keywords: *Benefit-Cost Ratio (BCR), Present status, Socio-economic determinants, Tobacco farming*

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Supporting agencies: None

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1. Introduction

Agriculture sector plays an important role in the overall economic development of Bangladesh. It is a predominant sector in generating livelihood, and employment. Agriculture remains the largest sector (46%) in terms of employment. The economy of the country is mainly dependent on agriculture. In FY 2018-2019, the contribution of agriculture sector to GDP is 12.52% (Population and Housing Census, 2022). Among different crops produced, tobacco is playing an increasingly important role in Bangladesh to create employment and income opportunities for farmers and help earn important foreign exchange for the country. Tobacco farming is comparatively more economically beneficial than other crops and plays a vital role in the local economy, as well as being an important solution for hunger elimination and poverty reduction (Minh et al., 2009). In 2012, tobacco produced almost 7.5 million MT of leaves on 10.62 million acres of agricultural land in at least 124 countries, of which six countries account for two-thirds of all production: China, Brazil, India, the USA, Malawi, and Indonesia (Mangora, 2005) but Bangladesh can be considered a marginal player. Again 81,016 acres of woodland would be cleared annually only for curing tobacco in Tanzania (Fassa et al., 2014). In recent decades, transnational tobacco corporations have lowered production costs by shifting tobacco leaf production from high-income to low-income countries, where around 90% of tobacco farming now takes place (Geist et al., 2009). Tobacco is now broadly grown as a cash crop in developing countries where wealthy multinational companies are growers, traders, and manufacturers (Kibwage et al., 2009). Bangladeshi tobacco ranks as the world's 6th largest cash earning but 2nd top most exporting crop that lies in the world at 14th position in area acreage and 12th position for production (1.3% of global tobacco production). The tobacco cultivation areas are still only 0.22% of the total land as compared to all crop production in Bangladesh, and employment is less than 0.5% of agricultural employment (FAO, 2010). The overall tobacco production has risen by 76% and 134%, respectively, during the period from 2007-08 to 2014-15,

though the total tobacco acreage has decreased (BBS, 2022).

Tobacco is an herbaceous annual plant belonging to the nightshade family, grown for its leaves. More than 70 species of tobacco are known, but the chief commercial species is *Nicotiana tabacum*. Kushtia district is located on the southern bank of the Padma river (predominantly AEZ-11: High Ganges River Floodplain) consisting of six upazilas having 978 villages. It had a total area of 1621.15 km^2, a total population of 2149692 (Muslims-97.23% and Hindus-2.73%) out of which 78.73% lived in rural areas and 21.27% in urban areas, population density was 1336 persons per km^2, education rate was 68.88% and average household size was 3.8 persons. (Population and Housing Census, 2022). Main occupations ware agriculture 31.5%, commerce 15.34%, and agricultural labor 13.9%. According to the Agriculture Census of Bangladesh-2019, in Kushtia district, about 49.61% of the total population are landless farmers, 46.71% small farmers, 3.15% medium farmers and 0.09% large farmers. Total net crop area in Kushtia diatrict was 260746 acres, in where boro rice 85563 acres (32.81%), wheat 25467 acres (9.77%), winter maize 16861 acres (6.47%) and tobacco 31,604 acres (12.12%). Main crops were rice, wheat, maize, jute, pulses, oil seeds, tobacco, betel leaf, banana and sugarcane. Kushtia is the centre for virginia tobacco production and manufacturing of Bangladesh. The economy of the farmers of kushtia is highly dependent on tobacco cultivation. Kushtia district positions first in tobacco cultivation followed by Lalmonirhat and Nilphamari (BBS, 2022; Joardar et al., 2022). FY 2021-22, about 29457 acres land was cultivated under tobacco in Kushtia, which was 29.58% of total tobacco cultivated land in Bangladesh. For last 10 years from 2013-14 to 2022-23, the land under tobacco cultivation is decreasing slowly with some fluctuation over time; for Kushtia district the decreasing rate was 4.65% per year and 3.04% per year for Bheramara upazila and 6.18% per year for Daulatpur upazila. The decreasing rate was highest for Daulatpur upazila among all upazilas in Kushtia district. All these decreasing tobacco lands were being replaced mostly by winter maize, wheat, boro rice and pepper (DAE, Kushtia, 2023).

Tobacco originated in the Peruvian and Ecuadorian Andes (Hussain et al., 2017) between 5000 and 3000 BC. The tobacco plant was taken to Europe by early explorers in the 15^{th} and 16^{th} centuries and later re-exported to the rest of the world including Bangladesh during colonization, where it was used as medicine and as a hallucinogen. In Bangladesh, tobacco had introduced 1751 and more widely after independence in 1971 by British American Tobacco plc. (BAT) in the Teesta belt of the Rangpur area, later moved to Kushtia in 1980 for the Gangetic Floodplain, and then to the Chittagong Hill Tracts (CHTs) mostly for the fertile river bed of Matamuhuri and trees in the hill forest (Akhter, 2011). The expansion of tobacco production is a corporation's grabbing of fertile land, and forests for fuel wood, and water. Although Bangladesh Agricultural Research Institute (BARI) conducted tobacco research and development activities and was abandoned in 1995, tobacco production was largely imposed by large multinational companies such as BAT through contract growers. The efforts of past governments in the form of active participation in the tobacco industry, including increased export incentives and access to foreign markets, have contributed to the increasing growth of the sector. From 1990 to 2010, tobacco production in Bangladesh had increased from 607.29 kg per acre to 773.28 kg. Since 2008, the government has changed its policy on tobacco by withdrawing cash incentives given to exporters and imposing tariffs on tobacco leaf exports (PRI, 2012). Now, Rangpur, greater Kushtia (Meherpur, Kushtia, Chuadanga), CHTs region, Jashore, and Gazipur are the top most tobacco growing reasons in Bangladesh. In addition to this, it extends to Rajshahi, Jhenaidah, Nilphamari, Lalmonirhat, and even Manikganj and Tangail districts. Three varieties of tobacco, like jati, motihari, and virginia, are grown in different districts of Bangladesh. Jati and motihari are commonly grown in Rangpur and Bandarban, while virginia is mostly grown in Kushtia, Rangpur, Jashore, and Dhaka. Among the varieties, virginia is the most 'popular' variety used as a cigarette for the companies. Bangladesh produces international standard flue cured virginia (FCV) tobacco, and the demand for Bangladeshi tobacco is increasing in the global market. Kushtia district, under the Khulna division of Bangladesh, is one of the hotspots where tobacco farming is popular. In recent years, a significant amount of cultivable land has been used for tobacco cultivation in this district. Kushtia district had the highest tobacco production rate among all regions of the country in the last 5 years (Rahman et al., 2019 and BBS, 2022).

Article 17 of the World Health Organization Framework Convention on Tobacco Control (FCTC) states the need to offer economically sustainable livelihood options to those affected by the decline in global demand for tobacco leaves. The FCTC Article 18 emphasizes the need to protect the environment from the adverse effects of tobacco cultivation and the health of people engaged in tobacco cultivation (Sitati, 2016). The objective of this study is to explore the basic socio-economic determinants that significantly influence farmers in tobacco farming in Kushtia district of Bangladesh. Study on socio-economic condition of tobacco farming was not available in Bangladesh (Ali et al., 2018) including Kushtia district to decide whether tobacco cultivation will be expanded in the future or not. In order to decide on this issue, first of all, the overall socio-economic determinants that significantly influence farmers to decide whether to increase or decrease tobacco cultivation must be found that is a big research gap for a researcher.

2. Materials and methods

2.1. Study area, population, and sample size

The study area, Kushtia district, has an area of 1621.15 km^2 and lies between $23^0$42' and $24^0$12' North latitude and $88^0$42' and $89^0$22' East longitude. It is a district in the Khulna administrative division of western Bangladesh. The study was exploratory, combining primary and secondary data. As the study area was very large, the researcher used the sampling method to conduct the study to save money and time. Kazihata village of Dharampur union of Bheramar upazila and Kamalpur village of Payarpur union of Daulatpur upazila of Kushtia district were selected as study areas for my research. Kazihata village of Bheramar upazila and Kamalpur village of Daulatpur upazila had the most tobacco cultivation. The total number of agricultural households in these two villages ware 410 out of which majority (54.63%) were tobacco-growing farmers (TF) (DAE, Kushtia, 2023) and remaining 17.87% farmers were also engaged with tobacco cultivation as daily labor or tobacco related business. Because of these distinctive features, these two villages were chosen as study areas.

Adam, 2020, suggested to use the Yamane (1967) formula to obtain a representative sample size in social survey form a known population at the 95% confidence level. Moreover this equation is simple and easy to calculate so "Taro Yamane Equation, 1967" was used to determine the representative sample size. The formula is as follows:

$$n = \frac{N}{1+(N*e^2)} \qquad (1)$$

Where, n=Sample size; N=Population size and e=Sampling Error

According to this formula, the total representative sample size of the study was determined as 144 TF. To identify the basic socio-economic traits that significantly influence farmers in tobacco farming about 72 (50% of the TF sample size) non-tobacco growing farmers (NTF) were also considered as a sample (also demonstrated in earlier by PRI, 2012; Rahman et al., 2019 and Talukder et al., 2020).

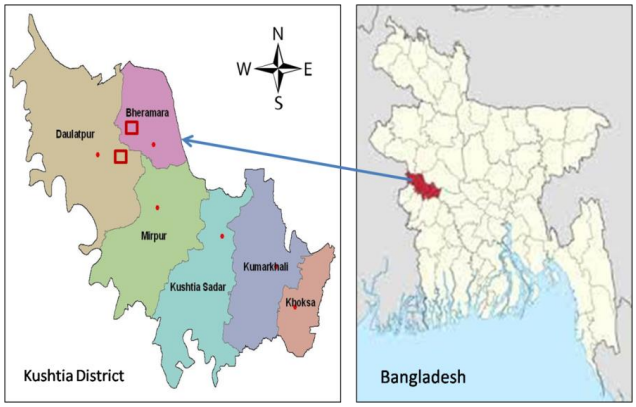

Figure 1: Location map of the study area

2.2. Data collection method, data processing, and analysis

In order to collect the desired information, a well-structured questionnaire was developed based on a thorough review of the literatures and a pre-examination of actual field situations. A random sampling technique was applied for selecting samples. The primary data were collected by the researcher himself from a sample of TF and NTF using a questionnaire survey, face-to-face interviews, FGD (focus group discussion), expert's opinions, and observation. To ensure the accuracy and reliability of the data, care and caution were taken during data collection. Data collection began on July 3 and ended on July 21, 2023. Majority of the farmers cultivate tobacco descendant year after year but some farmers quit tobacco cultivation as well as some farmers newly engaged in tobacco cultivation every year. But all farmers have to decide before planting the pre-tobacco crop (June-July) whether they will grow tobacco this year or not. As if they want, they must plant as such crops which must harvest before tobacco planting or allow tobacco as relay. So, June-July is the decision making time for tobacco cultivation. Tobacco leaves curing is so tiring that almost all farmers think that they will not grow tobacco in the next year but they get a lot of money when selling tobacco and all farmers think that tobacco cultivation is the most profitable farming. As a result, only June-July is the appropriate time for data collection. At this time the farmers can judge the pros and cons of tobacco cultivation impartially and take a decision. Secondary data were collected from the Department of Agricultural Extension (DAE) and the Bangladesh Bureau of Statistics (BBS). Very good cooperation was received from Sub-Assistant Agriculture Officers (SAAOs), Upazila Agriculture Officers (UAOs), and local leaders. The data received from the respondents was transferred to the master sheet and then compiled to facilitate tabulation. Data were analyzed as mean, standard deviation (SD), and t-test through a Microsoft Excel Worksheet 2016 using the following formulae:

$$\bar{x} = \frac{1}{n}\sum_1^i f_i\, x_i \qquad (2)$$

$$S = \sqrt{\left\{\frac{\sum_1^i (x_i-\bar{x})^2}{n-1}\right\}} \qquad (3)$$

$$t = \frac{|\bar{x}_1-\bar{x}_2|}{\sqrt{\frac{{s_1}^2}{n_1}+\frac{{s_2}^2}{n_2}}}\ at\ (n_1+n_2-2)df \qquad (4)$$

Where, $\bar{x}$=Mean Value of the Samples, x=Sample Value, f=Frequency, s= Standard Deviation, n=Sample Size and df= Degree of Freedom.

In assessing the expense viability of tobacco, rice, wheat and winter maize cultivation, the study employed Benefit Cost Ration (BCR) procedure referenced bellow (Joardar *et al*., 2022 and Srinivas *et al*., 2022):

$$BCR = \frac{Gross\ Return}{Total\ Cost\ of\ Production} \quad (5)$$

Where, Gross Return (US$) =Total value of crop + Total value of by-product.

Total Cost of Production (US$) = fixed cost + Variable cost= land rent + price of seed + total cost of seedling production + Cost of plowing land+ Total cost of manure and fertilizer (Urea, TSP, DAP, MoP, SoP, Gypsum, Zinc Sulfate, and Borax) + Total cost of pesticides and PGR Irrigation cost+ Processing and transport costs total labor cost + Miscellaneous cost at 10% of total cost + Interest on capital is 4% per year (6)

Net Profit (US$) =Gross Return - Total Cost of Production (7)

3. Results and discussion

3.1. Present status of tobacco farming at Kushtia District in Bangladesh

From field survey it is found that FY 2021-22, about 29457 acres land was cultivated under tobacco in Kushtia which was 29.58% of total tobacco cultivated land in Bangladesh. Only 56.25% TF and 52.78% NTF work in their own crop fields. The average tobacco cultivation per tobacco farmer was 1.22 acres which is 66.15% of the total cultivated area in rabi season. TF households did not depend on Rabi season but kharif-1 and kharif-2 season for food crops. Most of the tobacco growing farmers (84.72%) were well experienced in tobacco farming (more than 9 years) and associated (96.36%) with tobacco companies. This result is in good agreement with the finding as mentioned earlier by (Hassan et al., 2015); who stated that 44.60% TF had more than 20 years tobacco farming experience. Tobacco was usually grown in medium to high land with loam to clay loam soil texture. Tobacco cultivated mid-October to mid-March followed by amon as relay crop and the principle cropping pattern was: tobacco-amon-jute/sesbania. Tobacco is a monoculture crops (Akhter, 2011; FAO, 2010 and Yang et al., 2011); tobacco production matches with rabi season with some overlapping with the previous crop season kharif-2 (amon rice) and the following crop season kharif-1 (aus rice and jute), so consequently tobacco does not only compete with other crops in one season but also it blocks the land for two other seasons and the crops (Akhter, 2011). But, in Kushtia, tobacco seedlings remain in the seed bed for 30-45 days and planted 15 days before harvesting of aman rice so, tobacco cultivation did not pose any problem to previous aman cultivation and following aus and jute cultivation. This unique feature of Kushtia district (tobacco is grown as a relay crop with aman rice) encourages triple cropping pattern. Long experience in tobacco cultivation, close collaboration with tobacco companies and relay cropping system positively motivate the farmers of Kushtia district to cultivate tobacco.

Main reasons behind tobacco cultivation

A question containing a set of 7 traits was put to TF and NTF about to find out the reasons for growing tobacco. Figure 2 demonstrate that both TF and NTF believe that first of all, tobacco farming earns a lot of money at once (TF-37.50%, NTF-30.56%), secondly tobacco farming is profitable (TF-32.64%, NTF-22.22%) and thirdly free family labor can be used (TF-9.72%, NTF-25.00%), these are the main reasons for tobacco cultivation.

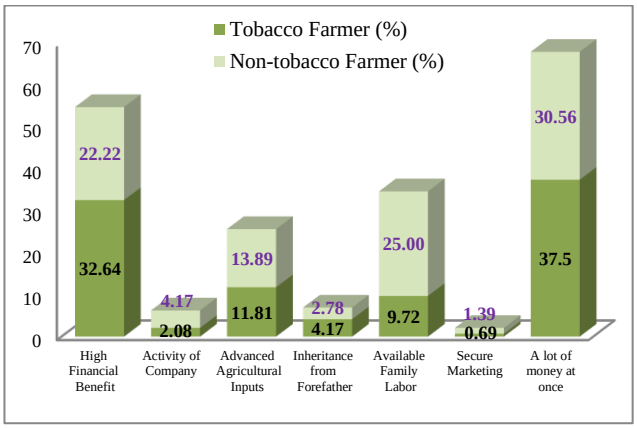

Figure 2: Respondents' perception about the reasons behind the tobacco cultivation

Some farmers (TF-11.81%, NTF-13.89%) feel that advanced agricultural inputs such as fertilizers, seeds, safety materials, loans for building curing house etc., are provided by tobacco companies (though these are later deducted from the sale of tobacco leaves), this is one of the reasons for growing tobacco. According to (Kibwage et al., 2009, PRI, 2012, Ali et al., 2015, Hassan et al., 2015, Baliwada et al., 2018, Appau et al., 2020 & Srinivas et al., 2020 and 2022), tobacco farming received high profit than others field crops. In Zambia, the greatest proportions (33.8%) of farmers grow tobacco because they viewed it as the most viable crop (Goma et al., 2017). Conversely, (Akhter, 2011; Magati et al., 2016 and Hussain et al., 2020), showed that tobacco cultivation is less profitable than other crops for the farmers and turns into a losing concern when the opportunity cost of unpaid family labor, environmental costs and the health effects of tobacco cultivations are included. Tobacco farming is profitable, earning a lot of money at once and unpaid family labor can be used all these features greatly stimulate tobacco farming in Kushtia region.

Reasons for gradual decline of tobacco cultivation

The acreage of tobacco cultivation for last 10 years in Kushtia district is decreasing at a rate of 4.65% per year, while the yield is increasing at a rate of 10.98%. To find out the causes of declining tobacco cultivation a question set with 8 traits were requested to TF and NTF and the

results are displayed in Figure 3. Labor shortage (TF-31.25% and NTF-30.56%) especially during the curing period is the main reason for quitting tobacco farming, where as 25.00% TF and 29.17% NTF feel that tobacco cultivation is an economic loss for those who do not have unpaid family labor is the second reason of decreasing tobacco acreage. 16.67% TF and 23.61% NTF feel that health conscious and many educated people are turning away from tobacco cultivation due to health problems is the third. In tobacco production, curing is the most tedious and laborious job.

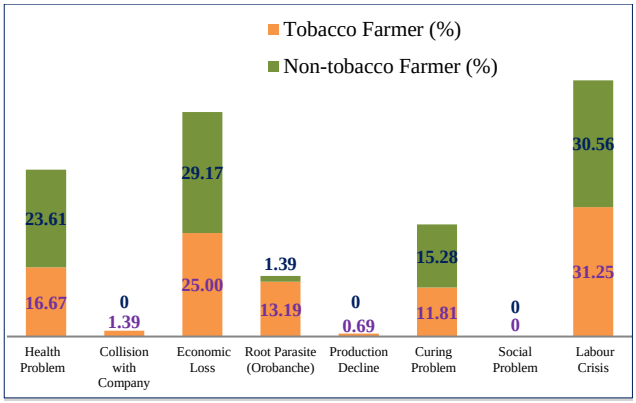

Figure 3: Root causes of decline tobacco acreage over time

During curing time, men-women-children of tobacco farm family don't get time to eat and sleep properly for 72 hours. So, 11.81% TF and 15.28% NTF feel curing problem is one of the most important reasons for abandoning tobacco cultivation. High input cost and high labor requirement were the principal reasons given by TF in shifting to another crop (Espino et al., 2009). As, a large number of farmers have been engaged in tobacco farming for a long time, they do not feel that the status of tobacco farmer is low in the society. Shortage of labor especially during curing time, lack of unpaid family labor and health problems directly discourage tobacco cultivation in Kushtia district.

Pests, diseases, weed infestation picture and yield status of tobacco field

An exploration study was carried out about the pest, disease and weed infestation picture and yield status of tobacco cultivated field. From survey, it was observed that tobacco had fewer pests and diseases than other contemporary crops in the research areas. Cutworm (*Spodoptera litura*), Aphids (*Myzus nicotianae*), and Whitefly (*Bemisia tabaci*) were the most common pests and Tobacco Mosaic Virus (TMV), Bunchy Top (Virus), Tobacco Frog Eye Leaf Spot (*Cercospora nicotianae*) and Damping off/Wilt (*Pythium spp.* and *Fusarium oxysporum*) were the most infested diseases in tobacco growing field. *Orobanche spp*., reported by the respondents were the only one dangerous root parasitic species in some tobacco field. On an average, tobacco fields require three times as many pesticide applications to control pests and diseases. But no tobacco farmers were found to have used banned pesticides. Figure 4 displays that 78.47% respondents feel that tobacco land have fewer weeds and 68.06% feel that successive jute land also have fewer weeds. About 100% tobacco farmers used no herbicides. In the research place, most of the tobacco was planted 15 days before the harvest of aman rice, apart from tobacco is a broad leaf crop and the tobacco land is required earthen-up, due to all these reasons, weeds have less chance to grow in tobacco fields. Figure 4 also depicts; about 85.42% of the respondents feel that the yield of successive jute crop is higher than that of non-tobacco jute crop. According to them, huge fertilizers are applied to tobacco land, which in turn increases the yield of the successive jute crop. Leaf emergence, seedling dry weight, uniformity, chlorophyll contents, and growth of maize were significantly improved when grown after tobacco (Farooq et al., 2014). This result indirectly supports of the findings of the increase in yield of jute cultivation after tobacco cultivation. About 88.19% TF and 52.78% NTF believe that tobacco cultivation play a vital role in their rural economy. Though *Orobanche spp*., a dangerous root parasitic species, forces farmers to rotate tobacco fields in the following year, fewer weeds and higher yield with lower input costs in the tobacco post-crop fields as compared to other contemporary field inspire the expansion of tobacco cultivation in Kushtia district.

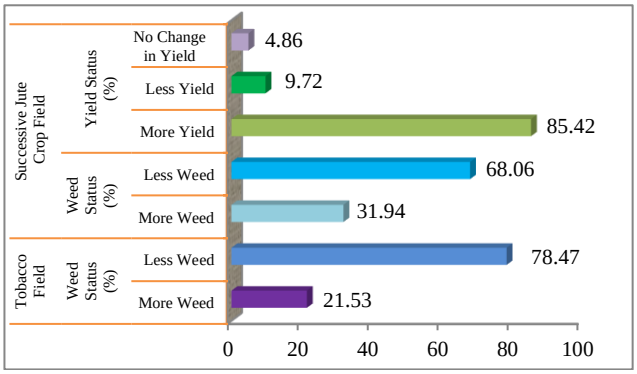

Figure 4: Respondents' opinion about weed and yield of tobacco and successive jute field

Comparative evaluation of tobacco with basic cereal crops cultivated in Bangladesh

Table 1 illustrates a comparative picture that tobacco cultivation requires huge amount fertilizer (645 kg/acre) which is 2.02 times more of boro rice cultivation, 2.48 times more of wheat cultivation and 1.48 times more of winter maize cultivation. The findings are in accordance with (Akhter, 2011; Ali et al., 2015; Hussain et al., 2020 and Joardar et al., 2022).

Table 1: Comparison of input used of tobacco with boro rice, wheat and maize per acre of land

Name of Crops	Total ferti-lizer (kg)	Pesticide appli-cation (Number)	PGR appli-cation (Number)	Irrigation appli-cation (Number)	Labor used (Numbe r)
Tobacco	645	3	1	7	144
Boro rice	320	4	0	30	75
Wheat	260	1	0	3	36
Winter maize	435	2	0	3	90

Note: 1 Labor=6 hours per day; Number=How many times apply

All tobacco farmers used Fair-85 once as Plant Growth Regulator (PGR) but no farmer used PGR in rice, wheat and maize field. Boro rice was the most susceptible to the pests and diseases among the four crops followed by tobacco, followed by winter maize and wheat was the least, but opposite result stated in PRI, 2012 and Hussain et al., 2020; tobacco cultivation requires more pesticide and fertilizers compared to other crops. There is no doubt that boro rice required the most water, 4.29 times that of tobacco and 10 times that of wheat and maize. One of the major problems in tobacco cultivation was that tobacco cultivation requires more labor than any other field crops, which was 1.92 times more than that of boro rice, 4 times of wheat and 1.6 times of winter maize. Similar findings were reported by Hussain et al., 2020 and Joardar et al., 2022. Baliwada et al., 2018, showed that total labor employed per acre for tobacco (131) was comparatively higher than rice, maize and sugarcane.

Among the four crops, tobacco had the highest net profit per acre and wheat the lowest that were US$ 505.20 and US$ 231.90 respectively. Whereas the net profit per acre of winter maize and boro rice were US$ 353.80 and US$ 297.90 respectively i.e., the net profit of tobacco farming is 1.70 times more than that of boro rice, 2.18 times of wheat and 1.43 times of maize. According to PRI, 2012; the return from tobacco is about 18.8% higher than rice. Hema et al., 2021, showed that the average net returns per acre was comparatively high for tobacco (US$ 379.37) than maize (US$ 268.75) and cotton (US$ 225.00). From the field survey information, it is found that total cost of production per acres of tobacco, boro rice, wheat and winter maize are US$ 1609.77, US$ 1172.10, US$ 830.07 and US$ 1086.09, respectively.

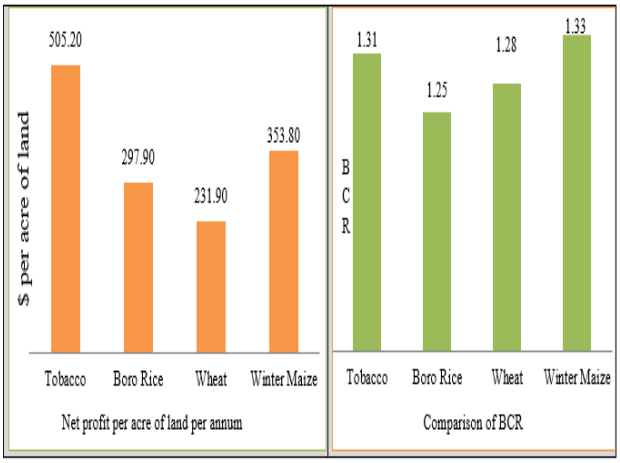

Figure 5: Comparison of net profit and BCR of tobacco with boro rice, wheat and maize

From Figure 5, net profit is higher for tobacco but BCR is highest for winter maize (1.33). The BCR sequence among the four crops is winter maize (1.33)>tobacco (1.31)>wheat (1.28)>boro rice (1.25). This result is good agreement with the findings of Srinivas et al., 2020; showed that the average net profit per acre for tobacco US$ 611.11, wheat US$ 277.78, boro rice US$ 177.78 and the BCR for tobacco 1.6, wheat 1.43, and boro rice 1.36. These findings were also similar with Hassan et al., 2015 and Wisnujati and Patiung, 2023. Although handsome net returns inspire, tobacco cultivation required huge amount of fertilizers, high input cost and excessive labor highly discourage tobacco farming in Kushtia district. Comparing the BCR of tobacco with other field crops shows that winter maize is a good alternative to tobacco.

3.2. Effect of farmers' age, household size, education level, own land and farm size on tobacco cultivation

Age, household size, education level, own cultivated land and farm size (cultivated last year) of the respondents were compared between TF and NTF to know whether they had any effect on tobacco cultivation or not. To find out the significant difference between two independent groups, t-test was carried out (Baliwada et al., 2018 and Srinivas et al., 2020 and 2022) and the results are presented in Table 2. It clearly showed that there is no statistically significant difference in the extent of age between TF and NTF (t=1.35, is smaller than the $t_{0.05}$ value=1.96 at 214 df). The maximum numbers of TF and NTF were middle aged (35-49 years) and the mean was (47.10±2.83) and (46.38±4.05) respectively. Table 2 noted that both TF and NTF, the maximum number of household size belong to the class medium family size (5-7 members) with an average number of 5.23±0.14 and 4.79±0.32 respectively. Hassan et al., 2015 and Kumar et al., 2023 mentioned earlier; tobacco farmers with medium family size (5-6 members) were more interested in tobacco cultivation. As the calculated t-value (4.56) is higher than the tabulated t-value at 5% level of significance at 214 df (1.96), so the null hypothesis is rejected i.e., family size has a direct impact on positive decision making in tobacco farming (as $x_1>x_2$). The maximum number of farmers' education level was can sign only to PSC pass. It is seen from Table 2, the calculated t-value (6.37) is higher than tabulated $t_{0.05}$ level of significance at 214 df (1.96), the null hypothesis is rejected and said that education level has negative impact on tobacco cultivation (as $x_2>x_1$). These findings are in accordance with (Talukder et al., 2020). According to (Kibwage et al., 2009 & Rahman et al., 2019); maximum number of tobacco grower are middle aged (30-49 years) and education level was `can sign only to PSC pass'. Though (Chavez et al., 2016 in Philippines) showed that most heads of TF were more than 50 years old with a

modal educational attainment of finishing high school. Finally, it has been inferred that there is no effect of farmers' age on tobacco cultivation but with larger family size they are more inclined towards tobacco cultivation; conversely, more educated people are less inclined towards tobacco cultivation. As tobacco farming requires more labor, larger families can use unpaid labor in their tobacco fields, so larger families are more inclined towards tobacco farming but educated people are a bit more health and environment conscious; as a result, they are less inclined towards tobacco cultivation.

Table 2: Effect of farmers' age, household size, education level, own cultivated land, and farm size (operated land)

Attributes	Classification	Tobacco Farmer			Non-tobacco Farmer			Statistical Analysis	
		Frequency	Percent (%)	Mean±SD	Frequency	Percent (%)	Mean±SD	Calculated t-Value	$t_{0.05}$ Value at 214 df
Age	Young age (20-34 years)	28	19.44	47.10 ±2.83	12	16.67	46.38 ±4.05	1.35	1.96
	Middle age (35-49 Years)	53	36.81		33	45.83			
	Old age (50-64 years)	49	34.03		21	29.17			
	Extreme old age (65-79 years)	14	9.72		6	8.33			
Household size	Small family (2-4 members)	58	40.28	5.23 ±0.14	33	45.83	4.79 ±0.32	4.56	1.96
	Medium family (5-7 members)	65	45.14		35	48.61			
	Large family (8-10 members)	21	14.58		4	5.56			
Education level	Illiterate (0)	8	5.56	5.13 ±0.89	3	4.17	6.16 ±1.22	6.37	1.96
	Can sign (2.5)	49	34.03		27	37.50			
	PSC pass (5)	46	31.94		14	19.44			
	JSC pass (8)	18	12.5		4	5.56			
	SSC pass (10)	17	11.81		7	9.72			
	HSC pass and higher (12)	6	4.17		17	23.61			
Own cultivated land	Landless farmer (<0.05 acres)	28	19.44	(0.97± 0.35) acres	21	29.17	(1.02 ±0.50) acres	0.30	1.96
	Marginal farmer (0.05-0.5 acres)	49	34.03		20	27.78			
	Small farmer (0.5-2.5 acres)	60	41.67		25	34.72			
	Medium farmer (2.5-7.5 acres)	7	4.86		6	8.33			
	Large farmer (>7.5 acres)	0	0		0	0			
Farm size (operated land)	Landless farmer (<0.05 acres)	0	0	(2.37± 0.49) acres	0	0	(1.99 ±0.75) acres	3.89	1.96
	Marginal farmer (0.05-0.5 acres)	0	0		0	0			
	Small farmer (0.5-2.5 acres)	112	77.78		62	86.11			
	Medium farmer (2.5-7.5 acres)	27	18.75		10	13.89			
	Large farmer (>7.5 acres)	5	3.47		0	0			

From Table 2, there is no significant difference in land ownership between TF and NTF as calculated t-value (0.30) is smaller than the tabulated $t_{0.05}$ value at 214 df (1.96) but there is a significant difference in cultivated (operated land last year) land, as calculated t-value (3.89) is greater than the tabulated $t_{0.05}$ value at 214 df (1.96). From these results it has been inferred that the farmer's decision whether or not to grow tobacco depends on how much land he is cultivating this year, not how much land he owns. Baliwada et al., 2018, exactly found these results and showed that there is no significant difference in the extent of own land size between TF and NTF, whereas leased in land of TF was significantly higher than the NTF. Both TF and NTF hire/leased in a great amount of land but TF leased in more

land than NTF. These results are similar to the findings of (PRI, 2012; Hassan et al., 2015 and Rahman et al., 2019). The possible reason is that the families of TF are relatively larger than those of NTF and depend on farming the entire land to meet their household expenses, so they always try to occupy larger areas for cultivation.

Analyzing the overall situation, it can be seen that the economic development of all the people in these areas is very important. While tobacco farming has some advantages such as: handsome net return at once, use of unpaid family labor etc., there are also some disadvantages such as: tobacco cultivation requires huge amount of fertilizer, high input cost, excessive labor, fatal damage to health etc. Article 17 of the WHO FCTC states the need to offer economically sustainable livelihood options by declining tobacco and the FCTC Article 18 emphasizes the need to protect the environment from the adverse effects of tobacco cultivation and the health of people. Considering these identified advantages and disadvantages of tobacco cultivation with utmost importance to the economy of the farmers, the policy makers should adopt such strategies so that they gradually move away from tobacco cultivation. It may be, if all the farmers, especially the farmers with relatively larger families and farm size, can be given incentives in robi season for short-lived high-yielding and profitable crops, then the farmers will gradually take off tobacco cultivation as well as the socio-economic conditions will also improve. Due to shortage of time and money the study could not cover a wide area for mandatory data collection, further studies can be carried out in wider areas considering opportunity cost, environmental cost and health cost in cost of production.

4. Conclusion

Agriculture sector is a predominant sector for livelihood and employment generation in Bangladesh. About 88.19% TF and 52.78% NTF believed that tobacco cultivation play a vital role in their rural economy. The average tobacco cultivation per tobacco farmer was1.22 acres which is 66.15% of the total cultivated area in rabi season. Most of the tobacco growing farmers (84.72%) were well experienced in tobacco farming (more than 9 years) and associated (96.36%) with tobacco companies. Tobacco farming was profitable, earning a lot of money at once and unpaid family labor can be used, long experience in tobacco cultivation, close collaboration with tobacco companies all these features were positively motivate the farmers of Kushtia district to cultivate tobacco. Among the four crops, tobacco had the highest net profit per acre and wheat the lowest that were US$ 505.20 and US$ 231.90 respectively. i.e., the net profit of tobacco farming is 1.70 times more than boro rice, 2.18 times of wheat and 1.43 times of maize with a BCR of winter maize (1.33)>tobacco (1.31)>wheat (1.28)>boro rice (1.25). The acreage of tobacco cultivation in Kushtia district for last 10 years was decreasing at a rate of 4.65% per year. Tobacco cultivation required huge amount of fertilizers (645 kg/acre) which was 2.02 times more of boro rice cultivation, 2.48 times more of wheat cultivation and 1.48 times more of winter maize cultivation, high input cost (US$ 1609.77) and excessive labor (144) highly discouraged tobacco farming in Kushtia district. Educated people were more aware of tobacco cultivation; although farmer's age and size of own cultivated land had no effect on tobacco cultivation, larger farm and family size were more inclined towards tobacco cultivation. Governments can develop strategies to improve farmers' livelihoods by switching to more profitable crops such as maize as an alternative to tobacco.

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