Original Research Article

Factors influencing farmer's participation in contract farming in Narsingdi district of Bangladesh

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ABSTRACT

Aims: Contract farming (CF) has been used extensively to integrate agricultural value chain both in the developed and developing countries. Participation in CF is associated with increased farm productivity and farmer income. Therefore, the purpose of this study was to analyze socio-economic factors affecting farmer's participation in contract farming.
Study design: The selected 15 socio-economic factors were used to determine the impact on farmer's participation in contract farming. Besides, the socio-demographic profile of the farmers in the study area was discussed.
Place and Duration of Study: The study was conducted upon contract and non-contract farmers of Shibpur upazila under Narsingdi district of Bangladesh. The duration of the study was from July, 2019 to December, 2020.
Methodology: The study used nationally-representative data of smallholder vegetable farmers in Shibpur upazila of Narsingdi district. The data were collected from 75 contract farmer and 125 non-contract farmer of Shibpur upazila. Binary logistic regression was used to analyze fifteen factors that potentially affected farmers' decision to participate in CF and descriptive statistics were used to analyze the socio-demographic profile of the farmer.
Results: The study found that farmers education, wife's occupation, family size, labor, fertilizer use, training, savings and income were the significant factors in the model and farmers occupation, other family member's occupation, income source, land type, size of land, experience, and storage place were non-significant predictors using p=0.01 and 0.05 threshold.
Conclusion: Farmer's education, female head's occupation, family size, land type, size of land holdings, labor use, type of fertilizers being used, training or technical knowledge and average monthly income of the respondents had a positive influence on farmer's decision.

Keywords: Contract farming, socio-economics, bean farmer, participation

1. INTRODUCTION

Bangladesh is a developing country with a large population of 163 million. About 62% of the population is living in the villages [1]. Among them, about 20.5% of people in the rural area living under the poverty line [2]. For the majority of rural people, agriculture is the main source of food, nutrition, employment and income generation. Linking poor farmers to markets is one way to break this vicious cycle, but it requires overcoming a number of obstacles and market imperfections [3] [4]. Smallholder farmers may face significant risks

due to the shortage of skill, technology, and financial service to produce a marketable surplus—or to supply the quality, quantity, and types of commodities demanded by buyers [5]. Contract farming, a pre-harvest agreement between farmers and buyers is widely regarded as a useful tool to mitigate market failures and lowering the risks that smallholder farmer faces [6] [7] [8].Several international studies have been conducted to assess the importance of contract farming [6] [9] [10] and factors that affect the farmer decision to participate in CF [11] [7] [12] [13] [14]. A particular study, such as Ntaganira*et al.,* (2017), discussed the effects of access to farm service on contract and non-contract dairy farmers in Rwanda [15]. However, the paper did not further discuss its effect on the farmer's decision to participate in contract farming.

With this backdrop, the current study was carried out in Narsingdi district with the following objectives:

- To analyze the socio-economic profile of the sample farmers.
- To identify the factors affecting participation of farmers towards contract farming.

2. METHODOLOGY

The study was conducted upon contract and non-contract bean farmers of Shibpur upazila under Narsingdi district of Bangladesh. Narsingdi District occupies an area of 1140.76 square kilometers, with latitudes ranging from 23'46' to 24'15' north and longitudes ranging from 90'34' to 90'59' east [2]. It is bordered by Kishoreganj district on the north, Narayanganj and Brahmanbaria districts on the south, Brahmanbaria and Kishoreganj districts on the east, Gazipur district on the west. Agriculture is the main source of income for 42.73% of the people of this district [16]. Selected upazila Shibpur is about 206.89 sq km [2]. It has a population of 237246 where Males constitute 50.77% of the population, and females 49.23% [2]. It has an average literacy rate of 32.3% (7+ years), and the national average of 32.4% literate [2]. Farming practices were categorized into 2 groups (Contract farm type & non-contract farm type) to identify the effect of the factors. The research required data from both contract and non-contract farmers and a large number of farmers of Shibpur upazila of Narsingdi district were engaged in contract farming for bean production. That's why the bean producers of the focal areas were selected as targeted respondents to collect data. Data collection instrument indicates through which tools data were collected. For conducting the study data were collected through an interview schedule prepared by the researcher. Data were collected from 125 non-contract grower and 75 contract growers. The semi-structured questionnaires contained a limited number of the set, closed questions, designed to elicit basic quantitative data, and a range of open-ended questions guided by a checklist of discussion topics. To get the desired information direct questions and different scales were kept in the questionnaire. Some information of supply chain was collected from internet, contract organizations, export organizations, different agro company and BADC.

- Descriptive statistics (frequencies and percentage) were used to describe socio-demographic characteristics, farming information.
- Binary logistic regression analysis was used as an analytical procedure to examine how the selected characteristics of the respondents influence the participation of contract farm type.

Following model was fitted to identify the factors:

$Logit(Yi) = ln[P(Yi = 1)/1 - P(Yi = 1)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \varepsilon$ (i=1, 2, 3, 4,….)

Where,

- P (Y_i=1) was the probability of participating in contract farming and $1 - P(Yi = 1)$ was the probability of not participating in contract farming.
- X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, and X_{15} represented as the 'Household head's education', 'Household head's occupation', 'Female head's occupation', 'Other family member's occupation', 'Family size', 'Major income source', 'Land type', 'Size of land holdings', 'No. of years engaged in farming', 'Labor use', 'Type of fertilizers being used', 'Having storage place for crops', 'Training or technical knowledge', 'Average annual savings', 'Average monthly income' respectively.
- β_0 is the intercept,
- β_1, β_2, β_3, β_4, β_5, β_6, β_7, β_8, β_9, β_{10}, β_{11}, β_{12}, β_{13}, β_{14} and β_{15} are the regression coefficient of the independent variables.
- $\varepsilon$is the random error, normally and independently distributed with zero mean and constant variance.

To examine the relationship between some specific indicators of dependent variable, co-efficient of regression was computed. One and five percent level of significance was used for rejecting null hypothesis.

Collinearity diagnostics tests were done using a simple regression matrix of the variables. Variance Inflation Factor (VIF) was used to check for tolerance level of multicollinearity. The average VIF of less than 10, implies that the variables in the model had no serious multicollinearity (Gujarati, 2004). In addition, Durbin Watson test (DW) was employed to test for serial autocorrelation which occurs due to omission of explanatory variables and misspecification of the mathematical model.

3. RESULTS AND DISCUSSION

The socio-economic background and characteristics of the farmer's influences the type of farming to a great extent. So, a description of the characteristics of a farmer is necessary for analyzing the main objective of the present study. Socio-economic characteristics of the farmers included their family size, educational status, farm size, farming experience of the respondents, occupation, income, savings, etc. These are described below:

Table 1. Farmer's personal and family information

Variables	Frequency	Percent
Household head's occupation		
Only Farming	111	55.5
Others with farming	89	44.5
Household head's education		
No institutional education	76	38.0
Primary	83	41.5
Secondary+	41	20.5
Female head's occupation		
Housewife	151	75.5
Others	49	24.5
Other family member's occupation		
Unemployed	98	49.0
Farmer	45	22.5
Others	57	28.5
Family size		
1 to 4	86	43.0

5 to 7	68	34.0
More than 7	46	23.0

From table 1, it is seen that 55.5% of respondents were involved with only farming practice, whereas, 44.5% of respondents had other occupations with farming. There was no institutional education for 38.0% of respondents, 41.5% of respondents had primary level education and only 20.5% had secondary and above level education. In the case of female head's occupation, 75.5% of females were housewives and only 24.5% of females were involved with earning activities. At the same time, 28.5% of other family members were engaged with farming and other professions, and 49.0% of members were unemployed. The family size of the bean farmers of the study ranged from 1 to above 7 persons. Bean farmers were classified into three categories based on their family size. Bean farmers having a family size of 1 to 4 members was 43.0%, family size of 5 to 7 members was 34.3% and family size above 7 members was 23.0%.

Table 2. Percentage distribution of income and savings information

Variables	Frequency	Percent
Major income source		
Agriculture	36	18.0
Agriculture and allied activities	100	50
Others	64	32.0
Average annual savings		
less than 1000	54	27.0
1000 to 5000	114	57.0
More than 5000	32	16
Average monthly income		
less than 20000	32	16.0
20000 to 30000	76	38.0
30000 to 40000	57	28.5
more than 40000	35	17.5

Table 2 shows the respondent's major sources of income, average monthly income and annual savings. It is seen that 50% of farmers are dependent on agriculture and allied activities for their income whereas, 18.0% of farmers rely on only agriculture as their earning source. A significant number of respondents (e.g. 32%) were dependent on other activities as their revenue source. A substantial number of respondents (57%) average annual savings was between Bangladeshi taka 1000 to 5000, while only 16% of respondents save more than Bangladeshi taka 5000 in a year. 27% of respondents saved less than Bangladeshi taka 1000 in a year. In the case of average monthly income, 38% of respondents earned Bangladeshi taka 20000 to 30000 per month and the percentage is 28.5 for a monthly income of Bangladeshi taka 30000 to 40000 per month. 11.4% of respondents earned less than Bangladeshi taka 20000 per month whereas, 17.5% of respondents earned more than Bangladeshi taka 40000 in a month.

Table 3. Percentage distribution of farming information

Variables	Frequency	Percent
Land type		
Owned	57	28.5
Rented \ leased	16	8.0
Both	127	63.5
Size of land holdings		
Below 1 acre	74	37.0
1-3 acres	117	58.5
Above 3 acres	9	4.5
No of years engaged in farming		
Less than 7 years	17	8.5
7-8 years	66	33.0
9-10 years	76	38.0
Above 10 years	41	20.5
Labor use		
Hired	29	14.5
Owned	21	10.5
Both hired and owned	150	75.0
Type of fertilizers being used		
Chemical fertilizers	20	10.0
Organic fertilizers	92	46.0
Both	88	44.0

Table 3 represents the farming information of respondents like land type, land size, years of farming experiences, labor use, the pattern of fertilizer usage. It is observed that 63.5% of respondents used both own and rented land for farming, where 28.5% of respondents used their own land and only 8% of respondents use leased land. Bean farmers were classified into three categories based on their farm size. The numbers of respondents having land size 'below 1 acre','1 to 3 acres', and 'more than 3 acres' were 37%, 58.5%, and 4.5% respectively. The farming experience of a respondent was determined based on involvement in the farming activities related to agriculture. Bean farmers were classified into three categories based on their farming experience. The highest portion of the bean farmers (38%) had farming experience of 9 - 10 years, and 33% of farmers had 7-8 years of experience. At least 8.5% of farmers had less than 7 years' experience whereas 20.5% of farmers had more than 10 years' experience. In the case of labor usage, 75% of respondents used both own and hired labor in their farming activities. Both chemical and organic fertilizers were used by farmers in the study area and 44% of farmers used both fertilizers on their land. 46% of farmers have used only organic fertilizers and the percentage of farmers used only chemical fertilizers was 10%.

Table 4. Percentage distribution of storage facilities and training

Variables	Frequency	Percent
Having storage place for crops		
Yes	20	10.0

No	180	90.0
Total	200	100
Training or technical knowledge		
Yes	85	42.5
No	115	57.5
Total	200	100

From table 4 it is found that a large number of farmers (90%) had not any storage place for their crops and only 10% of farmers had those facilities. Besides, 42.5% of farmers had access to training or technical knowledge where 57.5% of farmers had not any kind of training.

Table 5. Binary logistic model fitting with predictors

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	136.930[a]	.472	.643

Binary logistic regression model was run with the selected variables where engagement in poultry production was dependent variable and socioeconomic factors were the independent variable. Cox & Snell R square is 0.472 and Nagelkerke R square was 0.643 which denotes that the model can explain 47.2% to 64.3% variables properly.

Table 6. Factors influencing farmer's participation in contract farming

Factors	Coefficient	Standard Error	df	p-value
Household head's education	-1.565	.348	1	.000***
Household head's occupation	.990	.529	1	.061
Female head's occupation	-1.356	.541	1	.012**
Other family member's occupation	.338	.306	1	.270
Family size	.887	.410	1	.031**
Major income source	-.311	.399	1	.435
Land type	.438	.259	1	.092
Size of land holdings	.908	.473	1	.055
No. of years engaged in farming	-.076	.167	1	.648
Labor use	1.016	.309	1	.001***
Type of fertilizers being used	.712	.350	1	.042**
Having storage place for crops	-1.188	.817	1	.146
Training or technical knowledge	1.314	.457	1	.004***
Average annual savings	-.923	.397	1	.020**
Average monthly income	-1.369	.344	1	.000***
Constant	1.345	2.800	1	.631

From table 6, using p=0.01 and 0.05 threshold, it was found that 'household head's education', 'female head's occupation', 'family size', 'labor use', 'type of fertilizers being used', 'training or technical knowledge', 'average annual savings' and 'average monthly income' were the significant factors in the model. Besides, factors 'household head's

occupation', and 'Other family member's occupation', 'major income source', 'land type', 'size of land holding', 'no. of years engaged in farming', and 'having storage place' were non-significant predictors.

Household head's education (*P*=.000) influenced the decision of farmers to participate in contract farming. In the study area 20.5% of the farmer completed their secondary level of education. Coefficient of farmer's education denotes that, 1 unit changes in farmer's education decreases by 1.56 unit the participation in contract farming.

Female head's occupation (*P*=0.01) had a significant effect on the participation in contract farming decision where 49% of the farmer's wife involved in other occupation like government or private job. In the study area, 1 unit changes in farmers wife's occupation decreases 1.35 unit in the participation of contract farming.

Family size (*P*=.03) influenced the farmer's decision where large family members might convert into family labor and it reduces production cost. 1 unit changes in family size increases 0.887 unit contract farming participation.

Rented or own labor use (*P*=.001) and type of fertilizers used ($p < 0.05$) influenced farmer's decision to participate in contract farming. Farmers of the area used chemical fertilizer and organic fertilizer. It was seen that most organic fertilizer user engaged in contract farming as contract farming give priority to organic farming. 1 unit changes in labor use and fertilizers use increases the participation of contract farming by 1.01 and 0.71 units.

Training or technical knowledge (*P*=.004), average annual savings (*P*=.02) and average monthly income (*P*=.000) had a significant effect on choosing farm type between contract and non-contract farm. The farmer got trainings from extension services, different government and private NGOs. Trained farmers felt comfort to join contract farming program while other non-trained farmers did not aware about contract farming. From the model it was found that 1 unit changes in training or technical knowledge increases the participation by 1.314 unit while 1 unit changes in average annual savings and monthly income decreases the participation by 0.92 and 1.36 unit respectively.

4. CONCLUSION

This study was aimed at analyzing vegetable contract farming in Shibpur upazila under Narsingdi district. The specific objectives of the study were to identify socio-economic factors affecting smallholder farmers' participation in vegetable contract farming in the study area. Binary Logistic regression model was applied to analyze factors affecting smallholder farmers' participation in vegetable contract farming in the study area. Among 15 explanatory variables, which were hypothesized to affect households' participation in contract farming, the significant variables included in the model such as farmers education, female head's occupation, family size, land type, size of land holdings, labor use, type of fertilizers being used, training or technical knowledge and average monthly income participation in contract farming.

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