Farm Economy *ISSN: 2789-3502*
The Journal of the Bangladesh Agricultural Economists Association
June 2022, Volume XVII, Page: 39-54

FINANCIAL AND ECONOMIC PROFITABILITY OF SELECTED SPICES CROPS IN BANGLADESH

M.A. Rashid[1], M. Khatun[2], M.S. Rahman[3], M.U. Molla[4] and M. Kamrul Hasan[5]

Abstract

The study was undertaken to estimate the financial and economic returns and competitiveness of selected spices crops in Bangladesh. A total of 1620 spices growers from nine upazilas of three districts were randomly selected for the study. Domestic resource cost (DRC) was estimated for evaluating the comparative advantage of selected spices crops. The study revealed that the gross margins of producing selected spices crops were positive. However, highest gross margin was estimated for garlic (Tk 229568/ha) followed by green chilli (Tk 212002/ha) and onion (Tk.188389/ha). Comparatively low net return was calculated for onion (Tk 130179/ha) than other two spices crops. The highest benefit cost ratio was found for green chilli (1.83) followed by onion (1.74) and garlic (1.71). The estimates of DRC showed that Bangladesh had comparative advantage in onion and garlic production as these estimates were less than one implied that the production of onion and garlic would be highly efficient for import substitution. Again, DRC for green chilli was also less than unity implied that the production of green chilli would be efficient for export promotion. Responded farmers mentioned that low market price at harvesting time and market syndicate were the major constraints to spices production. The constraints include fertilizer not working properly due to adulterations, crisis of labour at harvesting time and high wage rate in the study areas. Government should take initiatives for ensuring reasonable price at harvesting time. Mechanization should be introduced to the farmers' field for minimizing the labour crisis.

Keywords: Spices crops, Financial and Economic profitability, DRC, Import and Export parity

1. Introduction

Spices crop are important as food and medicine. The common use of spices is in cooking and seasoning of foods in order to bring out attractive color and natural taste of cuisines (Nahar, 2017). Spices can be described as that kind of plant that adds flavor, aromatic, aesthetic and therapeutic value treatment for food, drink and other items (Kumar *et al.* 2011). A number of natural ingredients are available in spices crops that boost human immunity (Islam et al. 2011). Globally, 109 kinds

[1]Chief Scientific Officer, E-mail: md.abdurr@yahoo.com, [2,3]Scientific Officer, Agricultural Economics Division, Bangladesh Agricultural Research Institute (BARI), Gazipur-1701, [4]Member-Director (AERS), Bangladesh Agricultural Research Council, Dhaka and [5]Director (Support & Services), BARI, Gazipur-1701

of spices are cultivated of which 27 types of spices are frequently used in Bangladesh (Prity, 2018). The spices demand in Bangladesh is growing steadily due to its diverse uses, changing human consumption patterns and rapid population growth (Huda et al. 2008; Mila and Parvin, 2019). The annual production of spices is 29.96 lakh metric tonnes in 2019-20 from a paltry 4.18 lakh tonnes in 2001-02. Conversely, the area coverage of spices was 10.47 lakh acres in 2019-20 from 6.23 lakh acres in 2001-02 (BBS, 2020). Although area coverage of spices and its production in Bangladesh are rising (Fig. 1), but the country has to expound nearly 4000 core BDT by importing during 2018-19 from different countries (BBS, 2019). Therefore, domestic production should be increased in the coming years in order to reduce import dependency. For this, information on financial and economic profitability of spices crops is very important. This will enable the government to redesign production, marketing and trade policies for spices in Bangladesh.

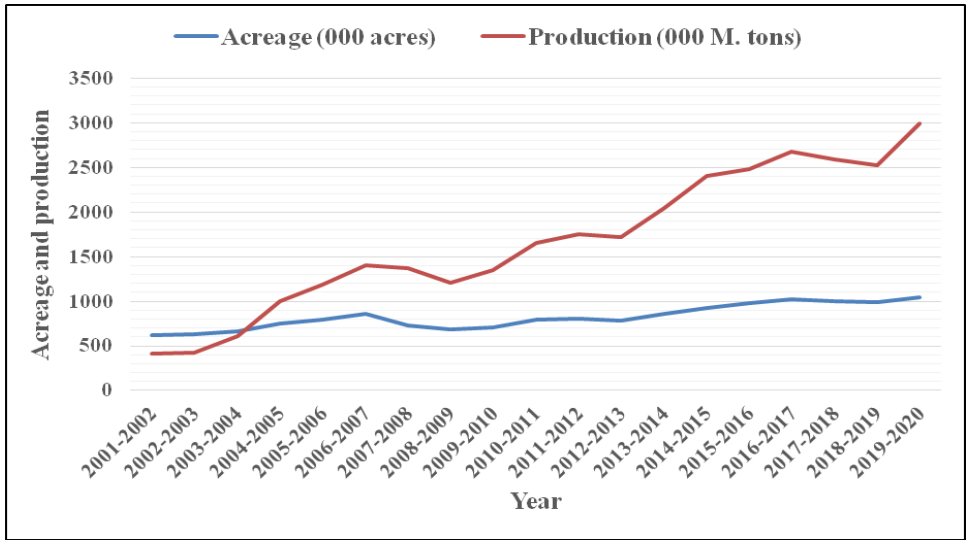

Fig. 1. Acreage and production of major spices in Bangladesh (Source: BBS, 2020)

Profitability data can be used to better understand and evaluate farm operations of different agricultural products. As a result, better farm-level decisions may be made, and as such marketing efficiency and performance can be improved. Due to scarcity of resources, production economists have begun to consider reallocating existing resources to generate more output with a given level of input combinations or to generate a certain level of output at the lowest possible cost without modifying the production technique. However, there is an insufficiency of data on how to use inputs efficiently in crop production. Likewise, analyzing productive efficiency in agricultural output is critical since it provides important information for making appropriate resource allocation decisions. Except for a few descriptive studies, econometric analysis is yet to be conducted to examine the production

function for crops cultivation and its potential for future improvement. To formulate appropriate planning for the sustainable development of agriculture sector, reliable data on crop production are urgently needed. Hence, the study may be very worthwhile in providing necessary socioeconomic information about a variety of crops to all stakeholders in the crop production sector.

The specific objectives of the present study were as follows:

i. to determine the level of input use and estimate the cost and return of selected spices crops cultivation at farm level;

ii. to estimate the economic returns and competitiveness of some selected spices crops in Bangladesh; and

iii. to identify problems and opportunities related to selected spices crops cultivation at farm level.

2. Methodology

Crops considered: Three spices crops namely onion, garlic and green chilli have been considered in this study.

Sampling design and data collection method: Both qualitative and quantitative data have been required for this study. Quantitative data have been collected through questionnaire survey at farm level in the selected areas and qualitative data have been assembled through secondary information. For questionnaire survey, both multi-stages and random sampling techniques have been adopted to select sample farm households for collecting primary data and information. Priority in selection of study areas was specified to the intensity of area coverage by respective crops and regional differences in Agro-ecological zones. In each selected location (district), 3 upazilas have been chosen purposively for the survey. The upazilas and villages have been selected by respective scientists and consultation with local DAE officials. A complete list of farmers growing different crops in all selected villages have been collected from local DAE offices. A total of 1620 farm households (180 for each location and for each crop) have been selected randomly for data collection.

Analytical technique: Collected data have been edited and scrutinized for analysis. Most appropriate, available and necessary descriptive methods, tools and techniques have been used for data analysis. Tabular and diagrammatic analyses have also been carried out. In this study, costs and returns analyses have been done on both variable and total cost basis. Per hectare profitability of growing selected crops from the viewpoints of individual farmers was measured in terms of gross return, gross margin and net return.

Measurement of Financial Costs and Returns: In this study, costs and returns analyses have been done on both variable and total cost basis. The following equation (Π) have been used to assess the financial profitability of selected crops.

$$\Pi_{ij} = \sum_{i=1}^{n} P_{ij}Q_{ij} - TC_{ij} = \sum_{i=1}^{n} P_{ij}Q_{ij} - (VC_{ij} + FC_{ij}) \text{ ----------(1)}$$

Where,

Π_{ij} = Profit or value addition from selected crop production

Q_{ij} = Quantity of crops of i^{th}farmers (kg/ha)

P_{ij} = Average price of crops of i^{th}farmers (Tk/kg)

TC_{ij} = Total cost (Tk/ha)

VC_{ij} = Variable cost (Tk/ha)

FC_{ij} = Fixed cost (Tk/ha)

i = Number of farmers (1,2,3……...n)

j = Number of crops (1,2,3.....25)

Per hectare profitability of growing selected crops from the viewpoints of individual farmers was measured in terms of gross return, gross margin and net return.

Gross return: Gross return was calculated by simply multiplying the total volume of output with its per unit of price in the harvesting period.

Gross margin: Gross margin calculation was done to have an estimate of the difference between total return and variable costs. The argument for using the gross margin analysis is that the farmers of Bangladesh are more interested to know their return over variable costs.

Net return: The analysis considered fixed cost (which included land rent and family supplied labour). Net margin was calculated by deducting all costs (Variable and Fixed) from gross return.

Measurement of Economic Costs and Returns

Measures of comparative advantage: Comparative advantage in the production of a given crop for a particular country is measured by comparing its border price with the social or economic opportunity costs of producing, processing, transporting, handling and marketing an incremental unit of commodity. The domestic resource cost (DRC) provides a measure of efficiency, with implications for the level of incentives offered to producers. Whether it is efficient for a country to produce a commodity as opposed to importing it, depends on the opportunity cost of domestic production relative to the value added it creates in foreign currency.

The DRC is the ratio of the cost in domestic resources and non-traded inputs (valued at their shadow prices) of producing the commodity domestically to the net foreign exchange earned or saved by producing the good domestically.

Formally DRCs is defined as

$$DRC = \frac{\text{Cost of domestic resource and non-traded inputs for producing per unit of output}}{\text{Value of tradable output} - \text{Value of tradable inputs}}$$

$$DRC = \frac{\sum f_{ij} P_j^d}{U_i - \sum a_{ik} P_k^b} \text{ ----------(2)}$$

Where,

f_{ij} = Domestic resource and non-traded inputs j used for producing per unit commodity i

P^d_j = Price of non-traded intermediate inputs and domestic resource

U_i = Border price of output i

a_{ik}= Amount of traded intermediate inputs for unit production of i

P^b_k = Border price of traded intermediate input

If DRC < 1, the economy saves foreign exchange by producing the good domestically either for export or for imports substitution. This is because the opportunity cost of domestic resources and non-traded factors used in producing the good is less than the foreign exchange earned or saved. In contrast, if DRC > 1, domestic costs are in excess of foreign exchange costs or savings, indicating that the good should not be produced domestically and should be imported instead.

Shadow Pricing of Inputs

- Land – Rental value of per unit of land will be applied for calculating the shadow price of land
- Labor – Market wage rate will be considered for shadow pricing because no substantial market imperfection exists in agricultural labor market
- Working capital – Interest rate for working capital
- Fertilizers– International prices will be used to calculate the import parity prices
- Seed – Actual market price

3. Results and Discussion

The aim of analyzing costs and returns is to determine the amount of profit a producer is making from a particular commodity production within the given technology and investment. This is important information in deciding on whether

to make an investment. The profitability of a commodity production crucially depends on its prices, cost of production, and availability of technology. Profitability depends on the costs involved in production and returns from its product. On the other hand, the amount of input use affects directly the cost. So, it is worthwhile to know the existing technology in terms of agronomic practices and input use in the area.

3.1 Financial and Economic Profitability of Onion

Pattern of input use for onion cultivation: Farmers in the study areas used various inputs for onion cultivation. They used on an average 290 man-days per hectare of total human labour for onion cultivation where family labour was 125 man-days and hired labour was 165 man-days. On an average, they sowed 8 kg seed per hectare of land. They applied on an average one-ton cowdung in each hectare of onion field. They applied Urea at the rate of 321 kg/ha, TSP 260 kg/ha, and MoP 217 kg/ha. (Table 3.1). In the study areas, farmers also applied zypsum (81 kg/ha), DAP (95 kg/ha), and zinc (12 kg/ha) for onion cultivation.

Table 3.1. Level of input use per hectare of onion cultivation

Particulars	Districts			All
	Pabna	Rajshahi	Faridpur	
Human labour (man-days)	289	295	286	290
Family	124	127	123	125
Hired	165	168	163	165
Seed (kg)	7	8	8	8
Cowdung (kg)	163	2749	229	1047
Urea (kg)	278	385	300	321
TSP (kg)	288	272	221	260
MoP (kg)	159	278	213	217
Zipsum (kg)	67	115	62	81
DAP (kg)	112	90	83	95
Zn(kg)	10	19	7	12

Source: Field Survey (2018-19).

Total cost of onion cultivation: The analysis revealed that total variable cost of onion cultivation was Tk. 120080 per hectare which was 69% of total cost of production (Table 3.2). The highest cost item was hired labour which accounted for about 27 % of the total cost. Cost of seed and irrigation accounted for about 8% and 6% respectively of total cost. The family labour and land use cost were Tk. 35358 and Tk. 18712 per hectare which accounted for about 20% and 11 % of total cost, respectively (Table 3.2). On average, the total cost of production was Tk. 174151 per hectare where 31% was fixed costs and 69 % was variable cost (Table 3.2).

Table 3.2. Per hectare cost of onion cultivation

Particulars	Districts				% of total cost
Variable costs:	**Pabna**	**Rajshahi**	**Faridpur**	**All**	
Land preparation	14403	13368	12928	13566	7.79
Hired labor	49476	50400	40806	46894	26.93
Seed	14409	12470	12470	13116	7.53
Cowdung	131	2199	229	853	0.49
Urea	4452	6159	4799	5137	2.95
TSP	8055	7616	6182	7284	4.18
MoP	2380	4176	3198	3251	1.87
Zipsum	2012	3443	1869	2441	1.40
DAP	3136	1440	2332	2303	1.32
Zn	768	1482	1318	1189	0.68
Irrigation	9533	11470	10461	10488	6.02
Insecticide	6528	9808	7723	8020	4.61
Weedicide	1730	1890	1084	1568	0.90
Growth hormone	1192	2766	886	1615	0.93
Sub-total	118205	128687	106285	117726	67.60
Interest on op. capital	2364	2574	2125.7	2355	1.35
Total variable cost (Tk./ha)	120569	131261	108411	120080	68.95
Fixed cost					0.00
Family labour	37182	38100	30792	35358	20.30
Land use cost	19960	19960	16217	18712	10.74
Total fixed cost (Tk./ha)	57142	58060	47009	54070	31.05
Total cost (Tk./ha)	177711	189321	155420	174151	100.00

Source: Author's own calculations from field survey (2018-19).

Table 3.3. Per hectare return from onion cultivation

Particulars	Districts			All
	Pabna	**Rajshahi**	**Faridpur**	
Yield (Ton)	14.19	18.12	12.63	14.98
Price (Tk./kg)	21	20	20	20
Gross return (Tk./ha)	297990	362400	252600	304330
Total variable cost (TVC)	120323	131261	96238	115941
Total fixed cost (TFC)	57142	92234	47009	65462
Total cost (TC)	177711	189321	155420	174151
Gross margin (Tk./ha)	177667	231139	156362	188389
Net return (Tk./ha)	120279	173079	97180	130179
BCR over total cost	1.68	1.91	1.63	1.74
Cost of production (Tk./kg)	12.52	10.45	12.31	11.76

Source: Author's own calculations from field survey (2018-19).

Financial profitability of onion: Per hectare average yield of onion was 14.98 ton and per kg average price was about Tk. 20. The average gross return and gross margin of onion cultivation were found Tk. 304330/ha and Tk.188389/ha respectively. Per hectare average net return was Tk. 130179 which was found to

be the highest in Rajshahi (Tk.173079) followed by Pabna (Tk.120279) and Faridpur (Tk.97180). BCR on total cost basis was found 1.74 which was also the highest in Rajshahi (1.91). It was estimated that, to produce one kilogram of onion, total cost incurred was Tk.11.76 (Table 3.3).

Table 3.4. Domestic resource cost (DRC) of onion (Import parity)

Particulars	Districts			All
	Rajshahi	Faridpur	Pabna	
A. Traded input (Tk/MT)	**1784**	**1744**	**1971**	**1833**
Urea	629	682	763	692
TSP	825	610	712	716
MoP	330	451	496	426
B. Non-Traded inputs and domestic resources (Tk/MT)	**10852**	**8849**	**10590**	**10097**
Human labour	6107	4884	5669	5553
Land preparation	1015	738	1024	925
Seed	1015	688	987	897
Manure	9	121	18	50
Pesticide	460	541	611	538
Irrigation	672	633	828	711
Int. on oprating capital	167	142	168	159
Land use cost	1407	1102	1284	1264
C. Output price (Tk/MT)	**27519**	**27519**	**27519**	**27519**
D. Value added (Tradable) (Tk/MT) (C-A)	25734	25775	25548	25686
E. DRC (B/D)-Import parity	**0.42**	**0.34**	**0.41**	**0.39**

Source: Author's own calculations

Economic profitability of onion cultivation: Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in producing onion crop relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of onion (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for onion crop for the year 2018-19 are presented in Table 3.4. The DRCs for onion crop was observed to be less than unity (0.39) implying that Bangladesh had comparative advantage in onion production for import substitution.

3.2 Financial and Economic Profitability of Garlic

Pattern of input use for garlic cultivation: Farmers in the study areas used various inputs for garlic cultivation. Farmers used on an average 268 man-days per hectare of total human labour for garlic cultivation where family labour was 138 man-days and hired labour was 130 man-days. On an average, they sowed 681 kg seed per hectare of land. They applied on an average 5.6 ton cowdung in the garlic

field. They applied Urea at the rate of 246 kg/ha, TSP 232 kg/ha, and MoP 186 kg/ha (Table 3.5). In the study areas, farmers also applied zypsum (77 kg/ha), DAP (129 kg/ha) and Zinc (17 kg/ha) for garlic cultivation.

Table 3.5. Level of input use per hectare of garlic cultivation

Particulars	Districts			All
	Pabna	Natore	Rajbari	
Human labour (man-days)	273	295	236	268
Family	156	139	120	138
Hired	118	156	115	130
Seed (kg)	695	675	672	681
Cowdung (kg)	2186	6151	8708	5682
Urea (kg)	224	283	231	246
TSP (kg)	226	229	242	232
MoP (kg)	194	197	166	186
Zypsum (kg)	104	57	71	77
DAP (kg)	64	92	230	129
Zinc (kg)	20	11	21	17

Source: Field Survey (2018-19).

Table 3.6. Per hectare cost of garlic cultivation

Particulars	Districts				% of Total cost
	Pabna	Natore	Rajbari	All	
Variable Cost:					
Land preparation	5613	3455	7774	5614	2.54
Hired labor	47280	54540	34440	45420	20.59
Seed	52125	50625	50400	51050	23.14
Cowdung	2186	6151	8708	5682	2.58
Urea	3841	4982	3897	4240	1.92
TSP	6363	6412	7247	6674	3.02
MoP	3331	3258	2634	3074	1.39
Zypsum	1252	684	1849	1262	0.57
DAP	2192	3171	7258	4207	1.91
Zinc	3175	1423	3037	2545	1.15
Irrigation	10225	12570	11472	11422	5.18
Insecticides	3865	4644	3897	4135	1.87
Sub-total	141448	151915	142613	145325	65.87
Interest on operating capital	2829	3038	2852	2907	1.32
Total variable cost (Tk./ha)	**144277**	**154953**	**145465**	**148232**	**67.18**
Fixed cost					
Family labour	62505	48597	35937	49013	22.21
Land use cost	20378	24949	24848	23392	10.60
Total fixed cost (Tk./ha)	**82883**	**73546**	**60785**	**72405**	**32.82**
Total cost (Tk./ha)	**227160**	**228499**	**206250**	**220637**	**100.00**

Source: Author's own calculations from field survey (2018-19).

Total cost of garlic cultivation: The study revealed that total variable cost of garlic cultivation was Tk. 148232 per hectare which was 67% of total cost of production (Table 3.7). The highest cost item was seed which shared about 23 % of the total cost. Hired labour cost accounted for about 21% of total cost and ranked second cost item. The family labour and land use cost were Tk. 49013 and Tk. 23392 per hectare which was accounted for about 22 % and 11 % of total cost respectively (Table 3.6). On an average, the total cost of production was Tk. 220637 per hectare where 33% was fixed costs and 67% was variable cost (Table 3.6).

Financial profitability of garlic cultivation: Per hectare average yield of garlic was 7.98 ton and per kg average price was about Tk.47.33. The average gross return and gross margin of garlic cultivation were found Tk.377800/ha and Tk.229568/ha respectively. Per hectare average net return was Tk.157163 which was found to be highest in Pabna (Tk.179390) followed by Rajbari (Tk.148600) and Natore (Tk.143501). BCR on total cost basis was found 1.71 which was more or less similar among the districts. It was estimated that, to produce one kilogram of garlic, total cost incurred about Tk. 28 (Table 3.7).

Table 3.7. Per hectare return of garlic

Figure in Tk.

Particulars	Districts			All
	Pabna	Natore	Rajbari	
Yield (Ton)	8.65	7.75	7.55	7.98
Price (Tk./kg)	47	48	47	47.33
Gross return	406550	372000	354850	377800
Total variable cost (TVC)	144277	154953	145465	148232
Total fixed cost (TFC)	82883	73546	60785	72405
Total cost (TC)	227160	228499	206250	220637
Gross margin	262273	217047	209385	229568
Net return	179390	143501	148600	157163
BCR over total cost	1.79	1.63	1.72	1.71
Cost of production (Tk./kg)	26.26	29.48	27.32	27.69

Source: Author's own calculations from field survey (2018-19)

Economic profitability of garlic cultivation: Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in garlic relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of garlic (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while DRC is less than one implies that the production is efficient and make positive contribution to domestic value addition. The estimates of DRCs for garlic for the year 2018-19 are presented in Table 3.8. The DRCs for garlic was observed to be less than unity (0.27)

implying that Bangladesh had comparative advantage in garlic production for import substitution.

Table 3.8. Domestic resource cost (DRC) of garlic (import parity)

Particulars	Districts			All
	Pabna	Natore	Rajbari	
A. Traded input (Tk/MT)	**2554**	**3122**	**2933**	**2870**
Urea	832	1173	983	996
TSP	1063	1202	1304	1189
MoP	660	748	647	685
B. Non-Traded inputs and domestic resources (Tk/MT)	**23931**	**26912**	**23885**	**24909**
Human labour	12692	13308	9321	11774
Land preparation	649	446	1030	708
Seed	6026	6532	6675	6411
Manure	253	794	1153	733
Pesticide	447	599	516	521
Irrigation	1182	1622	1519	1441
Int. on operating capital	327	392	378	366
Land use cost	2356	3219	3291	2955
C. Output price (Tk/MT)	**95177**	**95177**	**95177**	**95177**
D. Value added (Tradable) (Tk/MT) (C-A)	92623	92055	92244	92307
E. DRC (B/D)-Import parity	**0.26**	**0.29**	**0.26**	**0.27**

Source: Author's own calculations

Table 3.9. Level of input use per hectare of green chilli

Particulars	Districts			
	Bogura	Jamalpur	Bhola	All
Human labour (man-days)	262	253	280	265
Family	95	88	102	95
Hired	167	165	178	170
Seedlings (no.)	22454	23952	26197	24201
Cowdung (kg)	2250	1980	2450	2227
Urea (kg)	375	360	378	371
TSP (kg)	350	325	495	390
MoP (kg)	201	215	205	207
Zinc sulphate (kg)	5	6	7	6
Boric acid (kg)	4	4	5	4

Source: Field Survey (2018-19)

3.3 Financial and Economic Profitability of Green Chilli

Pattern of input use for chilli cultivation: The human labour used for producing green chilli was found to be 265 man days per hectare of which 36% were family supplied (Table 3.9). The use of human labor was highest in Cumilla (280 man-days/ha) followed by Bogura (262 man-days/ha) and Sherpur (253 man-days). The average seedling used by the farmers was 24201/ha. On an average, farmers used

2227 kg of cow dung per hectare for producing green chilli.Green chilli farmers used different types of chemical fertilizers such as urea (371 kg/ha), TSP (390 kg/ha), MoP (207 kg/ha), Zinc sulphate (6 kg/ha) and Boric acid (4 kg/ha) in the study areas. Among the chemical fertilizers, TSP was used at a higher rate for producing green chilli in the study areas.

Cost of green chilli cultivation: The study revealed that on an average total variable cost of green chilli cultivation was Tk.134047 per hectare which was 71% of total cost of production (Table 3.10). The highest cost item was hired labour which accounted for about 31% of the total cost. Pesticides cost accounted for about 8% of total cost and ranked second in the study areas. The average cost of green chilli production was Tk 189701 per hectare of which 29% was fixed costs and 71% was variable cost (Table 3.12).

Table 3.10. Per hectare cost of green chilli cultivation

Figure in Tk.

Particulars	Districts				% of total cost
	Bogura	Jamalpur	Bhola	All	
Variable cost					
Land preparation	7484	7904	8982	8123	4.28
Hired labor	58450	57750	62300	59500	31.37
Seedlings	11227	11976	13099	12101	6.38
Cowdung	3375	2970	3675	3340	1.76
Urea	8250	7920	8316	8162	4.30
TSP	9100	8450	12870	10140	5.35
MoP	3216	3440	3280	3312	1.75
Zinc sulphate	750	900	1050	900	0.47
Boric acid	480	480	600	520	0.27
Irrigation	7550	6916	5988	6818	3.59
Bamboo stick	3421	4210	3850	3827	2.02
Pesticides	15550	13227	15250	14676	7.74
Sub-total	128853	126143	139260	131419	69.28
Interest on op. capital	2577	2523	2785	2628	1.39
Total variable cost	131430	128666	142045	134047	70.66
Fixed cost					
Family labor	33250	30800	35700	33250	17.53
Land use cost	21207	22454	23550	22404	11.81
Total fixed cost	54457	53254	59250	55654	29.34
Total cost	185887	181920	201295	189701	100.00

Source: Author's own calculations from field survey (2018-19)

Financial profitability of green chilli: The average yield of green chilli was 15.85 t/ha in the study areas while it was highest in Bogura (16.56 t/ha) followed by Bhola (15.55 t/ha) and Jamalpur (15.45 t/ha) (Table 3.11). The average gross return, gross margin and net return of green chilli were found to be Tk 346049/ha, Tk 212002/ha and Tk.156348/ha, respectively. Average benefit cost ratio was

found to be 1.83 on the basis of total cost. The average cost of producing per kg of green chilli was Tk.11.98 (Table 3.11).

Table 3.11. Per hectare returns from green chilli

Figure in Tk.

Particulars	Districts			All
	Bogura	Jamalpur	Bhola	
Yield (ton)	16.56	15.45	15.55	15.85
Price (Tk/kg)	21.55	21.45	22.5	21.83
Gross return	356868	331403	349875	346049
Total variable cost (TVC)	131430	128666	142045	134047
Total fixed cost (TFC)	54457	53254	59250	55654
Total cost (TC)	185887	181920	201295	189701
Gross margin	225438	202737	207830	212002
Net return	170981	149483	148580	156348
BCR over total cost	1.92	1.82	1.74	1.83
Cost of production (Tk/kg)	11.23	11.77	12.95	11.98

Source: Author's own calculations from field survey (2018-19)

Table 3.12. Domestic resource cost (DRC) of green chilli (Export parity)

Particulars	Districts			All
	Bogura	Jamalpur	Bhola	
A. Traded input (Tk/MT)	**1944**	**2013**	**2463**	**2140**
Urea	727	748	781	752
TSP	860	856	1295	1003
MoP	357	409	388	385
B. Non-Traded inputs & domestic resources(Tk/MT)	**9705**	**10211**	**11029**	**10315**
Human labour	5537	5731	6302	5857
Land preparation	452	512	578	514
Seedlings	678	775	842	765
Bamboo stick	207	272	248	242
Pesticide	939	856	981	925
Irrigation	456	448	385	430
Int. on operating capital	156	163	179	166
Land use	1281	1453	1514	1416
C. Output price (Tk/MT)	91042	91064	91062	91056
D. Value added (Tradable) (Tk/MT) (C-A)	89098	89051	88599	88916
E. DRC (B/D)-Export parity	**0.11**	**0.11**	**0.12**	**0.12**

Source: Author's own calculations

Economic profitability of green chilli: Domestic Resource Cost (DRC) indicates whether the domestic economy has a comparative advantage in producing green chilli crop relative to other countries. If the DRC is greater than one, it implies that the economy loses foreign exchange through domestic production of green chilli (in the sense that it uses more domestic resources than it generates net value added

to tradable goods and services), while a DRC less than one implies that the production is efficient and makes positive contribution to domestic value addition. The estimates of DRCs for green chilli for the year 2018-19 are presented in Table 3.12. The DRCs for green chilli was observed to be less than unity (0.12) implying that Bangladesh had comparative advantage in chilli production for export promotion.

3.4 Problems faced by the farmers in spices cultivation

Although the farmers in the study areas are cultivating onion, garlic and green chilli, so there were several problems to its higher production. The most acute problem for spices cultivation in all areas was low market price at harvesting time (75%). The other problems were lack of quality seed (25%) and low rate of seed germination (24%) might be due to adulterations, crisis of labour at harvesting time (27%) and high wage rate (13%). They also mentioned that due to severe infestation of insect (15%) and diseases (15%), spices yield drastically reduced and it led to heavy loss to the growers. They also opined the problems like, lack of storage related facility and high price of fertilizer (Table 3.13).

Table 3.13. Problems faced by the farmers in spices cultivation

Particulars	% Farmer responded			
	Pabna	Raj-shahi	Farid-pur	All
Seed related problem				
Lack of good quality seed	33	6	36	25
High price of seed	10	4	19	11
Adulterated seed	26	23	24	24
Fertilizer related problems				
High price of fertilizer	24	46	22	31
Adulterated fertilizer	21	19	24	21
Insect and disease related				
Infested with white fly	13	11	14	13
Leaf rust disease	15	11	12	13
Dandruff or early digestive disease	12	16	17	15
Attack by Fusarium fungus & leaves fall off	13	12	16	14
Labour related problems				
Crisis of labour	51	18	13	27
High wage of labour	13	14	12	13
Loan/Credit related problem				
Trouble in getting govt. loan	13	16	18	16
Store related problems				
Lack of technical knowledge of storing	14	10	12	12
Rotten when storing for several days	13	12	16	14
Marketing related problem				
Lower market price	74	76	74	75

3.5 Remedial measures for spices cultivation

- Government should take initiatives regarding reasonable price of selected spices at harvesting time
- Government should ensure the supply of good quality seed and fertilizer in time.
- DAE personnel (with the help of relevant scientists) should frequently visit to the farmer's field.
- Mechanization technology should be introduced to the selected spices cultivation to minimize labour crisis.

4. Conclusion

This study estimated financial and economic profitability of spices (Onion, Garlic and green chilli) cultivation in selected growing areas based on of net returns, gross margins and undiscounted BCRs. Results show that all the estimates of net returns, gross margins and the undiscounted BCRs are positive. This means that the production of spices crop were profitable for the farmers at the current market conditions. DRC indicates whether the domestic economy has a comparative advantage in spices production relative to other countries. The estimates of economic profitability used Domestic Resource Cost (DRC) for onion, garlic and green chilli were observed to be less than unity implying that Bangladesh had comparative advantage in production of onion and garlic for import substitution and green chilli production for export promotion. There are several constraints of selected crops to its higher production. The first and the foremost constraint for selected spices crops in all areas were low market price at harvesting time and market syndicate. Responded farmers mentioned that due to severe infestation of insect and diseases selected spices crops yield were drastically reduced and it led to heavy loss to the growers. The constraints include fertilizer not working properly due to adulterations, crisis of labour at harvesting time and high wage rate in the study areas. Government should have initiatives for ensuring reasonable price at harvesting time. DAE personnel should frequently visit the farmers field. Mechanization should be introduced to the farmers field for minimize the labour crisis.

References

BBS (2019). Statistical Yearbook of Bangladesh, Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka. http://www.bbs.gov.bd/site/page/3e838eb6-30a2-4709-be85-40484b0c16c6/-, Accessed 18 April 2022.

BBS (2020). Statistical Yearbook of Bangladesh, Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning, Government of the People's

Republic of Bangladesh, Dhaka, 40th Edition. http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/b2db8758_8497_412c_a9ec_6bb299f8b3ab/2021-08-11-04-54-154c14988ce53f65700592b03e05a0f8.pdf Accessed 18 April 2022.

Dorosh, P. and A.Valdes (1990). Effect of Exchange Rate and Trade Policies on Agriculture in Pakistan, Research Report No. 84, Washington, D.C, International Food Policy Research Institute.

Huda, F.A.; S. Islam and H. Biswas (2008). Impact assessment study on selected spice crops under action plan in Bangladesh. *Progressive Agriculture*, **19**(2): 229-241. 10.3329/pa.v19i2.16965

Islam, M. S.; K. M. Rahman and M. Hasan (2011). Profitability and resource use efficiency of producing major spices in Bangladesh. *Bangladesh Journal of Agricultural Economics*, **34** (3): 1-13. 10.22004/ag.econ.199330

Kumar, A.; A. Kumar; V. Kaushal; S. Patil; C. Payal and A. Kumar (2011). Antibacterial potential of some natural food preservatives against staphylococcus aureus isolated from various food samples of Himachal Pradesh (India), *World Journal of Science and Technology*, **1**(10): 48-53.

Mila, F.A. and M.T. Parvin (2019). Forecasting area, production and yield of onion in Bangladesh by using ARIMA model. *Asian Journal Agricultural Extension, Economics and Sociology*, **37** (4): 1-12. 10.9734/ajaees/2019/v37i430274

Nahar, L. (2017). Prospect of Spices Research in Bangladesh. A seminar paper presented at Department of Horticulture, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh.

Prity, J.A. (2018). Comparative Profitability Analysis of Spices Production in Bangladesh. A seminar paper presented at Department of Agricultural Economics, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh.

Rashid M.A. (2009). Trade Policies and Comparative Advantage in Bangladesh Agriculture, Ph.D. Thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh.