



PRODUCTION AND VALUE CHAIN ANALYSIS OF LENTIL IN SOME SELECTED AREAS OF BANGLADESH

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ABSTRACT

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The study assessed the value chain analysis of lentil in some selected areas of Bangladesh. Data were collected from 96 randomly selected lentil farmer, local trader, arathder, retailer and dal miller from Jashore, Jhenaidah and Kushtia district. The results indicated that most of the farmer of the study areas were cultivated BARI masur-8, BARI masur-7 and BARI masur-6 which were popular and prominent variety release from BARI. On an average, total production cost of lentil was Tk. 66373.83/ha, whereas variable cost was Tk. 35404.16/ha and fixed cost was Tk. 30969.68/ha. Average yield of lentil was 1.632 ton/ha in the study areas. Gross return was Tk. 115863.29/ha and net return was Tk. 49489.46/ha. Benefit cost ratio was 1.75 that means the lentil cultivation was profitable. Milling of 1 MT lentil at dal mill then it get 725 kg pulse (lentil) and 200 kg was husk (bran). Marketing cost of faria, bepari, wholesaler and retailer was Tk. 855/mt, Tk. 750/mt, Tk.5295/mt and Tk. 1580/mt respectfully. Retailer net margin was highest (Tk. 4945/mt) but they sold daily average 9.28 kg lentil only. Retailer was the highest value added Tk.6525/mt (44.85%) followed by wholesaler Tk.5525/mt (37.97%), faria (10.31%) and bepari Tk. 1000/mt (6.87%) respectfully. Total value added at different actors was Tk. 14550/mt. Bad weather and disease infestation were the major problems in the lentil cultivation.

Contribution/Originality: This study is one of very few studies which have investigated on the value chain, value addition and intermediaries involved in lentil value chain system of Bangladesh. This study also document about which variety of lentil was cultivated and profitability of lentil cultivation in Bangladesh.

1. INTRODUCTION

Pulses are the important crops cultivated all over the Bangladesh. It plays a vital role in the Bangladesh diet as a cheap source of protein. Eight kinds of pulses, such as lentil, mungbean, blackgram, grasspea, chickpea, cowpea, filed pea and pigeon pea are grown in Bangladesh (Bakr, Rahman, & Miah, 1997). Pulses cultivation cover 2.22% of the total cultivated land in Bangladesh (BBS, 2019). Among the pulses, lentil (*lens culinaris*) commonly known as “masur” is a popular pulse crop in Bangladesh and occupied 40.23% cultivation of pulse crops getting first position (BBS,2019). It contains more protein than any other agricultural produce, and is nearer to animal flesh in food value for which it is often called poor man’s meat. Lentil is a winter pulse of temperate and subtropical region. Its

contribution to pulse production of the world is 2.4%. Being legume, lentil is restorative in nature and its seed contains average 25.7% protein, which is almost three times higher than that of cereals (Erskine & Witecombe, 1984) and 59% carbohydrate (Bakhsh, Gafoor, Zubair, & Iqbal, 1991). The per capita pulses consumption required for balance diet as given by FAO is 15 gm. Lentil ranks first among the pulses in terms of area (40%) and consumer preferences (Miah & Rahman, 1991). The country is deficit in meeting her lentil demand. So, local markets are also being influenced by import quantity and prices. Different markets are there at different levels of distribution process. So, local markets with domestic products may not be much integrated as import markets which also influence price formation. As the markets were (monthly) segmented, price policy if any, for lentil improvement should be considered regionally for the effectiveness of such policies. Efforts need to be taken for market development throughout the country. Pulses are vital components in diversification of Bangladesh's predominantly rice-based cropping system. Lentil is the highest most important pulse crop in terms of area (142510 ha) and production (175384 MT) and ranks the highest in consumer preference and total consumption (BBS, 2019). Lentil seed is a rich source of protein and several essential micronutrients (Fe, Zn, β -carotene) (Bhatty, 1988). The area and production of lentil in study areas are shown Table 1 which indicate the major lentil cultivated areas in Bangladesh. BARI lentil varieties were occupied 98 % of lentil cultivated lands (Rahman, Hossain, Sarker, & Bakr, 2012). BARI has developed a good number of high yielding varieties which preferred by farmers in different parts of Bangladesh.

Table-1. Lentil area and production in study areas from 2007-08 to 2019-20.

Year	Jashore		Jhenaidah		Kushtia	
	Area (ha)	Production (MT)	Area (ha)	Production (MT)	Area (ha)	Production (MT)
2007-08	20060	16073	-	-	9967	10095
2008-09	20324	18190	-	-	9893	9473
2009-10	20926	19878	-	-	9538	1001
2010-11	20704	20625	-	-	11877	14047
2011-12	20431	18275	-	-	10665	12460
2012-13	20902	20314	-	-	11562	15882
2013-14	8969	9253	11045	14642	5901	8417
2014-15	10550	12564	12169	17050	5936	8784
2015-16	11337	11455	12609	12826	7108	9696
2016-17	11870	13849	13894	19431	7783	12021
2017-18	10284	11999	11579	16383	8572	13687
2018-19	10336	11905	11321	15987	8564	12577

A value chain analysis describes all the activities which are included from the production to the consumption which included the primary producer, a processor (packaging, transforming of product etc.) and a retailer (Kaplinsky & Morris, 2001). Value chain analysis has the potential to influence marketing decisions by the producers, processors, consumers, traders, investors and others. In each of these links there is a process of value adding and these can be called value added links. Most of the earlier studies in Bangladesh related to lentil based on production and technical efficiency. Matin, Islam, and Huque (2018) analyzed profitability of lentil; Tithi and Barmon (2018) analyzed the comparative advantages of lentil and mustard. A few studies such as Meera, Singh, Rahaman, Bairwa, and Meena (2018); USAID/Nepal (2011) conducted abroad were on value chain analysis of lentil. But these studies were not fully covered value chain analysis of lentil. With this background, a study on the lentil value chain gives information about production, marketing and value adding activities which will be helpful for the farmers and other market actors for decision making. Therefore, the present study was undertaken with the objectives of production and marketing system, marketing cost and margin and value chain analysis of lentil.

2. METHODOLOGY

2.1. Selection of the Study Area

The present study was conducted at three district viz. Jashore, Jhenaidah and Kushtia which were purposively selected because these districts are leading lentil producing areas in Bangladesh. Jashore Sadar upozila from Jashore, Kaligonj upozila from Jhenaidah and Kushtia Sadar upozila were selected for primary data collection. Marketing data were from different local and district main market of those district of the study areas. Total sample farmer was 60 where 20 farmer from each district. For value chain information 30 traders of different intermediaries and 6 millers were selected from study areas. Among the traders 9 farias (local traders), 9 arathdar cum bepari, 6 wholesaler and 6 retailers were selected. Necessary information regarding this study was collected based on socio economic characteristics of the farmers, agronomic management, production, marketing system, processing, market chain etc. Data were collected through pre-designed and pre-tested interview schedule during May-June, 2020. Field investigators under the direct supervision of the researcher collected field level data.

2.2. Analytical Techniques

Data were randomly collected from farmers and traders by the experienced field investigators with direct supervision of the researchers using a pre-tested interview schedule. Collected data were edited, summarized, tabulated and analyzed to fulfill the objectives of the study. Descriptive statistics using different statistical tools like averages, percentages and ratios were used in presenting the results of the study. Following profit equation was employed to assess the profitability of lentil production.

$$\Pi = Pl.Ql - (TVC + TFC)$$

Where, π = Profit of producer per hectare.

Pl = Per unit price of lentil (Tk/mt).

Ql = Quantity of lentil (ton/ha).

TVC = Total variable cost of lentil.

TFC = Total fixed cost of lentil.

Marketing margin: The marketing margin of different intermediaries were determined by the following formula,

$$MM = SP - PP$$

Where, MM = Marketing margin (Gross value addition).

SP = Selling price.

PP = Purchase price of lentil.

Net margin = MM - MC.

Where, MC = Marketing cost.

Value addition = Gross value addition - Marketing cost.

3. RESULT AND DISCUSSION

3.1. Socioeconomic Characteristics of Farmer

Socioeconomic status was the mirror of the society where it can gather knowledge about the present status of farmer. Average age of farmer was 44.22 years that means they become very young in age and capable of doing farming as their average farming experience was 14 years. Average lentil cultivated areas was 0.22 ha which was very few as its total cultivated land (0.59 ha). Average family member was 4.75 which were equal to national average. Most of the farmer was more or less educated [Table 2](#).

Table-2. Socioeconomics characteristics of lentil farmer.

Particulars	Jashore	Jhenaidah	Kushtia	All areas
Age (years)	40.85	44.6	47.2	44.22
Own land (ha)	0.49	0.83	0.44	0.59
Lentil cultivated land (ha)	0.15	0.35	0.16	0.22
Farming experience (years)	10.5	13.8	17.8	14.03
Lentil farming experience (years)	9.25	12.55	13.8	11.87
Family size				
Male	1.8	1.75	1.75	1.77
Female	1.75	1.65	1.7	1.70
Children	1.29	1.65	1.59	1.51
Total	4.55	4.8	4.9	4.75
Education level (%)				
Can sign	10.00	35.00	30.00	25.00
Primary	25.00	20.00	25.00	23.33
SSC	40.00	15.00	15.00	23.33
HSC	15.00	25.00	25.00	21.67
Degree & above	10.00	5.00	5.00	6.67

Source: Field survey, 2020.

3.2. Production Technology of Lentil Cultivation

Lentil is a most popular pulses crops cultivated in the Jashore region. It mainly cultivated in the robi season. The most appropriate planting time was 1st week of November to mid November Table 3. About 70 percent farmer sowing lentil seed at this time. Suitable sowing time of lentil was last week of October to Mid November (Azad et al., 2020). Farmer cultivate BARI masur-8 (41.67%), BARI masur-7 (30%) and BARI masur-6 (28.33%) lentil variety which were Bangladesh Agricultural Research Institute (BARI) developed lentil variety in the study areas. BARI has developed nine lentil varieties. All the farmer sowing seed with broadcasting (93.33%) and some are line sowing (6.67%) which were very few so that they require more seed then recommendation seed rate.

Table-3. Agronomic management of lentil farming.

Particulars	Jashore	Jhenaidah	Kushtia	All areas
Variety (%)				
BARI masur-6	25	30	30	28.33
BARI masur-7	30	15	45	30.00
BARI masur-8	45	55	25	41.67
Sowing time (%)				
November (1-15)	80.00	60.00	70.00	70.00
November (16-30)	20.00	40.00	30.00	30.00
Seed rate (kg/ha)	50.12	47.06	48.12	48.43
Source of seed (%)				
Own	20.00	25.00	15.00	20.00
Buy	80.00	75.00	85.00	80.00
Seed sowing method (%)				
Line	5.00	5.00	10.00	6.67
Broadcasting	95.00	95.00	90.00	93.33
Seed treatment before sowing (%)				
Yes	70.00	65.00	80.00	71.67
No	30.00	35.00	20.00	28.33
Intercultural operation				
Ploughing and laddering (PT and Tractor) (No.)	5.05	4.55	4.00	4.53
Weeding (No.)	1.00	1.00	1.00	1.00
Spray fungicide and pesticide-yes (%)	100.00	100.00	100.00	100.00
Average number of spraying	2.55	2.20	2.40	2.38
Spray schedule (%)				
Morning	70.00	65.00	80.00	71.67
Evening	30.00	35.00	20.00	28.33

Source: Field survey, 2020.

About 80 % farmer collect seed from local market and only twenty percent farmer kept their own necessary seed which was lower than the other pulse (78.44% incase of BARI Cowpea, Uddin, Rashid, and Begum (2020)). Average per hectare seed used by the farmer was 48.43 Kg/ha. They treated seed (71.67%) before sowing at field with Provax-200WP which was effective fungicide. Farmer ploughing and laddering about 4.53 times their land with power tiller and tractor for land preparation. Once they weeding their fields to keep weed free. Irrigation done if necessary but much irrigation being hamper the production the lentil fields. All the farmer spray their fields and on an average 2.38 times spray fungicide and pesticide. Spraying was mostly done in the morning (71.67%).

3.3. Post Harvest Management of Lentil

Lentil was harvested in the months of February-March. After harvest their product they clean it properly for sale in the market. They sell almost all the product in the market but some amount was kept for their consume and sowing seed for next year. About eighty five percent farmer sold out the whole lentil after harvest Table 4. Farmer sale their products immediately after harvest. Some farmer stored lentil for next year seed purpose and sold it to other farmer at cultivating season with high price. Storing it for few days then it get high profit and generating their income (Baksh, Rossi, Momin, Hajong, & Tiwari, 2017). They did not crushing the lentil. Some farmer sold lentil to bepari at local market and some one at arathdar. If the farmer kept lentil for consume then they milling lentil from local *dal mill* which cost 6 Tk./kg for small amount. If farmer kept lentil for seed purpose then they kept it at air tight plastic drum with Dursban powder for next season.

Table-4. Post harvest management of lentil farming.

Particulars	Jashore	Jhenaidah	Kushtia	All areas
Sale after harvest of whole lentil (%)				
Yes	85.00	80.00	90.00	85.00
No	15.00	20.00	10.00	15.00
Sale after crushing lentil (%)				
Yes	10.00	10.00	5.00	8.33
No	90.00	90.00	95.00	91.67
Selling place-where farmer sale the lentil after harvest (%)				
Home	25.00	35.00	15.00	25.00
Market	75.00	65.00	85.00	75.00
Lentil seed store at home (%)				
Yes	30.00	40.00	10.00	26.67
No	70.00	60.00	90.00	73.33
Seed store in which medium (%)				
Drum	100.00	100.00	100.00	100.00

Source: Field survey, 2020.

3.4. Cost of Lentil Cultivation

Cost is the expenses for organizing and carrying out the production process. The cost of production was included all variable cost items like human labor, land preparation, seed, manure, fertilizers, insecticides and irrigation. Besides, interest on operating capital was also considered as variable cost. Family labor and rental value of land was considered as fixed cost for the estimation of cost of production. Total cost of lentil cultivation was Tk. 66373.83/ha, where as variable cost was Tk. 35404.16/ha and fixed cost was Tk. 30969.68/ha Table 5. Interest on operating capital was calculated at the rate of 9 percent with four months of cultivation period. Land use cost was calculated Tk.44880.00/ha per year which was lease value of land at the study areas. Among the cost item highest cost was hired labor Tk. 8850.54/ha (13.33%) followed by land preparation cost Tk. 7286.34/ha (10.98%), fertilizer Tk. 6505.75/ha (9.80%), pesticide Tk. 3936.06/ha (5.93%) etc.

Table-5. Cost of lentil cultivation in the study areas (Tk./ha).

Cost item	Jashore	Jhenaidah	Kushtia	All areas	Percentage of cost
A. Variable cost					
Land preparation cost	7713.75	6967.35	7177.90	7286.34	10.98
Seed	6014.17	5646.83	5774.34	5811.78	8.76
Hired labor	9148.50	8940.58	8462.53	8850.54	13.33
Fertilizer	6579.47	6329.69	6608.08	6505.75	9.80
Manure	2212.41	2068.56	1666.55	1982.51	2.99
Pesticide	4891.54	3375.19	3541.45	3936.06	5.93
Interest on operating capital	1096.80	999.85	996.93	1031.19	1.55
Total variable cost	37656.64	34328.05	34227.78	35404.16	53.34
B. Fixed cost					
Land use cost	14960.00	14960.00	14960.00	14960.00	22.54
Family labor	15763.47	13384.66	18880.90	16009.68	24.12
Total fixed cost	30723.47	28344.66	33840.90	30969.68	46.66
Total cost (A+B)	68380.11	62672.72	68068.68	66373.83	100.00

3.5. Profitability of Lentil Cultivation

Profitability is one of the major criteria for determination of acceptance of a crop. The returns came from the sale of lentil seed which was consumed by consumer as pulses. Average yield of lentil was 1.632 ton/ha in the study areas [Table 6](#). But BARI developed lentil varieties BARI masur-8 yield was 2.10-2.20 ton/ha ([Azad et al., 2020](#)). Gross return was Tk. 115863.29/ha and net return was Tk. 49489.46/ha. Benefit cost ratio was 1.75 that means the lentil cultivation was profitable.

Table-6. Profitability of lentil cultivation in the study areas.

Particulars	Jashore	Jhenaidah	Kushtia	All areas
Yield	1.669	1.631	1.595	1.632
Gross return	118525.35	115830.16	113234.37	115863.29
Total cost	68380.11	62672.72	68068.68	66373.83
Net return	50145.24	53157.44	45165.69	49489.46
BCR	1.73	1.85	1.66	1.75

Note: Price: Tk.71.00/kg.

3.6. Value Chain

Value chain is the alternative roots of products flow from producer to consumers. A value chain is a sequence of related business activities (functions) from provision of specific inputs for a particular product to primary production, transformation and marketing, up to the final sale of a particular product to the consumer ([GTZ Value Links, 2008](#)). It also includes the number of intermediaries performing different functions, like producers, processors, traders and distributors of a particular product linked by a channel through which the product passes from primary producers to the end consumers. Thus, value chain actors, responsible for movement of materials, information and/or services, share an interest in the end-product was considered for analysis, because changes in the end-market affect them both collectively and simultaneously. In the study areas lentil are moved from producer to consumer in the different market through different intermediaries, such as beparies, arathdar, paiker and retailers. Lentil value chain map included in [Figure 1](#). After harvest of lentil farmer sold their product to faria and local arathdar. Again local arathdar sold it to far wholesaler, wholesaler to retailer and ultimately at consumer.

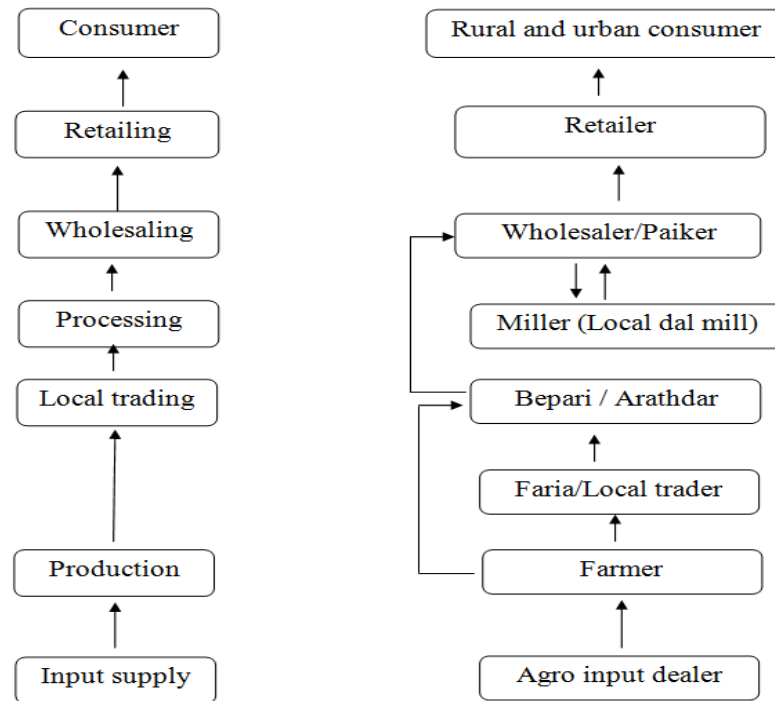


Figure-1. Value chain map for lentil in the study areas.

3.7. Actors Involved in Marketing Chains

Farmer: Farmer is a producer of the lentil and first actor of the channel. Some farmer sell its products to local traders at his home and some are sell to the local arathdar. If farmer sell its products at his home then he get less price but if he sell his products at local market by expense some cost the he get good price.

Local traders (Faria): Faria is a pretty trader who purchases lentil from farmer in the village and sell his products to the local arathdar.

Bepari cum local arathdar: Bepari is a professional wholesale trader who make his purchase from local farmer home, local market, stock the product and sell it to other city wholesaler or arathdar. This type of trader locally call Bhusi maler arath. Sometimes they milling the whole pulse and sell their products to retailer.

Paiker: Wholesaler in consuming area is known as paiker and arathdar, who purchase whole pulse from different local arath and storing and crushing (milling) of the whole pulse from dal mill and sell it in different retailer.

Miller: Miller is not directly involved in the lentil marketing but it has significant value. They milling the whole pulse with charges by other trader and also by own stock. Consumer and retailer also milling directly from dal mill by paying charge. Miller kept and sell the bi-product (bhusi) to different traders and consumer.

Retailer: The retailer is the last link of marketing channel and they collect from arathdar and sell the products to consumer directly.

3.8. Marketing Cost

The cost of marketing represents the cost of performing the various marketing functions and operations by various agencies involved in the marketing process (Kohls & Uhl, 2005). In other words the costs, which are incurred to move the product from producers to consumers, are ordinarily known as marketing cost. Marketing cost of different intermediaries was stated in the below Table 7. Lentil need to milling before sell it to consumer. Average milling cost Tk.4000.00/mt of lentil. If 1 mt raw lentil milling in the dal mill then it get 725 kg pulse (lentil) and 200 kg was husk (bran). Sometime farmer sold his products directly at local market and so that he expense some cost for marketing. Highest marketing cost was wholesaler (Arathdar/paiker) who were involved

processing of raw lentil to consumable pulses (dal) which was Tk. 5295/mt. Faria total cost was Tk. 855/mt, bepari cum local arathdar was Tk. 750/mt and retailer cost was Tk. 1580/mt.

Table-7. Marketing cost of different intermediaries (Tk./ton).

Cost item	Farmer/ Faria	Bepari cum Local arathdar	Arathdar/ Paiker	Retailer
Transportation cost	250	0	800	250
Loading	125	125	0	125
Unloading	125	0	125	0
Market toll/tax	75	50	20	75
Milling cost	0	0	4000	0
Wages and salaries	0	125	100	0
Packaging	0	200	0	300
Shop rent and godown charge	0	100	150	180
Personal expenses (Mobile bill, daily expenses etc.)	80	50	50	400
Miscellaneous cost (Electricity, subscription, weighing loss etc.)	200	100	50	250
Total cost	855	750	5295	1580

3.9. Marketing Margin

Marketing margin is the difference between the price paid by the consumer and price received by the producers. Marketing margin has two components marketing cost and net margin or profit. After milling of the pulse then it get consumable pulse and barn (husk). Prices were determined at the time of sale considering the prevailing market rate (Hajong, Moniruzzaman, Mia, & Rahman, 2014). This husk has also value and it sell Tk. 15.00/kg (Tk. 15000.00/kg). Arathder/ paiker/ miller were milling the lentil and then they sell lentil pulse and its husk to the retailer. Arathder cum wholesaler were act as a processor. Processor was the highest value added actor in the value chain system (Hajong, Mondal, Sikder, Paul, & Saha, 2016). Paiker sell mainly milled pulse to retailer so it calculated 725 kg out of 1000 kg (1 MT) of lentil. Faria net margin was Tk. 645/mt, bepari cum local arathdar was Tk. 250 and arathdar cum wholesaler was Tk. 230/mt. Retailer net margin was highest (Tk. 4945/mt) but they sold daily average 9.28 kg lentil only Table 8.

Table-8. Marketing margin of different intermediaries (Tk./MT).

Particulars	Farmer/Faria	Bepari cum local arathdar	Arathdar cum wholesaler	Retailer
A. Average sales price	71000	72500	73500	79025
B. Average purchased price	72500	73500	79025	85550
C. Gross margin (A-B)	1500	1000	5525	6525
D. Marketing cost	855	750	5295	1580
E. Net margin (C-D)	645	250	230	4945
Average daily transaction	13.70	113.33	225.00	9.28

Source: Field survey, 2020.

3.10. Distribution of Value Addition

Value addition is the difference in sales price and purchase price at each stage of the value chain. Each of the lentil value chain actors adds value to the product passes from one actor to another. In a way, the actors change the form of the product through processing or improve the grade by cleaning or create space and time utility. Lentil producer reported lower price of Tk. 71,000.00/mt by adding Tk. 1500.00/mt which was 10.30% of total value added in the study areas Table 9. Retailer was the highest value added Tk.6525/mt (44.85%) followed by wholesaler Tk.5525/mt (37.97%), faria (10.31%) and bepari Tk. 1000/mt (6.87%) respectfully. Total value added at different actors was Tk. 14550/mt.

Table-9. Distribution of value addition among different intermediaries (Tk/ton).

Value chain	Farmer/Faria	Bepari local arathdar	Arathdar cum wholesaler	Retailer	Consumer
Sales price	71000	72500	73500	79025	
Purchase price	72500	73500	79025	85550	
Gross value added	1500	1000	5525	6525	
% of total value added*	10.31	6.87	37.97	44.85	

Note: Total value added = Tk. 14550.00.

3.11. Problems of Lentil Cultivation

For lentil cultivation weather is very important. Foggy weather was threaten for lentil cultivation. Most of the farmer claim that bad weather and disease infestation were the problems in the lentil cultivation. Disease such as root rot (*Sclerotium rolfsii*) and leaf rot (*Stemphylium blight*) were the threaten for lentil cultivation and it hamper and lessen lentil production. Insect pest attack was another problem for lentil cultivation. Because of high demand farmer did not face any marketing problem (Hajong, Sikder, Mondal, & Islam, 2018).

4. CONCLUSION

Lentil was the most popular pulses crops cultivated in the South western region of Bangladesh and it has great demand at the farmer and consumer. This region has convenient environment and suitable land for lentil cultivation. Improved varieties of lentil developed by BARI were increase both production and yield in those areas and make highly profitable for lentil farmer. It has a great scope to increase the acreage to fulfill the local demand and export to abroad. In lentil value chain millers has important role that they process and crushing the whole pulse and make consumable for consumer. Lentil value chain did not follow traditional marketing channel. Farmer sometimes itself sold its product directly to local arathdar where as local faria can not role play. Retailer margin was high as they deal in very small amount in daily transaction. Bad weather and disease infestation such as *Stemphylium blight* is the major constraint to develop lentil cultivation. Short duration and disease resistant improved lentil varieties are pre-requisites for expanding the cultivation throughout the country. Therefore, continuous effort should be given by the breeders for developing high yielding and stress tolerant lentil varieties.

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