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PROFITABILITY OF LENTIL CULTIVATION IN SOME SELECTED SITES OF BANGLADESH

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Abstract

The study estimated the profitability, farm specific technical efficiency of lentil growers and measured the impacts of different factors associated with technical efficiency of lentil farmers. The study employed farm level cross sectional data from three lentil growing districts namely Jessore, Meherpur and Natore of Bangladesh. The study revealed that HYV lentil is profitable than local variety. Cost of human labour, organic fertilizer, TSP, MoP and irrigation cost were found to contribute significantly in the efficiency of lentil farmers. The average technical efficiency of lentil growers in Bangladesh is 64 percent. This indicates a good potential for increasing lentil output by 36 percent with the existing technology and level of inputs. Farmers' educations and training have positive significant effect on yield and efficiency of lentil production. Farmers faced some problems like disease infestation, lack of storage facilities, lack of knowledge, untimely rainfall, high price of input and unavailability of HYV seed. Therefore, researchers should develop integrated pest, disease and insect management schedule which are environment friendly and ecologically sound. Good quality seeds of lentil should be made available locally to the farmers at a reasonable price.

Keywords: Profitability, lentil, technical efficiency.

Introduction

Pulse crops are important for the people of 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 *et al.,* 1997). Among the pulses, lentil *(lens culinaris)* commonly known as "masur" is a popular pulse crop in Bangladesh. 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% (Knight, 1987). 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 and Witcombe, 1984) and 59% carbohydrate (Bakhsh *et al.*, 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 (Mia, 1991). The area under lentil cultivation in

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Bangladesh is declining but recently it was slightly upward and the average yield is only 960 kg/ha (BBS, 2012).

Table 1. Area, production, yield and harvest price of lentil in Bangladesh from 1981-82 to 2010-11

Year	Area (ha)	Production (MT)	Yield (T/ha)
1981-82	74706	47755	0.639
1982-83	73312	43750	0.597
1983-84	72907	47883	0.657
1984-85	70789	48442	0.684
1985-86	67470	47096	0.698
1986-87	212838	148988	0.700
1987-88	216404	158919	0.734
1988-89	215393	158040	0.734
1989-90	209178	155120	0.742
1990-91	210172	157280	0.748
1991-92	209004	152820	0.731
1992-93	207532	163425	0.787
1993-94	207642	167615	0.807
1994-95	207356	167945	0.810
1995-96	205868	169945	0.826
1996-97	206439	170505	0.826
1997-98	205858	162775	0.791
1998-99	205577	165315	0.804
1999-00	166781	127750	0.077
2000-01	164567	125905	0.765
2001-02	157229	115205	0.733
2002-03	154123	115590	0.750
2003-04	154810	122225	0.790
2004-05	153899	121065	0.787
2005-06	134694	115370	0.857
2006-07	137613	116810	0.849
2007-08	72613	71535	0.985
2008-09	70983	60537	0.853
2009-10	77321	71100	0.920
2010-11	83005	80442	0.960

Source: BBS, Different Issues.

Sikder and Elias (1985) reported that the average yield of lentil in Bangladesh was very poor, but varied widely between farms and between locations. In a

study of Tomer *et al*. (1987) showed that the average yield of lentil increased with and increase in farm size. Bangladesh Agricultural research Institute (BARI) with other institutes has developed a number of high yielding lentil varieties and disseminated to farmers fields through different agencies. So it is essential to know the economic profitability of lentil production at farm level. But there is very few study conducted. Therefore, the present study was undertaken with the following objectives:

1. to know the input use pattern in lentil cultivation;
2. to estimate the profitability of the lentil cultivation and
3. to estimate the tecnical efficiency of lentil growers.

Materials and Methods

a) *Sampling technique:* Jessore, Meherpur and Natore districts were selected purposively as the study areas because these districts are leading lentil producing areas of Bangladesh. From each district, three upazilas namely Lalpur, Natore Sadar, and Baraigram from Natore and Bagarpara, Chougacha and Jhekorgacha from Jessore and Meherpur Sadar, Mujibnagor and Gangni from Meherpur were purposively selected on the basis of intensive lentil cultivation respectively. From each upazila one village under one block was selected with the help of knowledgeable persons and Department of Agricultural Extension (DAE) personnel. A complete list of all lentil growers from the selected villages was prepared with the help of extension personnel. From the list, 180 farmers from each district were selected randomly taking 60 farmers from each upazila.

b) *Method of data collection:* Data were randomly collected from improved and local variety growers. A total of 540 farmers were selected for the study using simple random sampling technique. Secondary data were collected from relevant upazilas, and statistical bulletin. Data were collected by the eexperienced field investigators with direct supervision of the researchers using a pre-tested interview schedule.

Analytical Technique

Empirical Cobb-Douglas frontier production function model

The Cobb-Douglas production function is used for functional analysis of the data. It is the most widely used form for fitting agricultural production data, because of its mathematical properties, ease of interpretation and computational simplicity. It is a homogeneous function that provides a scale factor enabling one to measure the return to scale and to interpret the elasticity coefficient with relative ease. It is also relatively easy to estimate because in logarithmic form it is linear and

parsimonious (Beattic and Taylor, 1985). Thus Cobb-Douglas specification provides an adequate representation of the agricultural production technology.

The empirical Cobb-Douglas stochastic frontier production function with double log form can be expressed as:

$$LnY_i = \beta_0 + \beta_1 LnX_{1i} + \beta_2 LnX_{2i} + \beta_3 LnX_{3i} + \beta_4 LnX_{4i} + \beta_5 LnX_{5i} + \beta_6 LnX_{6i} + \beta_7 LnX_{7i} + \beta_8 LnX_{8i} + \beta_9 LnX_{9i} + \beta_{10} LnX_{10i} + \beta_{11} LnX_{11i} + \beta_{12} LnX_{12i} + v_i - u_i \quad \text{..... (1)}$$

Where,

Ln = Natural logarithm,

Y_i = Yield of lentil of the i-th farm (kg/ha)

X_{1i} = Land preparation cost of the i-th farm (Tk/ha)

X_{2i} =Human labour used by the i-th farm (man-days/ha)

X_{3i} = Seed used by the i-th farm (kg/ha)

X_{4i} = Organic fertilizer use by the i-th farm (kg/ha)

X_{5i} =Urea used by the i-th farm (kg/ha)

X_{6i} =TSP used by the i-th farm (kg/ha)

X_{7i} =MoP used by the i-th farm (kg/ha)

X_{8i} = Pesticide/Insecticides cost of the i-th farm (Tk/ha)

X_{9i} = Irrigation cost of the i-th farm (Tk./ha)

X_{10i} = Dummy for land type of the i-th farm (1= MHL, 0= otherwise)

X_{11i} = Dummy for sowing of the i-th farm date [1= optimum (30-35 kg/ha), 0= otherwise]

X_{12i} = Dummy for variety of the i-th farm (1= HYV 0= otherwise)

β's and η's are unknown parameters to be estimated

$v_i - u_i$ = error term the i-th farm (Tk/ha

V_i are assumed to be independently and identically distributed (iid) random errors, having N $(0, \sigma_v^2)$ distribution.

Technical inefficiency effect model

The u·s in equation (1) are non-negative random variables, called technical inefficiency effects, assumed to be independently distributed such that the technical inefficiency effects for the i^{th} farmer, u_i, are obtained by truncation of normal distribution with mean zero and variance σ_u^2, such that

$$u_i = \delta_0 + \delta_1 z_{1i} + \delta_2 z_{2i} + \delta_3 z_{3i} + \delta_4 z_{4i} + \delta_5 z_{5i} + W_i \quad \text{..... (2)}$$

Where,

z_{1i} = Farm size of the i-th farm (ha)

z_{2i} = Age of the i-th farm operator (year)

z_{3i} = Education of the i-th farm operator (year of schooling)

z_{4i} = Family Size of the i-th farm operator

z_{5i} = Dummy for occupation of the i-th farm operator (1= Farming, 0 = Otherwise)

z_{6i} = Dummy for Training of the i-th farm operator (1= Trained, 0 = Otherwise)

z_{7i} = Dummy for extension contact of the i-th farm operator (1= contacted, 0= Otherwise)

z_{8i} = Dummy for seed source of the i-th farm operator (1= own, 0= Otherwise)

δ's are unknown parameters to be estimated

W_i are unobservable random variable or classical disturbance term, which are assumed to be independently distributed, obtained by truncation of the normal distribution with mean zero and unknown variance σ^2, such that u_i is non-negative.

The β, η and δ coefficients are unknown parameters to be estimated, together with the variance parameters which are expressed in term of

$$\sigma^2 = \sigma_u^2 + \sigma_v^2 \quad \text{..... (3)}$$

and $$\gamma = \sigma_u^2 / \sigma^2 \quad \text{..... (4)}$$

γ is the ratio of variance of farm specific technical efficiency to the total variance of output and has a value between zero and one.

The estimates for all parameters of the stochastic frontier (1) and inefficiency model (2) were estimated in a single stage by using the Maximum Likelihood (ML) method. The econometric computer software package FRONTIER 4.1 (Coelli and Battese, 1996) was applied to estimate the parameters of stochastic frontier models using the ML method.

Profitability analysis of lentil

An attempt was made to estimate the detailed cost and return, relative profitability, resource use efficiency. The financial profitability of improved lentil production over their traditional varieties was calculated using simple accounting procedures. Hence, data relating to input use for the production of lentil and their market prices were collected. Besides, data on outputs and their prices were also gathered for the study. Finally, the cost and return of improved

pulse variety were compared with the respective cost and return of local pulse variety.

For calculating per hectare cost of lentil cultivation, all variable costs like human labour, land preparation, seed, manure, fertilizers, insecticides, irrigation and interest on operating capital were considered. The fixed cost of lentil cultivation included cost of land use and family labour. The land use cost was calculated on the basis of lease value of land. Finally cost was determined by adding fixed cost and variable cost.

Result and discussion

Input use pattern

On an average, 89 man-days of human labour per hectare were used for HYV lentil cultivation but it was only 62 man days for local variety. In the case of HYV, the highest number of human labour was used in Jessore (94 man-days/ha) and lowest in Natore (85 man-days/ha). Both type of farmers used 35 kg of seeds per hectare which was similar to the recommended rate of 30-35 kg/ha (BARI, 2011). Highest seed rate was used in Meherpur (37 kg/ha) and lowest in Natore (33 Kg/ha) for HYV cultivation while for local variety highest amount of seed was used in Jessore (35 kg/ha) and lowest in Meherpur (32kg/ha). HYV lentil farmer used 2984 kg cowdung per hectare as manure while it was 3566 kg/ha for local variety. It was mentioned that, farmers at Natore did not use cowdung in local variety cultivation. The farmers applied urea, TSP and MoP at the rate of 38, 81 and 47 kg/ha respectively in HYV cultivation while for local variety it was 35, 80 and 33 kg/ha of urea, TSP and MoP, respectively. Comparatively Jessore farmers used less amount of fertilizer in local variety, it may be due to more use of cow dung (Table 1).

Table 1. Level of input used in HYV and local variety of lentil cultivation in the study areas

Inputs	HYV				Local variety			
	Natore	Jessore	Meherpur	All	Natore	Jessore	Meherpur	All
Human labour (m-d/ha)	85	94	88	89	65	61	61	62
Seed (kg/ha)	33	36	37	35	34	35	32	35
Cow dung (kg/ha)	2447	4013	2684	2984	0	4151	1457	3566
Urea (kg/ha)	36	36	42	38	55	32	41	35
TSP(kg/ha)	76	78	90	81	84	79	88	80
MoP (kg/ha)	37	46	57	47	42	30	47	33

Source: Field Survey (2011-12).

Cost of lentil cultivation

The total cost of production of HYV and local variety of lentil were found Tk.43906 and Tk.38092 in which per hectare fixed cost were Tk.14391 and Tk.12798, respectively. The average cost of production for HYV was higher than local variety, because the farmers used more inputs for HYV lentil cultivation. The cost of production in Jessore was higher than that of Natore and Meherpur due to more use of human labour, manures and land use cost (Table 2).

Table 2. Cost of cultivation of lentil in the study areas *(Taka /ha)*

Input costs	HYV				Local variety			
	Natore	Jessore	Meherpur	All	Natore	Jessore	Meherpur	All
A. Variable cost:								
Land preparation	5783	7186	6062	6287	5868	6435	5165	6168
Hired human labour	11499	12683	11768	11936	7134	8202	7339	8068
Seed	2555	2829	2807	2723	2021	2470	2161	2419
Manures	1147	1881	1330	1424	0	2446	748	2168
Fertilizers:								
Urea	729	717	843	766	693	648	623	648
TSP	2312	2122	2395	2286	2218	2194	1848	2162
MOP	677	772	975	810	619	640	855	659
Total	3718	3611	4213	3862	3530	3482	3326	3469
Insecticides	1474	1160	1185	1281	741	1207	1084	1173
Irrigation	1122	978	1296	1142	741	967	861	946
Int. on opt. capital	819	910	860	860	601	756	621	883
Total variable cost (TVC)	28117	31238	29521	29515	20636	25965	21304	25294
B. Fixed cost (FC)	14052	15400	13910	14391	11629	13006	11506	12798
Land use cost	8388	9153	8114	8512	7788	8590	7554	8453
Family lab our	5664	6247	5796	5879	3841	4416	3952	4345
C. Total cost (TVC+FC)	42168	46638	43431	43906	32265	38971	32810	38092

Source: Field Survey (2011-12).

Profitability

The average yield of HYV lentil was estimated at 1479 kg/ha which was much higher than the national average of 920 kg/ha (BBS, 2012). But the average yield of local variety of lentil was found 819 kg/ha which was lower than the national average. For HYV, the highest yield was found in Natore (1656 kg/ha) and the lowest in Jessore (1347 kg/ha). On the other hand, the highest yield of local variety was found in Natore (903 kg/ha) and the lowest in Meherpur (808 kg/ha).

The average gross return, gross margin and net return were Tk.79440, Tk.49925 Tk.35534 per hectare respectively for HYV while it was Tk.46417, Tk.21123 and Tk.8325 per hectare respectively for local variety cultivation. The benefit cost ratio (BCR) for HYV lentil was found 1.81 while in local variety, it was 1.22 on full cost basis. Whereas, BCR on cash cost basis, HYV and local variety was 2.69 and 1.84 respectively (Table 3).

Table 3. Per hectare return from HYV and local variety lentil cultivation in the study areas

Inputs	HYV				Local variety			
	Natore	Jessore	Meherpur	All	Natore	Jessore	Meherpur	All
Grain yield (kg/ha)	1656	1347	1409	1479	903	816	808	819
Gross return (GR) (Tk/ha)	87060	73533	76570	79440	50157	46258	46162	46417
Main product	84333	70919	73945	76786	47883	44064	44036	44226
By-product	2727	2614	2625	2654	2274	2194	2126	2191
Total variable cost (TVC)	28117	31238	29521	29515	20636	25965	21304	25294
Total cost	42168	46638	43431	43906	32265	38971	32810	38092
Gross margin (GR-TVC)	58943	42295	47049	49925	29521	20293	24858	21123
Net return (GR-TC)	44891	26895	33139	35534	17892	7287	13352	8325
Benefit cost ratio:								
Cash cost basis	3.10	2.35	2.59	2.69	2.43	1.78	2.17	1.84
Full cost basis	2.06	1.58	1.76	1.81	1.55	1.19	1.41	1.22

Source: Field Survey (2011-12).

Maximum likelihood estimates of farm–specific stochastic frontier production function and inefficiency model for lentil

The empirical results indicate that, the coefficients of human labour, organic fertilizer, TSP, MoP and irrigation cost were positive and significant. The for dummy for land type and sowing date was positive and significant implies that in general, the level of lentil production is higher in medium high land and for optimum sowing. This may be due to better suitability of medium high land and optimum sowing for lentil cultivation. At 1% level of significance, human labour had the largest positive coefficient compared to other inputs. In other words, the elasticity of human labour (0.118) is the biggest among all variables, implying that human labour had positive and greatest impact on lentil production. At 5% level of significance the coefficients of organic fertilizer, TSP, and MoP were positive implies that organic fertilizer, TSP, and MoP had a significant and positive impact on lentil production. The yield of lentil will be increased by 0.001, 0.006 and 0.012 percent if farmers apply one percent additional amount of

organic fertilizer, TSP, and MoP, respectively. The coefficient of irrigation was also positive and significant at 10% level of significance (Table 4). It was observed that, except few exception more or less same results was found in HYV and local variety farmers.

Table 4. Maximum likelihood estimates of frontier production function and technical inefficiency model for lentil in the study areas

Independent variable	Para-meter	HYV farms (n=498)	Local variety farms (n=42)	All farm (n=540)
Stochastic frontier:				
Constant	β_0	7.485*** (0.065)	7.194*** (0.312)	6.931** (0.181)
Land preparation (Tk./ha)	β_1	-0.050 (0.010)	-0.148 (0.173)	-0.008 (0.018)
Human labour (m-day/ha)	β_2	0.187 *** (0.023)	0.155** (0.508)	0.118*** (0.028)
Seed (kg/ha)	β_3	-0.021 (0.008	0.149(0.341)	-0.018 (0.020)
Organic fertilizers (kg/ha)	β_4	0.004*** (0.001)	0.008** (0.035)	0.001** (0.001)
Urea (kg/ha)	β_5	-0.009(0.004	-0.021(0.077)	0.005 (0.006)
TSP (kg/ha)	β_6	0.013*** (0.004)	0.041** (0.088)	0.006** (0.006)
MoP (kg/ha)	β_7	0.021*** (0.021)	0.002** (0.071)	0.012** (0.006)
Pesticides (Tk./ha)	β_8	0.005** (0.001)	-0.154 (0.049)	0.005 (0.002)
Irrigation (Tk/ha)	β_9	0.009 (0.001)	0.059** (0.015)	0.004* (0.001)
Dummy for land type (1=MHL, 0= otherwise)	β_{10}	0.023*** (0.007)	0.004*** (0.112)	0.028** (0.019)
Dummy for sowing date (1=optimum, 0= otherwise)	β_{11}	0.019*** (0.004)	0.253** (0.088)	0.013* (0.006)
Dummy for variety (1=HYV, 0= otherwise)	β_{12}	-	-	0.295 (0.051)***
Technical inefficiency model:				
Constant	δ_0	4.086 (0.242)	6.093 (0.641)	7.067 (0.231)
Farm size (ha)	δ_1	0.002 (0.022)	-0.189** (0.054)	0.015 (0.282)
Age (year)	δ_2	-0.001 (0.002)	0.002 (0.006)	-0.003 (0.002)
Education (year of schooling)	δ_3	-0.006** (0.006)	-0.019 (0.038)	-0.004* (0.008)

Independent variable	Para-meter	HYV farms (n=498)	Local variety farms (n=42)	All farm (n=540)
HH size (no)	δ_4	-0.007(0.015)	0.047(0.043)	-0.001(0.013)
Dummy for occupation (1=Farming, 0=Otherwise)	δ_5	0.001 (0.002)	0.002 (0.004)	0.005 (0.004)
Dummy for Training (1=Trained, 0=Otherwise)	δ_6	-0.098* (0.057)	-0.102* (0.046)	-0.071** (0.068)
Dummy for extension contact (1=Contacted, 0=Otherwise)	δ_7	-0.327 (0.158)	-0.132 (0.704)	-0.245 (0.155)
Dummy for seed source (1=Own, 0=Otherwise)	δ_8	-0.017 (0.056)	-0.086 (0.370)	-0.044 (0.074)
Variance parameters:				
Sigma-squared	σ^2	0.193*** (0.021)	0.158** (0.054)	0.184*** (0.025)
Gamma	γ	0.899*** (0.002)	0.919*** (0.001)	0.903** (0.005)
Log likelihood function		152.240	40.175	161.429

Note: ***, ** and * indicate significant at 1, 5 and 10 percent level of probability, respectively.

Effect of inefficiency variable

The estimated coefficients presented in Table 4 showed that education and training of the farmers has a negative and significant effect on the inefficiency effects for lentil production. This

means that the technical inefficiency decreases with the increase of farmers' education and training. So, the production can be attained maximum level by providing investment on farmers' education and training purposes.

The estimated values of variance parameters (σ and γ) were large and significantly different from zero which indicated a good fit and correctness of the specified distributional assumption. The significant value of γ also indicated that there were significant technical inefficiency effects in the production of lentil.

Farm specific technical efficiency

It was observed that the mean value of technical efficiency was 0.64. This implied that, on average, the lentil producers in the study areas were producing lentil for about 64 percent of the potential (stochastic) frontier production levels, given the levels of their inputs and the technology currently being used. This also

indicated that there existed an average level of technical inefficiency of 36 percent (Table 5). The technical efficiency was found slightly higher for the HYV adopters (0.65) compared to non-adopters (0.63).

Technical efficiency level of different producer type indicated that majority of the producers (54.4%) had technical efficiency level below 70 percent followed by the level 91-100 percent (18.5%). For the local variety practitioners more number of farmers (71.4%) had technical efficiency level below 70 percent followed by the level 71-80 percent (16.7%). But for HYV practitioners, more number of farmers (53.0%) had technical efficiency level below 70 percent followed by the level 91-100 percent (19.7%) (Table 6**).**

Table 5. Farm specific technical efficiencies of lentil producers in the study areas

Variety	No. of farm	Technical efficiency			
		Mean	Maximum	Minimum	SD ±
HYV	498	0.65	1.00	0.38	0.19
Local	42	0.63	1.00	0.44	0.12
All types	540	0.64	1.00	0.38	0.14

Table 6. Frequency distribution of technical efficiencies of lentil producer

Technical efficiency (%)	No. of farmers	Percent (%)
≤70	294	54.4
71-80	73	13.5
81-90	74	13.7
91-100	100	18.5
All	540	100
Mean	0.64	
Maximum	1.00	
Minimum	0.38	

Yield of lentil under technical efficiency levels

The yield of lentil was examined under farm specific technical efficiency levels and was presented in table 7. As technical efficiency was defined by technically more efficient farms who obtained higher levels of yield. The highest level yield of lentil was obtained by the farmers who had technical efficiency level 91-100 percent (2135 kg/ha) followed by technical efficiency level of 81-90 percent (1633 kg/ha) and 71-80 percent (1246 kg/ha**)** (Table 7**)**. The lowest level of yield (916 kg/ha) was obtained by the farmers who had lowest levels of technical efficiency (≤70%). This further established the fact that technical efficiency and yield had a direct and positive correlation. Similar trend were also observed for HYV and local variety adaptors.

Table 7. Yield of Lentil as affected by technical efficiency level

Producer type	Yield (kg/ha)				
	≤70	*71-80*	*81-90*	*91-100*	*All*
HYV	1022	1283	2018	2167	1474
Local	674	826	864	1086	819
All types	916	1246	1633	2135	1428

Constraints

Although lentil is a profitable crop in the study areas, the sample farmers encountered different constraints. The major constraints faced by the HYV farmers were disease infestation and lack of storage facities (19%), lack of knowledge (18%), untimely rainfall (17%), high price of input (16%), lack of suitable land (15%) and unavailability of HYV seed (13%). The constraints faced by the local farmers were disease infestation (25%), lack of knowledge (22%) and untimely rainfall (18%). Farmers opined that for these constraints they were not getting the normal yield (Table 8).

Table 8. Constraints to lentil cultivation

Constraints	HYV				Local variety			
	Natore	Jessore	Meherpur	All	Natore	Jessore	Meherpur	All
Lack of suitable land	11	14	21	15	12	14	19	15
Disease infestation	20	22	15	19	25	27	22	25
Unavailability of HYV Seed	10	13	16	13	-	-	-	-
Untimely rainfall	18	16	17	17	19	18	16	18
High input price	17	15	16	16	16	13	15	15
Lack of training/ knowledge	16	18	20	18	21	24	22	22
Lack of storage facilities	18	19	21	19	16	15	17	16
Impure fertilizer	11	10	13	11	9	8	10	9

Conclusion and Recommendations

Farm level input use varied significantly from area to area. This might be due to the knowledge gap among the lentil growers. The average technical efficiency of lentil growers is found 64 percent. This indicates a good potential for increasing lentil output by 36 percent with the existing technology and level of inputs used. Farmers' educations and training have positive significant effect on yield and efficiency of lentil production. Improved varieties of lentil cultivation increase yield as well as highly profitable to the farmers. But infestation of insects like

aphid, and diseases (stemphyllium blight, foot rot) is a common constraint in lentil cultivation. Short duration and stress tolerant 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 lentil varieties. And also researchers should develop integrated pest, disease and insect management schedule which are environment friendly and ecologically sound. Farmers training on lentil production should be needed and also extension works should be strengthen on lentil cultivation. Therefore, Government may provide more subsidies on the production and distribution of these important inputs, and make them available at local markets with reasonable price.

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