Published with Open Access at Journal BiNET
Vol. 12, Issue 01: 996-1002
Journal of Bioscience and Agriculture Research
Journal Home: www.journalbinet.com/jbar-journal.html

Socio-economic impact and profitability of liming by dolochun on vegetable production in acidic soil of Sreepur, Gazipur

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ABSTRACT

Impact of dolochun in terms of changes in yield and profitability of selected vegetables were studied. Sreepur upazila of Gazipur district was the location of this study. Sixty respondents were selected as the sample of the study by using proportionate random sampling technique. Data were collected with the help of an interview schedule. Statistical measures such as mean, number, percentage, standard deviation and t-test were administered to express result. Production of bitter gourd, snake gourd, red amaranth and ladies finger increased significantly and return found from the yield of those selected vegetables also increase significantly after adoption of dolochun technology. The benefit cost ratio (BCR) of selected vegetables such as bitter gourd, snake gourd, red amaranth and ladies finger was found 2.50, 2.41, 2.24 & 2.39 after application of dolochun before that it was 2.12, 2.09, 1.98 & 2.14 respectively. The study reflects that dolochun application can improve the yield efficiency and will help to increase profitability of the farmers.

Key Words: *Vegetable, Soil acidity, Dolochun, Yield and Profitabiliy*

Cite Article: Hasan, M. M., Pramanik, S., Haq, M. E. & Tareq, M. Z. (2017). Socio-economic impact and profitability of liming by dolochun on vegetable production in acidic soil of Sreepur, Gazipur. *Journal of Bioscience and Agriculture Research,* 12(01), 996-1002.

I. Introduction

Soil acidity is a great problem for Bangladesh as well as all over the world. Approximately 30 percent of the world's total land area consists of acid soils, and it has been estimated that over 50 percent of the world's potential arable lands are acidic (Von and Mutert, 1995). Soil acidity and elemental toxicities or deficiencies associated with it, affects crop growth and restricts yield throughout the world (Eswaran et al., 1997). Acid soils are usually excessive in soluble Al and Mn and deficient in P, Ca, Mg and Mg and Mo, that may cause their reduced uptake and lead to nutrient imbalances in plants (Foy, 1984; Clark and Baligar, 2000). Amelioration of acid soil by different liming materials can raise soil pH, benifiting soil properties and plant growth and liming is widely practiced for improving the acid soils productivity (Edmeades and Ridley, 2003). There are planting of liming materials that can be used to neutralize soil acidity, but majority of them comes from ground limestone such as calcite

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($CaCO_3$) and dolomite ($CaCO_3$, $MgCO_3$). In order to produce a better crop yield on acid soils, farmers are recommended to apply alkaline materials such as lime to increase the soil pH in amounts ranging from one-half ton to as much as two ton of effective calcium carbonate lime per acre (Abdenna and Negassa, 2007). In Sreepur upazila of Gazipur district, the pH is highly acidic to moderately acidic and there is a small change of pH with land type and it ranges from 4.90 – 5.73 (Begum et al., 2009). When soils are too acidic for a particular crop, Dolomite which is locally known as Dolochun can be used to increase soil pH to the desired level. The amount of dolochun required to correct an acidic pH will depend on the soil and the crop. Considering the above views, a survey was conducted in 2013-14 in Sreepur upazila to know the socio economic characteristics of the dolochun adopted farmers, measure the impact of dolochun on the productivity of vegetable production and estimate the profitability of vegetable production by using dolochun.

II. Materials and Methods

The study was conducted at Sreepur upazila in Gazipur district during the period from March'13 to April'14 by direct interviewing of the respondents through interview schedule and discussion with the concerned experienced farmers. Total sixty farmers were selected using simple random sampling technique from three unions (Maouna, Telihati and Bormi) of Sreepur upazila in Gazipur district. The final interview schedule related to socio-economic characteristics of the sample farmers, costs and returns and the problems faced by them in relation to vegeable producion and dolochun technology. The impact of liming by dolochun technology on vegetable production was measured in terms of increased income from the increased yield of vegetables after adopting dolochun technology. The selected vegetables were bitter gourd, snake gourd, red amaranth and lady's finger. The increased yield was calculated by deducting selected vegetables' yield before adoption of dolochun technology from those after adoption of dolochun technology. In order to justify the mean yield differences between before and after dolochun application paired t-test was used. To assess the profitability level simple tabular technique was used and benefit cost ratio (BCR) was computed, Where, BCR= Present worth of benefit/Present worth of cost. Data entry and analysis was done using computer software program SPSS and Microsoft excel. Respondents were also asked to mention the problems they faced in adoption of dolochun technology.

III. Results and Discussion

Socio-economics of respondents

Characteristics profile of the dolochun beneficiaries were determined and presented in Table 01. The findings indicate that most of the respondents were middle aged (48.3%) and can sign only (43.3%). It was also found that majority of them had medium family size (61.6%), medium farm size (43.4%), low farming experience (48.3%), medium extension contact (61.7%), medium training experience (48.3%) and had medium knowledge (70%) on dolochun technology.

Cost from vegetable production

The cost of production included costs for human labor, dolochun, fertilizers, manures, seeds, land use and land opportunity cost. Costs of all resources were calculated on per hectare basis. Per hectare cost of bitter gourd, snake gourd, red amaranth and lady's finger production are presented in Table 02 and Table 03. It was found that per hectare gross costs of bitter gourd, snake gourd, red amaranth and lady's finger production were Tk.45,667, Tk.45,456, Tk.26,703 and Tk.39,844 respectively before adopting dolochun technology but after application of dolochun bitter gourd, snake gourd, red amaranth and lady's finger production were Tk.48,326, Tk.48,018, Tk.29,338 and Tk.42,404 respectively.

Impact of dolochun technology

Dolochun has supposed to play positive role in changing total vegetable production and resultantly increasing return of the respondents. Changes in terms of increase in selected vegetable production and change in return of the respondents are discussed below.

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Impact on yield of vegetable

Yield of selected vegetables were assessed before and after use of dolochun and mean differences were compared using paired t-test which are shown in Table 04. Data in Table 04 revealed that mean production of bitter gourd, snake gourd, red amaranth and lady's finger increased significantly after application of dolochun.

Table 01. Distribution of the respondent according to their socio-economic characteristics

Characters	Measuring unit	Categories	No. of respondents	Percent	Mean	SD
Age	Actual year	Young aged(up to 35)	25	41.7	38.46	9.40
		Middle aged(36-45)	29	48.3		
		Old (>45)	6	10.0		
Education	Year of schooling	Illiterate(0)	16	26.7	1.97	2.14
		Can sign only	26	43.3		
		Primary (1-5)	14	23.3		
		Secondary(5-10)	4	06.7		
Family size	Number	Small(up to 4)	18	30.0	4.4	1.18
		Medium(5 to 6)	37	61.6		
		Large(>6)	5	8.4		
Farm size	Actual (ha)	Small(0.5-1.0)	23	38.3	1.95	1.76
		Medium(1-3)	26	43.4		
		Large(>3)	11	18.3		
Farming experience	No. of years	Low(up to 12)	29	48.3	9.75	5.79
		Medium(13-23)	20	33.3		
		High(>23)	11	18.3		
Extension contact	Scores	Low(up to 20)	13	21.7	24.4	4.09
		Medium(21-28)	37	61.7		
		High(>28)	10	16.6		
Training experience	No. of trainings	No training(0)	16	26.7	2.23	1.05
		Poor training(1-3)	8	13.3		
		Medium training(4-5)	29	48.3		
		High training(>5)	7	11.7		
Knowledge on dolochun technology	Score	Low(up to 11)	11	18.3	13.23	2.27
		Medium(12-15)	42	70.0		
		High(>15)	7	11.7		

Table 02. Per hectare inputs for vegetable before and after using of liming by dolochun

Characters	Units	Bitter Gourd		Snake Gourd		Red amaranth		Lady's Finger	
		Before Dolo-chun Use	After Dolo-chun Use	Before Dolo-chun Use	After Dolo-chun Use	Before Dolo-chun Use	After Dolo-chun Use	Before Dolo-chun Use	After Dolo-chun Use
Variable input									
Human labour (hired)	Man-days	90	92	90	92	29	31	68	70
Animal labour (hired)	Pair-days	14.03	14.03	14.03	14.03	14.03	14.03	14.03	14.03
Seed/Seedlings	Kg	48.2	48.2	51.2	51.2	51.2	51.2	43.2	43.2
Dolomite	Kg	-	800	-	800		800	-	800
Fertilizers									
Urea	Kg	107.51	104.51	107.51	104.51	87.51	84.51	97.51	94.51
TSP	Kg	30.45	28.45	30.45	28.45	22.45	21.45	28.45	26.45
MoP	Kg	38	35	38	35	28	25	30.2	31.3
Zypsum	Kg	8.48	7.48	8.48	7.48	7.48	6.48	7.48	7.08
Pesticide	ML	15.08	15.08	15.08	15.08	11.08	11.08	15.08	15.08

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Fixed input								
Human Labour Cost (Family)	Man-days	24	24	24	24	18	18	22	22
Total Human Labour	Man-days	114	116	114	116	51	49	90	92

Table 03. Per hectare cost (BDT) of vegetable before and after the use of liming by dolochun

Characters	Bitter Gourd		Snake Gourd		Red amaranth		Lady's Finger	
	Before Dolochun Use	After Dolochun Use	Before Dolochun Use	After Dolochun Use	Before Dolochun Use	After Dolochun Use	Before Dolochun Use	After Dolochun Use
Human Labour Cost (Hired)	20,861	21,361	20,861	21,361	9,704	9,989	16,911	17,234
Draft Power Cost	4,910	4,910	4,910	4,910	3,910	3,910	4,910	4,910
Seed/Seedling Cost	2234	2,234	2,023	1,926	1,050	1,050	1,202	1,202
Fertilizer cost								
Urea	2,253	2,153	2,253	2,153	1,745	1,698	1,836	1,790
TSP	750	670	750	670	591	577	732	670
MoP	615	570	615	570	548	498	609	570
Zypsum	298	212	298	212	258	195	298	212
Dolochun	-	2,500	-	2,500	-	2,500	-	2,500
Pesticide Cost	1,542	1,542	1,542	1,542	678	702	1,542	1,542
Irrigation Cost	1,536	1,506	1,536	1,506	1,035	1035	1,536	1,506
Total Variable Cost	34,999	37,658	34,788	37,350	19,519	22,154	29,576	32,136
Human Labour Cost (Family)	5,524	5,524	5,524	5,524	3,092	3,092	5,124	5,124
Opportunity Cost of Land	5,144	5,144	5,144	5,144	4,092	4,092	5,144	5,144
Total Fixed Cost	10,668	10,668	10,668	10,668	7,184	7,184	10,268	10,268
Total Cost	45,667	48,326	45,456	48,018	26,703	29,338	39,844	42,404

Table 04. Comparative yield of vegetable during pre and post adoption of dolochun technology

Characters	Yield(kg/ha)		Difference (%)	t-value
	Before Dolochun use	After Dolochon use		
Bitter gourd	18500	17100	8.18	5.834**
Snake gourd	19600	17900	9.49	2.89**
Red amaranth	7300	6612	10.41	5.045**
Ladies finger	11760	10540	11.57	3.841**

Profitability from vegetable production

Per hectare profitabiliuty of bitter gourd, snake gourd, red amaranth and ladies finger under pre and post adoption of dolochun are given in Table 05. Gross margin has been estimated by taking the difference between total return and variable cost. The argument for using the gross margin analysis is that the farmers of Bangladesh are more interested to know their return over variable cost. For short run analysis as well as for farm planning, the gross margin analysis is widely used and this analysis is

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easily understandable to the farmers because of its simplicity. Table 05 shows that per hectare gross margin of bitter gourd, snake gourd, red amaranth and ladies finger cultivation by using dolochun were Tk.83,640, Tk. 78,542, Tk.43,651 and Tk.69,438 whereas before using dolochun it was Tk. 61,815, Tk.60,215, Tk.33,561 and Tk.55,690. Per hectare net return was determined by deducting all cost (variable fixed) from gross return. Table 05 shows that per hectare net return of bitter gourd, snake gourd, red amaranth and ladies finger cultivation by using dolochun were Tk.72,972, Tk. 67,874, Tk.36,467 and Tk. 59,170 whereas before using dolochun it was Tk.51,147, Tk.49,547, Tk.26,377 and Tk.45,422. It indicates that net return was increased after application of dolochun. Return over per Taka investment or Benefit-cost-ratio (Undiscounted) was cultivated as a ratio of gross return to gross cost. Table 05 shows that per hectare BCR of bitter gourd, snake gourd, red amaranth and ladies finger cultivation by using dolochun were 2.50, 2.41, 2.24 and 2.39 whereas before using dolochun it was 2.12, 2.09, 1.98 and 2.14; implying that production of vegetables was profitable but after application of dolochun, it was more profitable.

Table 05. Comparative profitability of vegetable before and after the use of liming by dolochun

Characters	Bitter Gourd		Snake Gourd		Red amaranth		Lady's Finger	
	Before Dolo-chun Use	After Dolo-chun Use	Before Dolo-chun Use	After Dolo-chun Use	Before Dolo-chun Use	After Dolo-chun Use	Before Dolo-chun Use	After Dolo-chun Use
Yield(Kg/ha)	17100	18500	17900	19600	6612	7300	10540	11760
Gross Return(Tk/ha)	96,814	1,21,298	95,003	1,15,892	53,080	65,805	85,266	1,01,574
Variable Cost(Tk/ha)	34,999	37,658	34,788	37,350	19,519	22,154	29,576	32,136
Total cost(Tk/ha)	45,667	48,326	45,456	48,018	26,703	29,338	39,844	42,404
Gross Margin(Tk/ha)	61,815	83,640	60,215	78,542	33,561	43,651	55,690	69,438
Net Return(Tk/ha)	51,147	72,972	49,547	67,874	26,377	36,467	45,422	59,170
BCR	2.12	2.50	2.09	2.41	1.98	2.24	2.14	2.39

Problems faced by respondents in relation to vegetable production

Attempt has been made to find out the problems in adopting dolochun technology. Respondents were asked to mention the problems they faced in this correction. After compiling their responses, five major problems were identified. Rank order of their problems has been furnished in Table 06.

Table 06. Problems cited by the respondents according to their number of responses

Sl. No.	Problems	Respondents (N=60)		Rank Order
		Number	Percent	
1	Lack of knowledge for improved crop production and dolochun technology	46	76.67	1st
2	Inadequate supply of dolochun	44	71.67	2nd
3	Lack of proper training facilities	35	58.33	3rd
4	Impurities in dolochun	31	51.67	4th
5	Lack of marketing facilities	22	36.67	5th

Knowledge on any technology makes it easier to decide on any technology to adopt or reject. It increases confidence level of any individual. As dolochun is a new technology, therefore, their knowledge level especially principle knowledge and application knowledge are might be lower which is essential for construction of positive attitude towards adoption of dolochun technology. Hence, it came as first problem in adoption of dolochun technology. High acidic soil causes a hazardous problem for crop production. Optimum pH level is suitable for high yield. That's why, dolochun should be used properly. But if adequate dolochun is not provided among the farmers in time, then they cannot use it to reduce pH level in time. There might be high price of lime so that they cannot afford to buy it. Therefore, it came as the second important problem. Proper training facilities play an important role

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for developing knowledge, skill and attitude of an individual. It encourages an individual to adopt a new technology. It helps an individual to participate more in the development process more cheerfully with confidence. But training facilities is not provided properly among the farmers. May be the educational level of the farmers is poor so that they cannot realize about the essentialities of the training experience or a few training institutions are situated nearby of that area. But maximum institutions are situated far away from that area. So farmers are unable to go there due to poor transportation facilities. Hence, it came third most important problem. Farmer's use dolochun in their field to correct soil pH and make the soil tilth but sometimes they found impurities in dolochun which affect their soil productivity. So, it came as forth important problem. Marketing of the agricultural and other products is a key factor for successful production. There are many problems associated with other marketing channel like storage of agricultural product during the production boom, middle man intervention, lack of cooperation at farmers' level, perishable characteristics of vegetables, high transportation cost etc. Farmers have been encountering their marketing related problem. Therefore, it came as fifth most important problem.

IV. Conclusion

Most of the respondents were middle aged (48.3%) and had medium farm size (43.4%). Yield of selected vegetable was increase significantly after adoption of dolochun technology. The differences of gross return and benefit cost ratio (BCR) was saisfactory between post and pre adoption of dolochun technology. Thus the impact of dolochon application on vegetable production is certainly a very good practice in acid soils and it may create greater congenial results if the existing problems faced by the farmers could be overcome. However, identified problems faced by the respondents were 'lack of knowledge on improved crop production and dolochun technology', 'inadequate supply of dolochun', 'lack of proper training facilities', 'impurities in dolochun' and 'lack of marketing facilities'.

V. References

[1]. Abdenna, D., Negassa, C. W. & Tilahun, G. (2007). Inventory of soil acidity status in crop lands of central and western Ethiopia. Utilisation of diversity in land use systems: sustainable and organic approaches to meet human needs, Witzenhausen. pp. 9-11.

[2]. Begum, K., Jahan, I., Rahman, M. H., Chowdhury, M. S. & Elahi, S. F. (2009). Status of some micronutrients in different soils of Gazipur district as related to soil properties and land type. *Bangladesh J. Sci. Ind. Res.* 44(4), 425-430.

[3]. Clark, R. B. & Baligar, V. C. (2000). Acidic and alkaline soil constraints on plant mineral nutrition. Plant environment interactions II, Marcel Dekker Inc, Ny. pp. 133-177.

[4]. Edmeades, D. C. & Ridley, A. M. (2003). Using lime to ameliorate topsoil and subsoil acidity. In: Rengel, Z.(ed.), Handbook of Soil Acidity. Marcel Dekker, Inc., NewYork, Basel. pp. 297-336. https://doi.org/10.1201/9780203912317.ch11

[5]. Eswaran, H., Reich, P. & Beinroth, F. (1997). Global distribution of soils with acidity. In: Moniz, A. C., Furlani, A. M. C., Schaffert, R. E., Fageria, N. K., Rosolem, C. A. & Cantarella, H. (eds.). Plant-Soil Interactions at Low pH. Campinas, Brazil, Brasilian Society of Soil Science. pp. 159-164.

[6]. Foy, C. D. (1984). Physiological effects of hydrogen, aluminum, and manganese toxicities in acid soil. In:. Adams, F. (ed.). Soil Acidity and Liming. American Society of Agronomy, Inc., Madison, WI. pp. 57-97.

[7]. Von, U. H. R. & Mutert, E. (1995). Global extent, development and economic impact of acid soils. In: N. J. Crunden et. al. (eds). Plant-soil interactions at low pH: principles and management. Klower Academic Publishers, Netherlands. pp. 5-19.

HOW TO CITE THIS ARTICLE?

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Hasan, M. M., Pramanik, S., Haq, M. E. & Tareq, M. Z. (2016). Socio-economic impact and profitability of liming by dolochun on vegetable production in acidic soil of Sreepur, Gazipur. *Journal of Bioscience and Agriculture Research,* 12(01), 996-1002.

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Hasan, M. M., Pramanik, S., Haq, M. E. & Tareq, M. Z. "Socio-economic impact and profitability of liming by dolochun on vegetable production in acidic soil of Sreepur, Gazipur". *Journal of Bioscience and Agriculture Research,* 12 no.01(2017): 996-1002.

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