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Socioeconomic evaluation of insecticide use pattern on lablab bean cultivation at farm level in selected areas of Chittagong

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Abstract: The study was conducted at Satkania, Patiya and Hathazari upazilas of Chittagong district during 2008 to identify different pest problems and practices, input use and economic returns at farmers' levels. It was found that bean borer, white fly and aphids were the key insect pests for lablab bean production in the study areas. Majority of the farmers of Satkania was sprayed insecticides more than 21 times in lablab bean cultivation. Insecticide dealers were the major source of information to farmers on the selection of chemicals and application methods. Very few farmers used protective measures or safety measures during insecticide application where 39% of the respondents did not use any safety measures. On an average 61% believed that insecticide application are harmful to farm labor. This study reflects the irrational use of insecticide in vegetables cultivation that has serious consequences to human health and environment. Study found that average gross margin was Tk 94873 and net return per hectare on the basis of full cost was Tk 90161 for lablab bean production. It was also found that the average returns to labor was Tk 686/man-day on full cost basis and Tk 712/man-day on variable cost basis respectively.

Key words: Socioeconomic evaluation, lablab bean, insecticide use.

Introduction

Lablab bean is popularly known as 'Seem'. It is grown in 0.402 million hectare of land which is only about 62.13% of total land under vegetables in Bangladesh (BBS, 2005). In Bangladesh, it is one of the most common, popular and principal vegetable crops grown throughout the country. It is nutritious as a green pods provide a good amount of protein in addition to vitamins and minerals (Gopalan *et al.,* 1982). Moreover, its immature green pods are eaten boiled or roasted, and young shoots and inflorescences are also eaten boiled (sultana, 2001). According to AIS recommendation that vegetable consumption in Bangladesh should be 213 g per head per day (AIS, 2007) which is stands to 9.21 million metric tons. The annual vegetable production is 1.74 million metric tons (BBS, 2005). There is a big gap 7.47 m metric tons of about between the demand and supply of vegetables (BBS, 2005). Lablab bean farmers often fail to obtain the expected yield due to heavy damage caused by various insect pests and diseases and farmers sprayed insecticides quite frequently (Anon., 2000). The development of agriculture, the improvement of the food production technology and mainly the demands of the new markets for better products both in quality and quantity have been made among others with intensive uses of insecticides for ensuring productivity (Trevisan *et al.*, 2004). Insecticide being toxic can become a potential hazard to the manufacturers, users, the public at large and the environment (Kabir *et al.* 2008). Insecticide can produce negative impacts, both socially and economically (Antle and Pingali, 1994). Both overuse and misuse of insecticides may lead to the loss of effectiveness of insecticides due to the development of resistance (Forrester, 1990) and could cause human health hazards and environmental pollution (Maclntyre *et al*., 1989). Paul (2003) reported that intensified use of insecticides can cause a serious public health hazards especially in the form of residues in food. Inappropriate selection of insecticides and doses, improper spray scheduling and inadequate spray coverage (Phillips *et al*., 1990) may cause to the failure in controlling insect pests. For vegetables in general, Sabur and Mollah (2000) observed an increase in use of insecticides by farmers in combating pests throughout Bangladesh. So far, no published reports are available on the economic analysis of insecticide use on lablab bean production. Kabir *et al.* (1996) conducted a survey on insecticides usage pattern on vegetables at Jessore region. In the present study an attempt was made to document the existing pattern (kind, frequency etc.) and economic assessment of insecticide use on lablab bean production at farmers' level in Chittagong region with the objectives: i) to know the socioeconomic characteristics of insecticide users ii) to know the application of insecticides for lablab bean cultivation iii) to determine cost and return of the production of lablab bean, and iv) to observe the impact and implication of using insecticides.

Materials and Methods

The survey was conducted at three upazila namely Hathazari, Patiya and Satkania under Chittagong district during 2008. Because of intensive bean cultivation in that upazilas a total of 120 farmers were selected purposively taking 40 from each study area. Simple random sampling technique was followed in selecting the sample farmers. Data were collected from the sample farmers during the period April to May 2008 through field survey using pre-designed and pre-tested interview schedule. The collected data were coded, edited for processing through tabular method using average, percentage and ratio etc.

Estimation of Gross Margin: The gross margin or the income above variable costs for each enterprise is needed to consider for selection of a crop. The higher the gross margin of the crop enterprise, the more it will be preferred (Gonzales *et al.*, 1986, Climents, 1985 and Mc Gillivary, 1961). The gross margin for a simple crop enterprise is the difference between total income and total variable costs. The cost of all inputs either it was home supplied or purchased, have calculated as cash cost or direct expenses. To determine the cost for home supplied inputs, opportunity cost concept was applied. The total income of lablab bean is equal to output price time's yield or production. Return to human labor is estimated by deducting all variable costs other than costs of labor from gross return and dividing the figure by numbers of man days (human labor) employed for bean production.

Results and Discussion

Socio-economic profile of the farmers

An effort was made to focus briefly on some important features of the farmers. Socio-economic characteristics of the farmers affect their production patterns; technology use, and influence their farm decision-making process. Enterprise combination, consumption pattern and employment of different farm households would be influenced by their various characteristics as well as some other socio-economic aspects of the farm households such as, age distribution, level of education, family size and composition, occupation, land ownership and dependency status etc.

Age: Age is the important factor for working in the field. Young aged farmers work more than old age farmers because of their physical & mental energy. In this study not a single farmer was found below the age of 20. For this reason age group was calculated from 20. Majority of the farmers (53%) was within age group of 20-40 years that means more middle age people were engaged in vegetable cultivation (Table 1).

Table 1. Socioeconomic characteristic of the insecticide users

Particulars	Hathazari	Patiya	Satkania	Average
Age:				
20-40	22 (55)	21 (53)	21 (53)	21 (53)
41-60	13 (32)	12 (30)	11 (27)	12 (30)
60+	5 (13)	7 (17)	8 (20)	7 (17)
Education (years of schooling):				
Illiterate	6 (15)	6 (15)	5 (12)	6 (15)
Primary level	25 (63)	22 (55)	23 (58)	23 (58)
Secondary level	5 (12)	6 (15)	7 (18)	6 (15)
Above secondary level	4 (10)	6 (15)	5 (12)	5 (12)
Farm size (ha/farm):				
Total cultivated land	1.26	1.51	1.33	1.37
Own cultivated land	1.12	1.06	0.97	1.05
Family size (No./farm):	4.9	5.2	4.7	4.93
Occupation (%):				
Agriculture	79	72	68	73
Service	7	10	18	12
Business	14	18	14	15

Level of education: Education helps a farmer to take risk and adoption of new technology. Gross and Tales (1952) observed that the educated farmers differentiated themselves from non-educated ones with respect to the acceptance of recommended farm practices. Education helps a farmer to go to extension workers for solving any problem regarding crop production. According to the education level, the farmers were categorized into four groups such as “no education”, “primary level” (up to class five), “secondary level” (class six to ten) and “above secondary”. On an average 15% of the farmers were illiterate. The highest proportion (58%) of the farmers belonged to the primary level of education, while about 15% and 12% of them belonged to secondary and above secondary levels of education, respectively. The study also revealed that the literacy percentage (85%) of the farmers in the study area were quite high than that of national average of 51.6% (Anon. 2009).

Table 2. Land distribution pattern of lablab bean growers (ha/farm)

Crop	Hathazari	Patiya	Satkania	Average	% of Total Cultivation
Total vegetable area	0.29	0.23	0.37	0.30	23
Lablab bean area	0.07	0.08	0.08	0.08	6

Source: Field survey, 2008

Table 3. Percentage of the farmers indicating the insect infestation in lablab bean

Crop	Major pest	% of farmer			Average
		Hathazari	Patiya	Satkania	
Lablab bean	Bean borer	70	85	75	77
	Aphids	50	30	14	31
	Whitefly	65	70	75	70

Source: Field survey, 2008

Table 4. Insecticides spraying pattern on Lablab bean cultivation

Location	Spraying interval (day)	Total spray (no.)	% of sprayer		% of machine owner
			Spray machine	Piskari	
Hathazari	7	19	80	20	43
Patiya	7	15	80	20	40
Satkania	6	21	79	21	47

Source: Field survey, 2008

Family size: Family size and composition of farm families indicate availability of family labor. The family size in this study was defined as the number of persons either working or non-working and living together in the family, which included wife, sons, unmarried daughters, father, mother, brother, etc. The average size of the household was 4.93 (Table 1) which was more or less similar to the national average of 5 (BBS 2006)

Farm size: Land holding is another socioeconomic condition for the farmers that sometimes indicate financial condition of the farmers. In the present study, the size of farm is defined as the own cultivated land and rented in mortgaged in minus rented out/mortgage out lands in the year of investigation. The average farm size per household was 1.05 ha. (Table 1).

Major occupation: Cultivation was the main occupation for majority of farmers (73%) in the study area (Table 1).

Land Covered Under Vegetables

About 23% of the total land was used for different types of vegetable cultivation. The farmers were growing lablab bean in their 6% of the total land of vegetable cultivation (Table 2). About 6% area is covered by lablab bean which indicates that adaptation rate is very poor due to lack of scientific knowledge about its production technology and lack of linkage with extension workers as well as unavailability of HYV seed.

Insect Pests and their Management

Common Insect Pests of lablab bean: Bean borer, whitefly and aphids were found the key insect and pests in the study area in lablab bean production (Table 3).

All the farmers of all the three locations indicated bean borer as the main insect pest in lablab bean while 70% of them mentioned whitefly as the damaging insect in lablab bean. Only 31% percent of the farmers reported that aphids were the damaging insect for lablab bean production also.

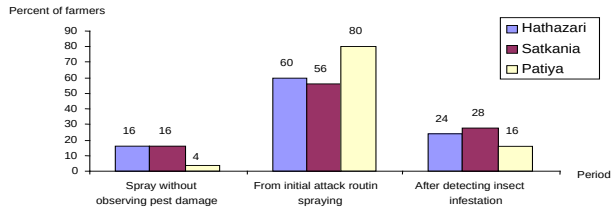

Figure 1 Period of pesticide application by farmers

Control Procedure and Other Aspects of Insecticide Use

Most of the farmers relied only on insecticide for control of insect pests and maximum of them (80%) used it from the initial attack and thereafter on a routine basis. Only 16% of the farmers of both Hathazari and Satkania and 4% farmers of Patiya sprayed insecticides in their fields without observing the attack of insect pests. The proportion of farmers spraying insecticides after detection of insect pest in their crops was 28% in Satkania, 24% in Hathazari and 16% in Patiya (Fig.1).

Interval of insecticides spraying: Insecticide application depended upon the season. During rainy season farmers' sprayed insecticides every day in Lablab bean at Chittagong region while in the winter season, interval was more than 7 days. Most of the farmers (80%) used sprayer machine in spraying insecticides, while only 20% used piskari which was locally made by bamboo (Table 4). Above 43% of the Lablab bean growers were the owner of the spray machine in the study area. Lablab bean is the crop in which the farmers applied insecticides to the highest frequency of 21 times in Satkania, 15 times in Patiya and 19 times in Hathazari.

The insecticide usage in Hathazari was much more judicial. This was probably because of the existence of regional agricultural research station there. The farmers of Hathazari got information about insect pest control from both the researchers and extension personnel.

Although the farmers of Chittagong region were more aware of the harmful effects of insecticide application, but they did not seem to follow the instructions of research workers and extension personnel or the labels on the bottles of insecticides before applying these. They normally used insecticides whenever they needed.

Types of Insecticides Applied for the Selected Vegetables

Lablab bean shoot and fruit borer, whitefly and aphids were the key insect pests in Lablab bean cultivation. Farmers of Chittagong region using too many toxic chemicals and applying them too frequently to control these insect pests and diseases. The growers used a variety of insecticides belonging to various chemical groups with various formulations which are mentioned in the Table 5.

Insecticide use advice: Study found that farmers received advice on the selection of chemicals and their doses of application from the insecticide sales agents (60%) followed by research workers (12%), neighbors (9%) and extension workers (8%). This indicated that the dealers of insecticides and research workers are important factors of insecticide application in the study areas (Table 6).

Protective measures adopted during use of insecticide: Very few farmers used protective clothing or other safety measures during insecticide application. A proportion of 39% of the farmers did not use any safety measures at all (Table 7). Only 8% covered their faces with cloth during insecticide application, while nearly 32% of them covered their body and wore shirts at the time of insecticide application. Only 21% reported that they covered both their faces and bodies. No farmer used glasses or other form of protective devices to protect their eyes during insecticide application.

Environment pollution due to insecticides use: Approximately 45% of the farmers expressed the view that insecticide application polluted water (Table 8). Sixty one percent of them believed that insecticide application was harmful to the health of farm labors. Over 34% of the farmers felt that insecticide application polluted the air. A proportion of 38% of the farmers reported that insecticides caused harm to natural enemies of insects. Thus, the majority of farmers believed that the adverse effect of insecticide application was more serious compared to the effect of other farm operations.

Input use pattern

Total number of human labor required for bean cultivation was 180 man days ha^{-1}. The application of urea, TSP, MoP and manure were 216 Kg ha^{-1}, 62kg ha^{-1}, 68 kg ha^{-1} and 5492 kg ha^{-1} respectively.

Table 5. Type of insecticides used by Lablab bean growers to control pests and diseases at surveyed area

Trade name	percent of farmers'			
	Hathazari	Patiya	Satkania	Average
Marshal 20EC6	48	12	48	36
Furadan 5G	56	12	8	25..33
Sevin 85SP	8	-	-	2.67
Malathion 57EC	8	-	-	2.67
Sumithion	12	-	-	4
Perfecthion 40EC	-	20	-	6.67
Dimethion 40EC	-	24	-	8
Tafgor 40EC	-	4	-	1.33
Kinolux 25EC	-	4	4	2.67
Relothrin 10EC	4	4	-	1.33
Cypermethrin 10EC	-	-	4	1.33
Ripcord 10EC	12	-	12	8
Pyriphos	4	-	-	1.33
Karate 25EC	16	12	4	10.67
Actara 25WG	12	16	4	10.67
Theovit	16	16	8	13..33
Dithane M-45	-	8	8	5.33
Cosavit	-	8	4	4
Bevistin	-	8	4	4
Ridomil Gold	12	-	-	4

Table 6. Source of information about insect pest control

Source	% of respondent			Average
	Hathazari	Patiya	Satkania	
Insecticide dealers	32	65	83	60
Neighbors/relatives	15	8	3	9
TV/ Radio	-	2	-	1
Extension workers	8	10	6	8
Show labels on the bottle of insecticide	10	8	-	6
Research workers	31	2	4	12
Company agents	4	5	4	4

Table 7. Protection measures taken by the farmers during insecticide application

Protection measures	% of respondents			Average
	Hathazari	Patiya	Satkania	
Cover face	8	11	5	8
Cover body	27	30	39	32
Cover face and body	21	20	22	21
No protection measures	44	39	34	39

Table 8. Farmers awareness about the detrimental effect of insecticides use

Particulars	% of respondents			Average
	Hathazari	Patiya	Satkania	
Water pollution	35	49	50	45
Air pollution	25	27	51	34
Harmful to natural enemies	30	50	34	38
Health hamper	62	55	67	61
Not harmful	3	10	-	4

Cost of Lablab bean production

Total operating costs were classified into two major groups such as labor, power tiller cost and material costs. In addition these, two indirect costs namely interest on operating capital and land use cost were considered to compute total cost of producing Lablab bean.

Cash cost defines all cash expenses while full cost defines all cash and kind cost including fixed costs. Power tiller was used mainly for land preparation. Total cost of production of Lablab bean was Tk 71848 ha^{-1} in which human labor cost was the lion share (46%) and it followed by support material i. e. bamboo/stick cost (16%),

fertilizer cost (10%), power tiller cost (10%), insecticides cost (6%) and seedlings cost (2%) etc. Cost of production of Lablab bean were Tk 67136 ha^{-1} and Tk 53384ha^{-1} on the basis of total variable cost and total cash cost, respectively (Table 9). Study found that yield of Lablab bean was 8.95 t/ha. Hence average gross margin was estimated Tk 94873 and Tk 108625 on variable cost and cash cost basis respectively. Net return per hectare on the basis of full cost was estimated at TK 90161. To measure the efficiency of labor, returns to labor was calculated. It was found that the average returns to labor was Tk 686/man-day on full cost basis, Tk 712/man-day on variable cost basis and Tk. 719/man-day on cash cost basis respectively. Average return to each spent on production is an important criterion for measuring profitability for producing Lablab bean. Study found that the average benefit cost ratio was 2.25 on full cost basis, 3.03 on cash cost basis and 2.41 on variable cost basis.

Table 9. Per hectare cost and return from producing Lablab bean

Items	Quantity	Cost and returns	% of total
Human labour (Man-days)	180	33300	46.35
Family	68	12580	17.52
Hired	112	20720	28.83
Power tiller cost (Tk)	-	7281	10.13
Material cost			
Seeds/Seedlings (No.)	-	1264	1.76
Fertilizer cost (Tk)	-	7477	10.40
Urea (Kg)	216	1512	2.10
TSP (Kg)	62	2170	3.02
MoP (Kg)	68	1708	2.38
Manure (Kg)	5492	2087	2.90
Home supplied	3084	1172	1.63
Purchased	2408	915	1.27
Irrigation (Tk)	-	1833	2.55
Insecticides (Tk)	-	4631	6.44
Bamboo/stick	-	11350	15.80
Land use cost (Tk)	-	4000	5.57
Int. on operating capital (Tk)	-	712	1.00
Total cost of production (Tk)	-	71848	100
Total variable cost (Tk)	-	67136	
Cash cost (Tk)	-	53384	
Returns			
Yield (T/ha)	9.85	156812	
By product (Tk/ha)		5197	
Gross return (Tk/ha)		162009	
Gross margin (Tk/ha)			
Total Variable Cost basis		94873	
Cash cost basis		108625	
Net return (Tk/ha)		90161	
Rate of return			
Full cost basis		2.25	
Variable cost basis		2.41	
Cash cost basis		3.03	
Returns to labor (Tk/man-day)			
Full cost basis		686	
Variable cost basis		712	
Cash cost basis		719	

Figures in the parentheses indicates percentage of total cost

Lablab bean cultivation is highly profitable on the basis of its returns to investment. The present study clearly demonstrated the indiscriminate, irrational and whimsical use of insecticides in Lablab bean cultivation. The existing excessive use of insecticide are causing different consequences like development of resistance power of pest, the killing of natural enemies which may again lead to the favorable condition for the development of pest population. This again results the disruption of agro-ecosystem, environmental pollution and serious threat to human health. Majorities of the farmers did not use biological and cultural methods. Very few farmers use simple sanitation method. Information dissemination through mass media should be undertaken on the successful and proper dose of insecticide use as well as the detrimental effect of insecticides use on Lablab bean cultivation.

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