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Farmers' Knowledge on Use of *Dolochun* for Crop Production

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Abstract

The purposes of this study were to determine and describe the knowledge of the farmers on use of *dolochun* (a liming material from dolomite) for crop production, to explore the relationship of the selected characteristics of the farmers with their knowledge and the contributing factors to knowledge. The study was conducted in three unions under Domar upazila of Nilphamari district of northern Bangladesh. Data were collected from randomly selected 104 farmers with a structured interview schedule during 15th April to 25th June, 2014 . Nine selected characteristics of the farmers were considered to explore relationship with the farmers' knowledge on use of *dolochun*. The regression analysis was run to identify the contributing factors that have effects on farmers' knowledge on use of *dolochun*. In addition to structured interviews, three focus group discussions in three unions were carried out to get possible solutions of the constraints as identified by the farmers during interviewing. The findings revealed that the majority of the farmers (59.6 percent) had 'fair' knowledge on the use of *dolochun* while 25.0 percent and 15.4 percent had 'poor' and 'good' knowledge, respectively. Among nine selected characteristics of the respondents, educational qualification, training exposure, organizational participation, extension media contact and attitude towards use of *dolochun* had positive significant relationship, while age and family size of the respondents had negative significant relationships with their knowledge on the use of *dolochun*. The regression analysis indicates that training exposure of the farmers contributed highest in predicting their knowledge followed by family size, extension media contact and attitude towards use of *dolochun*.

Keywords: *Farmers' knowledge, dolochun, acidic soil, northern Bangladesh*

Introduction

Soil acidity is a wide-spread problem of Bangladesh. Fifteen of the agro-ecological regions are from medium to strongly acidic in soil reaction, ranging from a pH of 4.5 to 5.5 out of thirty regions of the country (BARC, 2012). Approximately 50,000 hectares land are highly acidic to acidic resulting decreased crop production (Anonymous, 2013). Alternate wetting and drying cycle for crop production (mainly practiced for rice and wheat production) creates a complex condition in soil reaction. are influenced by such an alternate wetting and drying cycle of acidic soils (Rahman *et al.*, 2000). Several experiments and trials (Rahman et al., 2000; Rahman et al., 2001; Rahman et al., 2002 and Rahman et al., 2004) demonstrated the beneficial effect of liming and suggested liming to cure acidic soil in Bangladesh under rice-wheat cropping system. It was concluded that liming improves crop yield by eliminating the production constraints and favoring production factors related to nutrient

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Though liming is recommended as an important tool for the amendment of acidic soil, Cornel University, USA and Wheat Research Centre, Dinajpur introduce the *dolochun* (also termed as Dolomite [$CaMg(CO_3)_2$], on dissolution releases a large amount of calcium and increases calcium availability in soil after application) as lime and one of best possible solutions to cure the acidic soils in northern Bangladesh (Johansen et al., 2007). Farmers of northern Bangladesh are using this *dolochun* in their crop field randomly (which is not recommended) to cure soil acidity rather following specific recommended dose (Anonymous, 2013). This might be due to the lack of knowledge on use of *dolochun.* Thus, farmers' knowledge on use of *dolochun* need to be investigated to judge the socio-economic viability of this technology and to develop an effective management practice. Moreover, no study was available in this regards. Considering these issues, the present study has been undertaken to determine and describe farmers' knowledge on use of *dolochun* for crop production. The specific objectives of this study were: (i) to determine and describe the farmers' knowledge on use of *dolochun*; (ii) to determine and describe some selected characteristics of the farmers; (iii) to explore the relationship between the selected characteristics of farmers and their knowledge on use of *dolochun*; (iv) to determine the factors influencing the knowledge on use of *dolochun*; and (v) t o identify the constraints faced by the farmers in adopting *dolochun* and the possible solutions of these constraints.

Methodology

The farmers under the "Food for Progress for Bangladesh" project of RDRS Bangladesh (an NGO) of three unions (Domar, Vogdaburi and Jorabari) under Domar upozila of Nilphamari district were considered as the population of the study. An updated list of 310 farmers was collected from RDRS Bangladesh . Out of them, a sample of 104 farmers (34 percent) was selected by random sampling method. Simultaneously a reserve list of 10 farmers was made in order to use in case of unavailability of the sampled farmers. A structured interview schedule was prepared for collection of data containing both open and closed form of questions which was pre-tested with 10 farmers selected from the study area. In addition to structured interviews, three focus group discussions in three unions was carried out to get possible solutions of the constraints as identified by the farmers during structured interviewing. Data were collected from 15th April to 25th June, 2014.

The nine characteristics of the respondents (namely age, educational qualification, family size, farm size, annual family income, training exposure, organizational participation, extension media contact and attitude towards use of *dolochun*) constituted the independent variables and farmers' knowledge on use of *dolochun* considered as dependent variable of this study. There were 13 questions based upon different aspects and related issues of *dolochun* used to measure farmers' knowledge on use of *dolochun*. Each respondent was asked to answer all the 13 questions. A respondent could get full score against each question for correct responses, half score for partial answer and 0 for wrong answer. Thus, farmers' knowledge on use of *dolochun* of respondents could range from 0 to 35; zero (0) indicating no

knowledge and 35 indicating very high knowledge on use of *dolochun*.

The collected data were coded, compiled, tabulated and analyzed for interpretation. The SPSS computer program was used for analyzing the data. Different descriptive statistical measures such as frequency, number, percentage, mean, standard deviation and rank order was used for categorization and describing the variables. Pearson's Product Moment Correlation coefficient (r) was used for testing the relationship between the concerned variables. Regression analysis (both multiple and stepwise method) was run to explore the effects of explanatory variables on farmers' knowledge on use of *dolochun.* Thus the influential factors were identified that have effects on farmers' knowledge on use of *dolochun*.

Results and Discussion

Characteristics profile of the farmers: Nine selected characteristics of the farmers were selected to describe the characteristics profile of the farmers. Categorical distribution of these characteristics is given in Table 1.

Table 1 Characteristics profile of the farmers

Characteristics (measurement unit)	Possible range (observed range)	Respondents (n = 104)			Mean	SD
		Categories	No.	%		
Age (year)	Unknown (24 to 57)	Young (up to 35) Middle aged (36 to 50) Old (above 50)	41 51 12	39.5 49.0 11.5	39.59	8.34
Educational qualification (year of schooling)	Unknown (0.0 to 9.0)	Illiterate (0) Can sign name only (0.5) Primary education(1 to 5) Secondary education(6 to 10)	30 38 15 21	28.8 36.5 14.5 20.2	2.42	3.10
Family size (number)	Unknown (3 to 8)	Small family (up to 4) Medium family (5 to 6) Large family (7 and above)	37 40 27	35.6 38.4 26.0	5.38	1.50
Farm size (hectare)	Unknown (0.194 to 0.802)	Marginal (0.02 ha to 0.199 ha) Small (0.2 ha to 0.99 ha)	1 103	1 99	0.45	0.11
Annual family income ('000' Taka)	Unknown (52.70 to 124.00)	Low income (up to 75) Medium income (75 to 100) High income (above100)	29 45 30	27.9 43.3 28.8	88.21	16.57
Training exposure (days)	Unknown (0 to 8)	No training (0) Less than weeklong Weeklong Above weeklong	41 9 35 19	39.4 8.7 33.7 18.2	3.51	3.07
Organizational participation (score)	Unknown (10 to 31)	Low (up to 17) Medium (18 to 24) High (above 24)	26 60 18	25.0 57.7 17.3	20.96	4.81
Extension media contact (score)	11 to 33 (11 to 29)	Low (up to 17) Medium (18 to 23) High (above 23)	40 46 18	38.5 44.2 17.3	19.0	3.79
Attitude towards use of *dolochun* (score)	12 to 60 (36 to 56)	Slightly favorable (up to 42) Moderately favorable (43 to 49) Highly favorable (above 49)	24 43 37	23.1 41.3 35.6	46.25	5.15

The mean age of the farmers was found 39.59 years and about half of the respondents are middle aged. About two-third of the respondents are out of formal education and belongs to illiterate to can sign name only category. The average family size of the respondents is high compared to national average of 4.6 (BBS, 2012). Almost all of the respondents belongs to small farm size category. Majority of the respondents fall under the category of medium income although the average income is low considering the average family size of the respondents. Majority of the respondents (41 percent) are out of training exposure calling for improvement of training facilities in the study area. Organizational participation and extension media contact of the respondents are more or less satisfactory, this might be due to the fact that, sample farmers are the beneficiaries of RDRS and RDRS encourage the beneficiary farmers to participate in different organizations and social programs. Similarly the attitude of the respondents towards the use of *dolochun* in crop production is fairly favorable as the respondents are under 'Food for Progress for Bangladesh' project of RDRS and RDRS try to broaden the horizon of outlook of the beneficiaries through different non-formal education and support services which ultimately brings favorable attitude of the respondents.

Farmers' knowledge on use of *dolochun:* Farmers' knowledge score varied from 19-32 against the possible range from 0 to 35. The categorical distribution of the knowledge on use of *dolochun* of the respondents is presented in Table 2.

Table 2 Distribution of farmers according to their knowledge on the use of *dolochun*

Categories	Respondents		Mean	SD
	Number	Percent		
Poor knowledge (up to 23)	26	25.0	25.62	3.01
Fair knowledge (24 to 28)	62	59.6		
Good knowledge (above 28)	16	15.4		
Total	104	100.0		

Data presented in the table show that the highest proportion (59.6 percent) of farmers had fair knowledge, while 25.0 percent and 15.4 percent had poor and good knowledge on the use of *dolochun* for crop production, respectively. The respondents are under the 'Food for Progress for Bangladesh' project of RDRS and through this program RDRS provided different non-formal education (like training, information support etc.) and support services to the beneficiaries, all these help to broaden the horizon of outlook of the respondents which help to improve farmers' knowledge on the use of *dolochun* for crop production.

Relationships between farmers' knowledge on use of dolochun and their selected characteristics: The relationships between farmers' knowledge on use of *dolochun* and their selected nine characteristics are presented in Table 3.

Among the nine selected characteristics educational qualification, training exposure, organizational participation, extension media contact and attitude towards use of *dolochun* of the respondents had positively significant relationships with their knowledge on use of *dolochun* for crop production. Therefore, farmers' high educational qualification, training exposure,

organizational participation, extension media contact and more favorable attitude towards use of *dolochun* help to gain more knowledge on the use of *dolochun* for crop production. This might be due to the fact that, high educational qualification, training exposure, organizational participation, extension media contact and more favorable attitude, all these develop insight and broaden the horizon of outlook of the farmers which might help farmers to build their knowledge base on the use of *dolochun.* On the other hand, age and family size of the respondents had negatively significant relationships with their knowledge on the use of *dolochun* indicating lower age and low family size helps to gain more knowledge on the use of *dolochun* for crop production. This might be due to the fact that, young farmers are more eager to learn and adopt innovations compared to aged farmers (Rogers, 2003). The large family size might give more economic stress to the farmers for maintaining livelihood and the farmers might try to twig with conventional technologies to avoid risk of innovations, ultimately might not help to involve with the knowledge system and gain knowledge on innovations.

Table 3 Relationships between the farmers' knowledge on dolochun use and their selected characteristics

Farmers' characteristics	Correlation coefficient (r) with knowledge
Age	-.310**
Educational qualification	.500**
Family size	-.385**
Farm size	.161
Annual family income	.082
Training exposure	.760**
Organizational participation	.383**
Extension media contact	.608**
Attitude towards use of *dolochun*	.737**

**significant at 1% level of probability

Factors contributing to farmers' knowledge on use of *dolochun:* In order to find out the relative contribution of independent variables to the farmers' knowledge on use of *dolochun*, multiple regression analysis was computed. Out of nine variables seven variables were included in regression analysis due to their significant values in correlation analysis. The different independent variables had their own units of measurement that did not permit a comparison of the unstandardized regression coefficient values. For this reason a standardized regression coefficient values also computed to avoid the problems of different units of measurement.

Table 4 Contributing variables to explain the knowledge on the use of *dolochun* (n=104)

Variables entered	Unstandardized coefficient (B)	Standardized coefficient (Beta)	t value	F value
Age	0.037	0.101	0.862	
Education	0.113	0.117	1.756	
Family size	-0.484	-0.242	-2.109*	
Training exposure	0.297	0.303	3.267**	33.143***
Organizational participation	0.037	0.059	0.880	
Extension media contact	0.140	0.177	2.343*	
Attitude towards use of *dolochun*	0.180	0.309	3.438**	

Constant = 13.675***; R^2 = 0.707; Adjusted R^2 = 0.686

*significant at 5% level of probability; **significant at 1% level of probability; ***significant at 0.1% level of probability.

The values of multiple determination coefficients (R^2) for all the four independent variables jointly explained 70.7 percent of variation in the knowledge on use of *dolochun* (Table 4). The observed t value for regression coefficient was significant in case of family size, training exposure, extension media contact and attitude towards use of *dolochun*. For reaching an optimum model of prediction analysis of selected independent variables with the knowledge on use of *dolochun* only significantly contributed variables to the knowledge on use of *dolochun* were included in the stepwise multiple regression analysis (Table 5).

Table 5 Summary of stepwise multiple regression analysis

Model	Variable entered	Unstandardized coefficient (B)	Standardized coefficient (Beta)	Adjusted R^2	R^2 Change (% contribution)	t value	F value
1	Constant + Family size	-0.770	-0.385	0.139	13.9	-4.207 ***	17.697 ***
2	Constant + Family size + Training exposure	0.694	0.708	0.596	45.7	10.775 ***	76.878 ***
3	Constant + Family size + Training exposure + Extension media contact	0.224	0.282	0.645	4.9	3.857 ***	63.255 ***
4	Constant + Family size + Training exposure + Extension media contact + Attitude towards use of *dolochun*	0.175	0.300	0.680	3.5	3.495 **	55.814 ***

**significant at 1% level of probability; ***significant at 0.1% level of probability.

According to stepwise regressions analysis among the four variables training exposure of the farmers contributed 45.7 percent in predicting their knowledge on use of *dolochun* while family size negatively contributed 13.9 percent, extension media contact and attitude towards use of *dolochun* contributed 4.9 percent and 3.5 percent, respectively.

The results revealed that training exposure of the farmers increased their knowledge on use of *dolochun* by providing the skill and changing their attitudes toward the innovations. This might be due to the fact that, training broaden the horizon of outlook of an individual through sharing experience and achieving skill. As mentioned earlier, the large family size might influence farmers to sticky with conventional technologies to avoid economic risk of innovations resulting placement of family size as negative contributing factor to farmers' knowledge on use of *dolochun.* Extension media contact helps farmers to exchange their experiences and views with extension media which broaden their knowledge horizon. A more favorable attitude (contents of affective domain) helps farmers to improve the contents of cognitive domain (more knowledge) (Bloom et al., 1956), which explains the positive contribution of attitude towards the use of *dolochun* to knowledge on use of *dolochun*.

Constraints faced by the farmers in adopting *Dolochun:* There was an open question in interview schedule to know the constraints faced by the farmers' in adopting *dolochun.* The results are presented in Table 6.

Table 6. Constraints faced by the farmers in adopting *dolochun*

Constraints	No. of citation	Rank
Unavailability of *dolochun* at pick period	75	1st
Lack of knowledge about *dolochun*	65	2nd
Ignorance of farmers about the advantage of *dolochun*	42	3rd
Lack of training of farmers in using *dolochun*	35	4th

It is evident from Table 6 that, majority of the respondents had expressed 'unavailability of *dolochun* at pick period' is the major constraint faced by the farmers in adopting *dolochun* for crop production and was ranked first. 'lack of knowledge about *dolochun'* was ranked second, whereas 'ignorance of farmers about the advantage of *dolochun*' was the third problem of the farmers and ranked 3rd in the table because there was a large communication gap between the farmers and the service provider. 'lack of training of farmers in using *dolochun*' was identified as the fourth constraints in the ranked order.

Suggested solutions of the constraints: Three focus group discussions were performed to get solutions of the problems as suggested by the farmers during personal interview. Farmers through discussion mentioned some possible solutions which are presented as follows:

Ensuring availability of *dolochun* at time when needed, more preferably before starting of the *robi* season. The farmers of the study area feel comfort to use *dolochun* before preparation of field for potato cultivation. They also demand *dolochun* at free of cost from RDRS Bangladesh along with/or other development non-government organizations and government organizations working in their community.

Improvement of training facilities and frequent training provision for the farmers on different innovations like *dolochun* for improvement of knowledge of the farmers. This will motivate farmers towards use of these innovations and will improve their knowledge accordingly. In addition, different non-formal educational programs like farmers' rally, field day, motivational campaign, demonstration etc. need to be carried out regularly to motivate and encourage farmers in using *dolochun* for maintaining soil fertility, improving production efficiency and bringing overall agricultural development.

Conclusions

The majority of the farmers had 'fair' knowledge on the use of *dolochun*. These farmers can be used to tickle down their knowledge and information of *dolochun* to form a strong communal knowledge and information base for maintaining soil fertility, improving production efficiency and bringing overall agricultural development. Making availability of *dolochun* as when necessary especially before the *robi* season and different non-formal educational programs (like training, farmers' rally, field day, motivational campaign, demonstration etc.) might enhance this kind of endeavors. Moreover different government and non-government organizations can take the scope to inform and motivate farmers towards the use of *dolochun* for crop production. Innovation based specific programs like 'Food for

Progress for Bangladesh' of RDRS is one of the examples of such case. This kind of innovation based programs might be encouraged by the agricultural policy planners for overall agricultural development of the country.

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