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Identify Problems and Suggest Possible Solutions for Safe Pineapple Production in Madhupur Tract

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ABSTRACT

The aim of this study was to ascertain the current problems faced by pineapple growers and suggest possible solutions. A total of 300 pineapple growers of the Madhupur tract were selected as samples following the proportionate random sampling technique. Primary data were collected using a pre-designed and pre-tested interview schedule. Findings indicate that majority of the respondents were middle and young aged (71.4%), and having medium family size (61.9%). The highest proportion (42.9%) of the respondents were illiterate, had high annual income (48.6%), medium farming experience (53.3%), contact with fertilizer dealer (68.67%), medium to small farm size (88.6%), also having medium to small pineapple farm size (89.5%), and majorities production cost and net return was also low which is (42.6%) and (40.0%) respectively. Major constraints reported by pineapple growers were ineffective extension services, high value or unavailability of agrochemicals, infestation of Bengal Monitors in mature fruit, high value or unavailability of labor and so on. Effective extension services, establishment of farmers' association with processing company, making pineapple processing factory, provide training in processing to local small entrepreneurs were some of the major suggestions by the pineapple growers. Multiple regression analysis result indicated that respondents' education, farm size, pineapple farm size and total income were the contributing factors that influenced their problem facing. These findings will be helpful to the policy maker for developing a sustainable framework and relevant guidelines for increasing pineapple production in Bangladesh.

Keywords: Extension Services, Madhupur, Pineapple Production, Problems, Solutions.

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I. Introduction

Pineapple is a common fruit in Bangladesh as well as in some other countries of the world. Pineapple (*Ananas comosus*) belongs to Bromeliaceae family. Which is very delicious in nature as well as excellent flavor and nutritive value. It is the third most consumed fruit in this world after bananas and oranges [1]. It could be consumed as fresh fruit or to make it become tastier it can be taken as juice or cocktail after processing [2], [3]. According to [2], [4], [5] pineapple has immense nutritional and medicinal benefits. Pineapple is exuberant in vitamin A, vitamin B & vitamin C [6]. It also contains a distinguished enzyme called 'Bromelin' (which help digestion of protein) [7], [8]. Pineapple is also used as medical diet for certain diseases [9]. Pineapple contains good amount of crude fiber, water, carbohydrates and several minerals that are helpful for the digestive system and assist in maintaining balanced nutrition and ideal weight. Pineapple ranks 5th in terms of total area and production among all the fruits produced in the country [10]. Pineapple is grown almost all over Bangladesh especially in high land and hilly area. The climate and the soils of Bangladesh are suitable for pineapple production. It is widely cultivated in the districts of Tangail, Mymensingh, Gazipur, Sylhet, Moulvibazar, Chittagong, Bnandarban, Khagrachari and Rangamati. 49% of total pineapple cultivated area and 59% of total production was covered by Tangail district [11]. Day by day production and productivity of pineapple is growing [12].

Pineapple is extensively cultivated in all over Madhupur Upazila of Tangail District [13]. In Bangladesh mostly three varieties of pineapple are grown. Those varieties are: Honey Queen, Giant Kew and Ghorasal. For the last few years mainly Giant Kew variety of pineapple has intensively been cultivated in Tangail district by the farmers.

The market value of pineapple has increased over the last 2 years. Where Covid-19 has had a negative impact on other crops, there the scenario of pineapple growers is completely different. In the midst of the lockdown, pineapple growers have been able to market it to a higher rate due to the goodwill of the government. Which is making farmers more interested in pineapple cultivation.

Due to unrestricted use of growth hormones and chemicals the original taste of pineapple become lost. Growth boosting chemicals on pineapple flowers was sprayed by many pineapple growers to produce large fruit and then for early harvesting they also apply hormones to immature fruit [14]. Every year due to lack of transportation facilities and storage a large amount of pineapple become damaged. That's why

growers used carbide for ripening pineapple without recommended dose and formalin for preservation, which may enhance the chance of contamination of food materials. Due to this many consumers avoid pineapple. That's why growers are compelled to sell the pineapple at a low price in peak season.

Day by day the demand for quality pineapple fruits is increasing abroad. Despite the fact that pineapple ranks high among the fruit crops of Bangladesh, limited studies have been done regarding the production, area, yield, problems, and nutritional value of pineapple under 30 AEZ of Bangladesh.

The government, concerning health and law enforcement agencies have less attention to controlling the illegal use of hormones, developing new varieties and technology, making a sufficient number of the processing center, and developing pineapple marketing and export facilities [11]. That's why farmers nowadays face a lot of problems in pineapple cultivation. Bearing the above situation in mind, the study was undertaken to explore the current constraints faced by pineapple growers and to spread out the best possible solutions against those problems. That's why the following objectives were undertaken to conduct the study:

• To identify the current problems faced by pineapple growers and
• To suggest possible solutions for the pineapple growers for overcoming those problems.

II. Materials And Methods

A. Research Design

A descriptive and diagnostic research design was applied in the present study. The study was designed to explore the current problems faced by pineapple growers. Data were collected through different methods e.g., interviews, case studies, FGD, expert's opinion, etc. All the pineapple growers of the selected study area were the main unit of analysis of the present study.

B. Study Site

The study was conducted in the Madhupur tract. The reason behind the selection of the study area because Madhupur upazilla of Tangail district situated in the Madhupur tract which stands first in pineapple production in Bangladesh.

C. Population And Sample of The Study

All the pineapple growers of the study location were the population of the study. Out of the population, 300 respondents were selected as a sample following a simple proportionate random sampling technique as per the formula given by [15].

For collecting primary data at a household level, a pre-designed interview schedule was developed with a smooth combination of both opened and close-ended questions and it was pre-tested before finalization.

D. Data Collection Method

The household survey was conducted in the selected study area for assessing the problems in the production of pineapple and remedial measures to overcome those problems. The entire process of data collection took place from January to May 2022.

An updated list of pineapple growers in these two selected upazillas namely Madhupur and Kapasia was collected from the upazilla agricultural office. The total number of pineapple growers in these upazillas was 1200 out of which 300 (40.0%) were selected as the sample of the study following a proportionate random sampling technique [16].

E. Measurement of The Variable

Problems faced by the pineapple growers were the dependent variable and 10 selected characteristics included: age, family size, education, annual income, farming experience, extension contacts, farm size, pineapple farm size, income from pineapple, and expenditure (pineapple production) of the farmers were considered as independent variables of this study.

A farmer's age was calculated using his real-life age and expressed in years. The age of a respondent was measured by counting the years from the time of his/her birth to the date of the interview according to [17]. The family size was measured by the total number of the members in the family of the respondent. The family members included the respondent, his/her wife/husband, sons and daughters, and other dependents according to [18]. The total number of family members was considered as the family size score of a respondent.

The education of a respondent was measured in terms of degree he/she obtained in the formal education system (i.e., primary school, high school) according to [19]. A score of one (1) was assigned for each class he/she formally attended. It is the total number of academic years that a respondent received by getting formal education in the educational institutions. A score of '1' was assigned for each class passed by the respondent and '0' was assigned for illiterate and so on.

The accrescent annual revenue of a respondent from different sources was used to calculate one's annual income. The farming experience was determined by the duration of experience of a respondent in agricultural works. The term "extension contacts" refers to the involvement of the respondents in gathering data. A three-point scale, i.e., never, occasionally, and always, was used to estimate the respondent's contact with extension personnel, and sufficient weights were allocated to quantify the characteristics. In this study, the total land area occupied by the farmer under the farm and homestead was used to determine farm size, which was expressed in Acres. Pineapple farm size was also calculated in acres where how much land areas respondents cultivate pineapple. The annual income of a respondent from pineapple cultivation was used to calculate one's annual income from pineapple. The cumulative amount of money spent in a year for pineapple cultivation was calculated as the expenditure on pineapple.

F. Problem Analysis

Four Focus Group Discussion (FGD) consisting of 8-10 pineapple growers were conducted and were asked about the production-related problems faced by them. Based on their responses, a list of problems was identified. After identification of the constraints/problems respondents were asked to rank them following the five-point scale. Score 4, 3,

2, 1, and 0 was assigned for very high, high, medium, low, and not at all respectively. Finally, the "Constraints Score" of a respondent was calculated by compiling the weights of his / her responses to all the statements. To make the session more effective, experienced farmers, and local leaders were added as moderators. For clear understanding, identifying constraints/problems were arranged in rank order by developing Constraint Facing Index (CFI) through (1) according to [20]:

$$CFI = Pn \times 0 + Pl \times 1 + Ph \times 2 + Pvh \times 3 \quad (1)$$

Where, CFI = Constraint Facing Index
Pn = Percentage of farmers having no constraints
Pl = Percentage of farmers having little constraints
Ph = Percentage of farmers having high constraints
Pvh = Percentage of farmers having very high constraints

To compare the intensity of the constraints in pineapple production, the rank ordering of various constraints was done in descending order of the CFI. For discerning the suggestion to overcome the constraints identified by the pineapple growers for the improvement and better working of pineapple cultivation the suggestions were also invited openly from respondents. Based on the responses, the suggestions were computed in percentage, rank, and score according to the frequency of the respondents against each of the suggestions.

G. Processing and Analysis of Data

After the collection of data, all the information contained in the interview schedule was edited before leaving a respondent. All the collected data were then checked and cross-checked, compiled, coded, and entered into the computer for analysis and interpretation using the SPSS program [21]. Descriptive statistical measures like range, number, mean, percentage distribution, and standard deviation were used to recount and explain the data.

III. Results And Discussion

A. Farmers Socio Demography

Based on socio-demographic characteristics farmers' distribution has been shown in Table I. The age category revealed that the total number of respondents in the middle and young aged group was 71.4%, which makes the spacious majority of the respondents. 61.9% of the respondents had a medium-sized household. The highest proportion 42.9% of the respondents were literate which is not appreciable. Though a majority of them are illiterate, 48.6% of respondents had an annual income of more than Tk 300000 indicating that they had a high annual income. The average income (BDT 481523) of the respondents was much higher than the national average (BDT219738) [22]. Data presented in Table I also revealed that the majority of the respondents (53.3%) had 16 to 35 years of farming experience, which falls within the medium farming experience category. The current study's results are in line with [19] findings. Most percentages of the pineapple growers (68.67%) maintained contact with fertilizer dealers while 10.33% had contact with SAAO. Which become a major problem for pineapple growers. Almost 88.6 percent of respondents had medium to small farm sizes, this may be due to the increased population growth rate which results in the shrinking of farm size.

As a result, the amount of land for pineapple cultivation is decreasing day by day. Most of the respondents (89.5%) also possessed medium to small pineapple farm size. The highest proportion of the respondents earned a low amount of money and also spent low money which is 42.6% and 40.0% respectively.

TABLE I: Respondents Socioeconomic And Demographic Characteristics

Characteristics	Scoring method	Categories	Respondents (N=300)		Mean	SD
			Number	Percent		
Age	Number of years	Young (≤35)	94	31.4	45.34	11.80
		Middle (36 - 50)	120	40.0		
		Old (>50)	86	28.6		
Family Size	Number of members	Small (<4)	55	18.1	4.99	2.06
		Medium (4-6)	185	61.9		
		Large (>6)	60	20.0		
Education	Years of schooling	Illiterate (0)	129	42.9	4.72	4.47
		Primary (1-5)	40	13.3		
		Secondary (6-10)	114	38.1		
		Higher secondary (>10)	17	5.7		
Annual Income	BDT	Low (up to Tk. 150,000)	80	26.6	481523	650308
		Medium (Tk. 150,000 -300,000)	74	24.8		
		High (Above Tk. 300,000)	146	48.6		
Farming experience	Years in cultivation	Low (up to 16)	51	17.1	28.94	13.18
		Medium (16-35)	160	53.3		
		High (Above 36)	89	29.5		
Extension contacts	Score	SAAO	31	10.33	-	-
		Fertilizer dealer	206	68.67		
		Others	63	21.00		
Farm size	Size in Acres	Small (up to 0.9Acre)	66	21.9	4.00	4.95
		Medium (0.10-8.8 Acre)	200	66.7		
		Large (Above 8.9 Acre)	34	11.4		
Pineapple Farm size	Size in Acres	Small (up to 1.11Acre)	117	39.0	3.07	4.18
		Medium (1.11-7.25 Acre)	151	50.5		
		Large (Above 7.26 Acre)	32	10.5		
Income from pineapple	BDT	low (up to Tk. 150,000)	128	42.6	376523	618991
		Medium (Tk. 150,000 -300,000)	86	28.7		
		High (Above Tk. 300,000)	86	28.7		
Expenditure (Pineapple production)	BDT	low (up to Tk. 150,000)	120	40.0	436166	702998
		Medium (Tk. 150,000 -300,000)	77	25.7		
		High (Above Tk. 300,000)	103	34.3		

B. Problems in Pineapple Cultivation

Compared to other crops pineapple is less affected by pests. Due to this they took less intercultural operation in pineapple cultivation. Which causes them some problems later on. Not all farmers face the same problems in pineapple cultivation. It may be noted that problems identified by the individuals were not the same for all. In this study, an attempt has been made to identify some major problems of pineapple production as reported by the farmers growing pineapple in the study area. The issues were discussed in two parts. Those were production constraints and marketing constraints.

C. Production Constraints

Among the two types of problems, the farmers were facing more problems related to production. In this study, an effort was made to identify the major production-related constraints faced by pineapple growers. The results obtained are given in Table II. Table II revealed that the first rank was given to ineffective extension services. In Bangladesh pineapple is still treated as a minor fruit. That's why DAE and other research organization did not focus much on it. Still, there is no modern variety of pineapple being introduced. So, pineapple growers often deprived of getting proper extension services.

High value or unavailability of agrochemicals was ranked 2nd. Although the government provides fertilizers at low prices, some unscrupulous traders sell fertilizers at exorbitant prices when needed. Which increases the production cost of the farmers.

Infestation of Bengal Monitors in mature fruit was another main problem of pineapple fields. They lived in a hole in a pineapple field. For those who did not take any intercultural operation, it become a major problem for them. They attack the mature fruit at or before harvesting time.

Lack of labor during planting seedlings and collecting mature fruits become another major problem to pineapple cultivation. When all the fruits of the land become ripened labor's crisis took a dramatic turn for collecting pineapple.

Lack of improved varieties was ranked 5th. Pineapple is still considered as minor fruit. Various research institutes are not working on pineapple like other crops. Day by day the response among the pineapple farmers is increasing. In this case, there is a big obstacle in the cultivation of pineapple that there is no high yielding modern variety of pineapple. This problem was ranked first by [1] in his study.

Lack of irrigation water become a major problem for the pineapple growers in the dry season. Now a days respondents grow pineapple round the year. Day by day the water layer is going down. The ponds, canals and rivers are being filled by human beings. There is no water in the dry season because they are not repaired. At that time everyone is dependent on ground water. Which become a major threat to sustainable agriculture. In the case of irrigation, rising fuel prices have also become a major problem.

Problems with land ownership results growers to taking loans from moneylenders with high interest rate. Farmers were not getting loans from government management due to poor land deeds. Since most of the arable land is located beside forest land, farmers are gradually bringing those forest lands under their cultivation. Also, they do not pay land tax on time and many do not have their land recorded at the land office. That's why, it is not possible to take a loan by mortgaging land deeds. As a result, they are taking loans from moneylenders with high interest which is a barrier to their pineapple cultivation. [1] found similar results in his study.

Due to commercial farming, farmers are now more inclined towards chemical fertilizers. Which initially increases yield but it is detrimental to sustainable agricultural management. Inadequate organic manure reduces soil fertility. Again, the same crop has been cultivated on the same land for many years which has a negative effect on the yield.

Lack of power tiller at the planting time becomes a major barrier to pineapple cultivar. In this case, those who are big farmers try to buy their own power tiller through Upazilla Agriculture Office (UAO), but it is not possible due to the oppressiveness of political leaders. They control the power tiller by distributing them among themselves. So, they have to pay more rent at the beginning of the season. In some cases, even if the cultivation time has passed, they cannot cultivate.

Among many farmers lack of interest or problem in weed control has been seen. They did not take any intercultural operation in the pineapple field. That's why at the end of the year, they do not have their desired yield.

Many new entrepreneurs were starting new farming by watching various videos on agriculture on YouTube and Facebook. They tend to cultivate dragon fruit, coffee and other high-value crops. Though they were cultivating without any formal training. As a result, they lose their capital due to not knowing the actual intercultural operation and not getting a proper return. Which makes them more frustrated and demotivated.

Another big problem was not giving hormones at the right time and in the right amount. The problem was more visible to those pineapple growers who recently join to cultivation. There were also some unscrupulous and greedy farmers who use excessive hormones in the hope of making more profit in a short period of time. The quality and taste of those fruits become low.

D. Marketing Constraints

Marketing of produced pineapple is often a major problem for the farmers. Results obtained in respect of marketing constraints are given in Table III. Table III revealed that the first rank was given to narrow roads and unpaved roads for vehicles to enter. Most of the roads between pineapple farm and main road were broken and earthen. Transportation and marketing of seedlings, fertilizer, fruits was not a big problem in dry season. But in rainy season when it was the peak season (June- September) for pineapple due to continuous rain the road become muddy and slippery. So, it's too tough for the growers for marketing pineapple. [20] also found similar results in their study.

Loss of production due to lack of processing was ranked 2nd. There are no processing centers near the study area. So, a lot of pineapples were wasted in the peak season. Then farmers are forced to sell at low prices.

Problems with processed pineapple marketing and perishable nature of pineapple was ranked 3rd and 4th respectively. Many growers were trying to process pineapple locally through cooperatives. They were producing jam, jelly, juice, pickles etc. Which was able to meet their own needs. Due to marketing problems, they were not getting real value

or could not start it on a large scale. In this case, not getting a BSTI license became a major obstacle. Some of the top companies in the country were marketing their processed food using their tags. But in this case the entrepreneurs were not getting the real value.

Pineapple is a highly perishable fruit. Whole pineapples would be kept well at room temperature for about 2 to 3 days. After that the fruit began to ferment and was replaced by a more pungent sour smell. Due to poor marketing conditions all pineapples were not sold at once. So, a lot of fruit became lost due to proper conservation. [1], [23] found similar results in their study.

Violence of middlemen were ranked 5th. 20-25% of farmers sell their pineapple to wholesalers from the field due to lack of time and manpower. In this case they have to sell their pineapple at a much lower price than the market price. Basically, middleman takes their profits. Which demotivate them to cultivate in the next season.

TABLE II: PRODUCTION CONSTRAINTS FACED BY THE PINEAPPLE GROWERS

Sl. No.	Constraints Items	CFI	Rank Order
1.	Lack of irrigation in the dry season	511.43	7
2.	Borrowing money from lenders in high interest rate	557.14	6
3.	Problems with land ownership	328.57	11
4.	High value or unavailability of agrochemicals	857.14	2
5.	High value or unavailability of labor	740.00	4
6.	Power tiller's unavailability in case of cultivation	411.43	10
7.	Not giving hormones at the right time and level	311.43	14
8.	Lack of improved varieties	585.71	5
9.	Inadequate organic manure has resulted in soil fertility	497.14	8
10.	Production has been declining due to the use of the same land for many years	485.71	9
11.	Lack of interest or problem in weed control	325.71	12
12.	Interest in other high value crops	314.29	13
13.	Ineffective extension services	862.86	1
14.	Infestation of Bengal Monitors in mature fruit	765.71	3

TABLE III: MARKETING CONSTRAINTS FACED BY THE PINEAPPLE GROWERS

Sl. No.	Constraints Items	CFI	Rank Order
1.	Narrow roads and unpaved roads for vehicles to enter	737.14	1
2.	Loss of production due to lack of processing	622.86	2
3.	Problems with processed pineapple marketing	620.00	3
4.	Pineapple is a perishable fruit	465.71	4
5.	Violence of middlemen	448.57	5

TABLE IV: INDEX OF CONSTRAINTS FACED BY THE PINEAPPLE GROWERS

Sl. No.	Constraints Items	Severity Index (Rank)
1.	Ineffective extension services [P]	1
2.	High value or unavailability of agrochemicals[P]	2
3.	Infestation of Bengal Monitors in mature fruit[P]	3
4.	High value or unavailability of labor[P]	4
5.	Narrow roads and unpaved roads for vehicles to enter[M]	5
6.	Loss of production due to lack of processing[M]	6
7.	Problems with processed pineapple marketing[M]	7
8.	Lack of improved varieties[P]	8
9.	Borrowing money from lenders in high interest rate[P]	9
10.	Lack of irrigation in the dry season[P]	10
11.	Inadequate organic manure has resulted in soil fertility[P]	11
12.	Production has been declining due to the use of the same land for many years[P]	12
13.	Pineapple is a perishable fruit[M]	13
14.	Violence of middlemen[M]	14
15.	Power tiller's unavailability in case of cultivation[P]	15
16.	Problems with land ownership[P]	16
17.	Lack of interest or problem in weed control[P]	17
18.	Interest in other high value crops[P]	18
19.	Not giving hormones at the right time and level[P]	19

(M=Marketing constraint, P= Production constraint)

TABLE V: RANK ORDER OF SUGGESTED SOLUTIONS BY THE PINEAPPLE GROWERS

Sl. No.	Suggested solutions	CFI	Rank Order
1.	Establishment and development of main road connection from pineapple farm	805.71	5
2.	Arranging low interest government loans	714.29	9
3.	Preserving & managing cold storage	791.43	6
4.	Making Pineapple Processing Factory	831.43	3
5.	Exporting pineapple	805.71	5
6.	Provide improved seedlings	725.71	7
7.	Use of organic fertilizer	580.00	15
8.	Irrigation in dry season	614.29	13
9.	Regular weed control	582.86	14
10.	Effective extension Service	894.29	1
11.	Market management	702.86	10
12.	Development of HYV through research	720.00	8
13.	Provide training in processing to local small entrepreneurs	808.57	4
14.	Establishment of farmers' association with processing company	851.43	2
15.	Introduce farmers to online market management	620.00	12
16.	Cultivation of Dragon Fruit, Ginger, Turmeric as companion crops	662.86	11

E. Intensity of Constraints

Various factors were responsible for severity of constraints faced by the pineapple growers. The intensity varies from farmer to farmer. The intensity of constraints faced by the farmers was worked out in this study. Table IV revealed that 'ineffective extension services' was the most severe constraints faced by the pineapple growers followed by high value or unavailability of agrochemicals, infestation of Bengal Monitors in mature fruit, high value or unavailability of labor in the cultivation and harvesting period, narrow roads and unpaved roads for vehicles to enter and so on. Fourteen out of nineteen constraints identified were production related. Which indicate that farmers face more problem at production time rather than marketing time.

F. Suggested Solutions

Farmers want to solve all these problems in the hope of getting good yield at the end of the day. That's why they identify 16 probable solutions which is shown in Table V. Almost Cent percentage of the farmer talked about effective extension services. Establishment of farmers' association with processing company, making pineapple processing factory, provide training in processing to local small entrepreneurs, establishment and development of main road connection from pineapple farm were some of the major suggestions by the pineapple growers.

G. Factors Influencing Respondents' Problems Towards Selected Characteristics

To find out the factors influencing the respondents' problems towards selected characteristics, six independent variables were identified to regression analysis. Regression results in Table VI indicated that four out of six characteristics- education, farm size, pineapple farm size, total income showed significant contribution towards problem faced by the respondents.

The model seems to have good fitness as indicated by R-square. R2 value was 0.56, which revealed that 56.0% of the variation in the preference towards problems identified. The adjusted R2 value of 0.52 alluded a good fitting of the model.

The multiple regression analysis (Table VI) results explained that education showed a negative and significant contribution towards problems faced by pineapple growers. This characteristic was significant at 1% level. That means higher the education level of the respondents lesser the rate of problem faced. But [24] found different results in their studies which was education had positive and significant contribution.

Farm size showed a positive and significant contribution towards problems faced by pineapple growers. This characteristic was significant at 5% level. That means if the farm size of the respondents increased their problem will also increase. Majority of the pineapple growers cultivate pineapple intensively in their large farm, which need more management practices where they face more production and marketing related problem. Similar types of findings were also found by [25].

TABLE VI: INFLUENCE OF SELECTED CHARACTERISTICS ON THEIR PROBLEM FACED BY THE PINEAPPLE GROWERS

Characteristics of the respondents	Coefficient β	t - value	p (significant)
1. Age	-0.015	-0.205	0.838
2. Family member	0.030	.413	0.680
3. Education	-0.213**	-2.786	0.006
4. Farm size	0.387*	2.106	0.038
5. Pineapple farm size	0.681**	3.197	0.002
6. Total income	1.041**	3.843	0.000

R=0.746, R^2=0.56, Adjusted R^2=0.52, value of F= 15.062, *p<0.05, and **p<0.01

Pineapple farm size also showed a positive and significant contribution towards problems faced by pineapple growers. This characteristic was significant at 1% level. That means if the pineapple farm size of the respondents increased their problem will also increase. Majority of the respondents follow single cropping pattern. That's why fertility of the soil decreases also higher infestation of insects and diseases were also found.

The respondents' total income showed a positive and significant contribution towards problems faced by pineapple growers. This characteristic was significant at 1% level. That means higher the income of the respondents higher the rate of problem faced. Pineapple growers with increased income face many problems because their amount of land is more and they cultivate pineapple intensively in large scale.

IV. CONCLUSIONS

Based on study findings and their logical interpretation, it can be concluded that, majority of the respondents were middle and young aged (71.4%), having medium family size (61.9%). Highest proportion (42.9%) of the respondents were illiterate, having high annual income (48.6%), medium farming experience (53.3%), higher contact with fertilizer dealer (68.67%), medium to small farm size (88.6%), also having medium to small pineapple farm size (89.5%), and majorities production cost and net return was also low which was (42.6%) and (40.0%) respectively. Pineapple growers face many production and marketing related constraints. Major constraints reported by pineapple growers were ineffective extension services, high value or unavailability of agrochemicals, infestation of Bengal Monitors in mature fruit, high value or unavailability of labor and so on. Effective extension services, establishment of farmers' association with processing company, making pineapple processing factory, provide training in processing to local small entrepreneurs were some of the major suggestions by the pineapple growers. Results of multiple regression analysis indicated that respondents' education, farm size, pineapple farm size and total income were the contributing factors that influenced their problem facing.

REFERENCES

[1] Baruwa OI. Profitability and constraints of pineapple production in Osun State, Nigeria. *Journal of Horticultural research*. 2013;21(2).

[2] Hossain MF, Akhtar S, Anwar M. Nutritional value and medicinal benefits of pineapple. *International Journal of Nutrition and Food Sciences.* 2015 Jan;4(1):84-8.

[3] Umi HN, Tricahya RA, Farid AM. Performance analysis of drip and sprinkler irrigation on pineapple cultivation. *InIOP Conference Series: Earth and Environmental Science* 2020 Mar 1 (Vol. 451, No. 1, p. 012034). *IOP Publishing*.
[4] Joy PP. Benefits and uses of pineapple. Pineapple Research Station (Kerala Agricultural University), *Vazhakulam*-686. 2010;670.
[5] Kader A, Hossain FM, Islam MM, Kabir G, Sarkar SK, Absar N. A comparative analysis on the nutritional contents of two varieties of pineapple of Chittagong region. *Chittagong University Journal of Biological Sciences.* 2010:105-12.
[6] Williams PA, Crespo O, Atkinson CJ, Essegbey GO. Impact of climate variability on pineapple production in Ghana. *Agriculture & Food Security.* 2017 Dec;6(1):1-4.
[7] Afzal MF, Siddiqui SH, Farrukh S. Growth analysis of productivity, dispersal and profitability of Pineapple in India. *American International Journal of Research in Humanities, Arts and Social Sciences.* 2018;25(1):76-82.
[8] Nongbri B, Singh R, Feroze SM, Devarani L, Hemochandra L. Food and Nutritional Security of Farm Households in Meghalaya: A Food Basket Approach Using Temporal and Spatial Analysis. *Indian Journal of Agricultural Economics.* 2021 Apr;76(1):292-306.
[9] Moniruzzaman FM. Bangladesh Faler Chash (Fruit Cultivation in Bangladesh). *Bangla Academy*, Dhaka, Bangladesh. 1988:384.
[10] BBS, 2021. *Statistical Yearbook Bangladesh*, Bangladesh Bureau of Statistics (BBS). Government of the Peoples Republic of Bangladesh, Dhaka, Bangladesh, 171 p.
[11] Hossain MF, Islam MA. Pineapple production status in Bangladesh. *Agriculture, Forestry and Fisheries*. 2017 Sep 28;6(5):173-7.
[12] Parvej Alam D, Usmani TM, Danish M. Growth of Pineapple Cultivation: a spatio-temporal analysis in India. *Growth*. 2020 Feb;4(2):505-11.
[13] Hasan SS, Ali MA, Khalil MI. Impact of pineapple cultivation on the increased income of pineapple growers. *The Agriculturists*. 2010;8(2):50-6.
[14] *http://www.dhakatribune.com* [Bangladesh: Chemical-free pineapple growers counting losses due to weak demand. Publication date: 9/8/2014].
[15] Kothari CR. Research methodology: Methods and techniques. *New Age International*; 2004.
[16] Khalil MI, Haque ME, Hoque MZ. Adoption of BARI recommended potato (Solanum tuberosum) varieties by the potato farmers of Bangladesh. *The Agriculturists*. 2013;11(2):79-86.
[17] Afrad MS, Begum A, Haque ME, Sarmin NS. Impact of Labor Migration on Rural Livelihood in Pakundia Upazila under Kishoregonj District of Bangladesh. *The Agriculturists*. 2020 Sep 29;18(1):66-80.
[18] Parvez AKMK. 2007. Respondents' knowledge, attitude and practices in using IPM. *PAT* 2008, 4(2): 1-11.
[19] Hasan S, Haque ME, Afrad MS, Alam MZ, Hoque MZ, Islam MR. Influences of socio-economic factors on lemon pest management practices in Tangail district of Bangladesh. *South Asian Journal of Social Studies and Economics.* 2021;10(3):59-67.
[20] Shah P, Ansari MA. A study of marketing and production constraints faces by vegetable growers. *Asian J Agric. Ext., Econ. and Socio*. 2020;38(11):257-63.
[21] Hasan S, Haque ME, Afrad MS, Alam MZ, Hoque MZ, Islam MR. Pest risk analysis and management practices for increasing profitability of lemon production. *Journal of Agriculture and Ecology Research International.* 2021;22(1):25-35.
[22] BBS, 2021. *Statistical Yearbook Bangladesh*, Bangladesh Bureau of Statistics (BBS). Government of the Peoples Republic of Bangladesh, Dhaka, Bangladesh, 432 p.
[23] Amao IO, Adebisi-Adelani O, Olajide-Taiwo FB, Adeoye IB, Bamimore KM, Olabode I. Economic analysis of pineapple marketing in Edo and Delta States Nigeria. *Libya Agriculture Research Center Journal International.* 2011;2(5):205-8.
[24] Saha S, Hasan SS, Haque ME, Ahamed T. Perception based assessment of ecosystem services of Madhupur Sal Forest in Bangladesh. European *Journal of Agriculture and Food Sciences*. 2021 Jan 15;3(1):39-44.
[25] Hoque MZ, Haque ME, Afrad MS, Islam MN. Effectiveness of floating agriculture for adapting climate change in southern Bangladesh. International *Journal of Economic Theory and Application*. 2016;3(1):14-25.