

Performance of Different Fruit Species under Agroforestry System in Chattogram Hill Tracts

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Abstract

Original Research Article

Performances of lemon, BARI Malta-1 and guava grown in different hill elevations under forest tree species Koro (*Albizia sp.*) were evaluated at the existing plantation of Hill Agricultural Research Station, Khagrachari during 2019-20. The results of the study revealed that Seedless lemon, BARI Malta-1 and BARI Guava-3 varieties have the potentiality of producing a remarkable yield under the partial shade of forest tree species *Albizia procera* in the different hill elevations under agro-forestry system. Mid and lower hill elevations are more suitable for Seedless lemon, BARI Malta-1 and BARI Guava-3 production than higher hill elevation. Both the vegetative growth and yield of fruits were comparatively lower in the higher elevations of the hill.

Keywords: *Albizia procera*, Hill Agricultural Research Station, agro-forestry system, hill elevation.

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INTRODUCTION

Chattogram Hill Tracts (CHT) covers one-tenth of the total area of Bangladesh (Ministry of CHT). Mainly reserve forest and some high value commercial fruit orchard is added to forest species in CHT. But the indigenous people widely practiced Shifting (Jhum) Cultivation which is the most prevalent form of farming (ADB, 2001; DANIDA, 2000; Gafur, 2001). As a result, productivity of jhum crops reduced due to destruction of forest, reducing the jhum cycle, degradation of land, soil erosion and loss of soil fertility in CHT (Gafur, 2001; HARS, 2000; Knudsen and Khan, 2002; Shoaib *et al.*, 1998) and the livelihood of people in this region have threatened. Many scientists have reported that fertile topsoil erosion caused by shifting cultivation which expose the rocks beneath (Kleinman *et al.*, 1995). Besides, shifting cultivation enhances loss of considerable amount of nutrients from the upper 10 cm soil. (Gafur, 2001; Gafur *et al.*, 2003). There is a need for modification of such land use gradually with alternative locally suitable land-use systems (DANIDA, 2000; Knudsen and Khan, 2002). The sustainability of hill agriculture depends on how farmers manage, protect and utilize their farm and forest resources. Shifting cultivation has gradually been replaced by more intensive forms of land use in Asia and elsewhere (Rasul and Thapa, 2003; Suraswadi *et al.*, 2000).

Agro-forestry is a land use system characterized by growing different species of woody perennials in association with field crops. Several agro-forestry production techniques designed with locally adapted trees and crops for different slopes are found to optimize the production of agro-forestry crops and minimize environmental degradation in the hills of Bangladesh. It helps to control soil erosion, reverse environmental degradation through biological interactions of tree, crops and livestock, and increase income from farmland (Garity, 2004) can be a suitable alternative to shifting cultivation specifically in the CHT region.

Fruits are the important and essential ingredients of human diet and valued as a protective food due to rich sources of vitamins and minerals. Although Bangladesh attained food self-sufficiency in the cereal food grain for the last few years, fruit production is far behind the requirement. Due to the ever growing population, per capita land area is decreasing at an alarming rate. Growing fruit trees with forest tree species under agro-forestry system in the CHT region may be an alternative option. Therefore, the present study was undertaken to observe the potentiality of the fruit trees in association with forest tree species in the CHT.

MATERIALS AND METHODS

The study was carried out at the existing plantation of Hill Agricultural Research Station, Khagrachari during 2019-20 with a view to determine the performance of different fruit species grown in different hill elevations under forest tree species Koroi. In the Chattogram Hill Tracts region, Koroi (*Albizia procera*) locally known as Shil Koroi is one of the important and dominant forest tree species usually grow upright with small leaflets and produced partial shades to the canopy areas. The treatments of the experiment were three fruit species- viz: Lemon variety- Seedless lemon, BARI Malta-1 and BARI Guava-3 which was planted at three Hill elevations viz. High hill (30-45m), Mid hill (15-30m) and foot hill (0-15m). The spacing of lemon, BARI Malta-1 and BARI Guava-3 were 2m x 2m, 5m x 5m and 5m x 5m respectively. The experiment was laid out following a Randomized Complete Block Design (RCBD) with three replications. However, all the plants under study were given uniform management practices in respect of weeding, mulching, fertilization, etc. For the study, data on plant growth and yield parameters were recorded from three plants in each treatment and the data were compiled and analyzed.

RESULTS AND DISCUSSION

Three fruit species grown along with the forest tree species (Koroi) showed significant positive response in respect of growth and yield parameters except average fruit weight (Table -1, 2 and 3).

It was observed that plant height and canopy spread of all the three fruit species- Seedless lemon, BARI Malta-1 and BARI Guava-3 increase with the decrease of hill elevation. The foot hill indicating better vegetative growth than the plants grown in the upper elevations- mid hill and high hill. Increased growth of the plants at the foot hill might be due to the availability of higher nutrient and moisture that received from the higher elevations due to erosion, leaching and percolation.

Number of fruits per plant was significantly higher in the foot hill treatments under study. However, all the three fruit species showed negative response in case of canopy spread and plant height respectively. The highest yield of fruits per plant was produced from the foot hill treatments followed by mid hill and high hill treatments.

Table 1. Growth and yield of Lemon with forest trees in different hill elevations

Crop	Hill elevation	Plant ht. (m)	Canopy spread (m ²)	Harvesting time	Fruit no./plant	Average fruit wt. (g)	Fruit yield (kg/plant)
Lemon	High hill	2.56	2.89	Feb-Aug	112	104.1	10.9
	Mid hill	2.75	3.07		125	105.1	11.7
	Foot hill	2.86	3.50		136	108.8	13.5
Level of sig.		*	**		**	NS	**

*= Significant at 5%; ** =Significant at 1%; NS: Not significant

Table 2. Growth and yield of BARI Malta-1 with forest trees in different hill elevations

Crop	Hill elevation	Plant ht. (m)	Canopy spread (m ²)	Harvesting time	Fruit no./plant	Average fruit wt. (g)	Fruit yield (kg/plant)
BARI Malta-1	High hill	2.02	2.17	Oct-Nov	113.3	131	14.18
	Mid hill	2.20	2.44		127.3	132	16.77
	Foot hill	2.45	2.55		141.3	141	20.30
Level of sig.		**	NS		*	NS	*

*= Significant at 5%; ** =Significant at 1%; NS: Not significant

Table 3. Growth and yield of BARI Guava-3 with forest trees in different hill elevations

Crop	Hill elevation	Plant ht. (m)	Canopy spread (m ²)	Harvesting time	Fruit No./plant	Average fruit wt. (g)	Fruit yield (kg/plant)
BARI Guava-3	High hill	3.65	3.48	July-Aug.	203.3	94.66	21.00
	Mid hill	4.40	3.90		303.3	92.33	27.30
	Foot hill	4.59	3.98		343.0	98.50	31.81
Level of sig.		NS	*		**	NS	**

*= Significant at 5%; ** =Significant at 1%; NS: Not significant

CONCLUSION

The results of the study revealed that fruit species like Seedless lemon, BARI Malta-1 and BARI Guava-3 have the potentiality of producing a remarkable yield even under the partial shade of forest tree species *Albizia procera* in the different hill elevations under

agro-forestry system of the CHT. However, both the vegetative growth and yield of fruits were comparatively lower in the higher elevations of the hill. Mid and lower hill elevations are more suitable for Seedless lemon, BARI Malta-1 and BARI Guava-3 than higher hill elevation.

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