

## Performance of sweet gourd under fruit tree based agroforestry practices in char land ecosystem

S. Rana, M.A. Khatun<sup>1</sup>, M.G. Mahboob<sup>2</sup>, M.A. Wadud and G.M.M. Rahman

Department of Agroforestry, Bangladesh Agricultural University, Mymensingh-2202, <sup>1</sup>Department of Agriculture Extension (DAE), Khamarbari, Dhaka, <sup>2</sup>ASICT Division, BARI, Joydebpur, Gazipur-1701, E-mail: sohel03330@gmail.com

**Abstract:** A field experiment was conducted in Char Kalibari of Old Brahmaputra River under Sadar Upazila of Mymensingh district during October 2016 to June 2017 to study the performance of sweet gourd in association with five years old mango and guava trees as agroforestry system. Mango and Guava trees were transplanted under strip plantation method during 2012 maintaining a spacing 3.6m × 3.7m distance. In this study sweet gourd was cultivated with and without fruit trees combinations which were the treatments of the study. Sweet gourd was grown under different treatments viz. T<sub>1</sub> (sweet gourd cultivation in association with mango tree), T<sub>2</sub> (sweet gourd in association with guava tree) and T<sub>3</sub> (sweet gourd cultivation without mango and guava trees) following a Randomized Complete Block Design (RCBD) with three replications. Growth, yield attributes and yield of sweet gourd were observed under different treatments of this study i.e with and without mango and guava tree combinations. Yield and yield attributes of mango and guava trees also recorded. From the result it is found that growth and yield of sweet gourd were remarkably reduced in association with both mango and guava trees. Yield of sweet gourd severely reduced per unit area compare to per plant but it was almost similar in association with both mango and guava trees. Around 77% yield reduction of sweet gourd was recorded per unit area where as it was around 50% in per plant of sweet gourd. Yield and yield attributes of mango and guava trees almost identical with and without sweet gourd combination. Land Equivalent Ratio (LER) of mango and guava with sweet gourd were 1.257 and 1.261, respectively, which indicate these combined production system in char land ecosystem are more productive compare to sole cultivation of fruit trees or vegetable crops. From this study it may be concluded that agroforestry practices in char areas of Bangladesh by combining fruit trees with sweet gourd is profitable than mono cropping system.

**Key words:** Agroforestry practice, char land ecosystem, fruit tree, sweet gourd, land equivalent ratio, LER.

### Introduction

Bangladesh is mainly an agriculture based country and two-thirds of the population directly or indirectly depend on agriculture. The economy of the country draws its strength and stability mostly from agriculture. Agriculture remains the most important sector of Bangladesh economy, contributing 14.79% to the country's Gross Domestic Product (GDP) and employs more than 45.1% of total labour force (BBS, 2017). This sector is playing a vital role in achieving self-sufficiency in food production. Around 75% of the people live in rural areas of which 60% depend on agriculture for their livelihood.

Bangladesh is one of the largest deltas of the world. It has a remarkable flood prone area. Islands and bars are very common features among with them. In Bangladesh, both islands and bars are known as chars. 'Char' a tract of land surrounded by the waters of an ocean, sea, lake, or stream; it usually means any accretion in a river course or estuary (Chowdhury, 1988). River water is a critical resource for the char land life and economic growth, cultural interaction and environmental development (Chowdhury, 2010).

There are over 12 million people who live in char lands and struggle against the floods and associated river bank instability (Hooper, 2001). Chars in Bangladesh have been distributed into five sub-areas: the Jamuna, the Ganges, the Padma, the Upper Meghna and the Lower Meghna rivers. There are other areas of riverine chars in Bangladesh, along the Old Brahmaputra and the Tista rivers. These populations are living in char areas and maintaining their livelihood through char based farming systems. Agroforestry plays a vital role in supplying not only the daily necessities of people but also in maintaining ecological balance. Agroforestry can provide a sound ecological basis for increased crop and animal productivity, more dependable economic returns, and

greater diversity in social benefits on a sustained basis (Rahim, 1997).

To meet up the demand of vegetable as well as fruit, it is necessary to cultivate tree (fruit tree) and vegetables combinedly as agroforestry system. Population of Bangladesh is increasing rapidly, therefore, demand for vegetable is increasing simultaneously. A large number of vegetables are grown in the field in our country. Most of them are grown in the winter season of which sweet gourd, chilli, radish, potato, sweet potato, coriander and carrot are very common, popular and quick growing vegetables having high nutritional value and can grow easily.

Considering the above facts, this study was undertaken for developing a viable agroforestry practices at the Char Kalibari in the bank of Old Brahmaputra River to observe the morphological characteristics and yield of sweet gourd in association with fruit trees and also observe the yield of fruit trees in char land ecosystem.

### Materials and Methods

**Study area:** The experiment was carried out at char Kalibari belongs to the Mymensingh Sadar Upazilla during the period from October 2016 to June 2017. The geographical position of char Kalibari located between 24°45' to 24°45'40" North and 90°24'4" to 90°24'44" East Latitude. The experimental site belongs to the agro ecological region of Old Brahmaputra flood plain having non-calcareous black grey flood plain soil. The soil of this area is mainly formed with recent and sub-recent alluvial sediments of low parts of the Old Brahmaputra Flood plain. Most of the soil has silts to clay texture and low contents of organic matter having pH ranged from 6.3 to 7.2. The climate at the locality is subtropical in nature. It is characterized by high temperature and heavy rainfall during kharif season (April to September) and a scanty rainfall during Rabi season (October to March). Every year after the monsoon huge area along the bank of the

river old Brahmaputra developed as char which is rich due to silt deposition. Farmers are cultivating different vegetables and rice in this newly accreted char area during the period from late October to May. During rainy season, Middle and lower elevation of this char area remained inundated.

**Fruit trees and plant materials:** In this study, five years old mango (*Mangifera indica*) and guava (*Psidium guajava*) fruit tree which were planted in the experimental site during the year 2012 and these trees were used as fruit tree components of this study. Sweet gourd was used as agricultural components of agroforestry practices in the char Kalibari. Planting materials of sweet gourd were purchased from BRAC seed center. Before starting the experiments all of the mango and guava fruit trees of experimental fields were cleaned by removing undesirable branches. Necessary pruning was done for ensuring maximum sunlight to the understorey sweet gourd of this study.

**Land preparation and seed sowing (sweet gourd) and management:** Land was prepared by spade during October 2016. In between the two strips of mango and guava trees pits were prepare for sweet gourd seed sowing. 1.5 feet cube size pits (i.e. 1.5 ft. × 1.5 ft × 1.5 ft.) were made by spading before 15 days of sweet gourd seed sowing. Inside the all prepared pits cow dung was mixed and kept for decomposing the cow dung. During the first week of November 2016, pit soil was mixed with decomposed cow dung and sweet gourd seeds were sown in the all prepare pits of this study (Fig. 1). Seeds of sweet gourd were directly sown in the experimental plot on 5th November 2016. The seeds were sown by hand and after emergence thinning and gap filling were done keeping four plant in each pit. Necessary, cultural operations viz. weeding, irrigation, fertilizing, pollination etc. were done when required.



Fig. 1. Land preparation for sweet gourd cultivation in association with mango and guava trees

**Experimental design and treatment combination:** Sweet gourd was grown in association mango and guava fruit tree and also without fruit tree combination. Different treatments of this study were as: (i) T<sub>1</sub> - Sweet gourd cultivation in association with mango trees, (ii) T<sub>2</sub> - Sweet gourd cultivation in association with guava trees and (iii) T<sub>3</sub> - Sweet gourd cultivation without mango and guava trees. Sweet gourd was grown in different treatments following a Randomized Complete Block Design (RCBD) with three replications.

**Harvesting:** Sweet gourd was harvested when fruit was attained edible size. All fruits of sweet gourd was harvested for green consumption purpose.

**Sampling procedure and data collection:**

**Sweet gourd:** Growth, yield attributes and yield data were recorded from representative samples (one from each pit)

plants sweet gourd. For growth purpose different morphological data were recorded at vegetative stage (Fig. 2) and harvesting stage (Fig. 3) viz. length of plant (cm), number of primary branches per plant, number of leaves per primary branch, number of leaves per plant, average leaf petiole length (cm), leaf blade length (cm) and leaf blade breath (cm), number of male flowers per plant, number of female flowers per plant, number of fruits setting per plant. For yield attributes of sweet gourd, number of fruits per plant, number of fruits per unit area, average fruits weight, average fruit size (Length × breadth) were recorded. Yield of sweet gourd in different treatments recorded per unit area (10 m<sup>2</sup>) which was converted as t/ha.



Fig. 2. Sweet gourd cultivation in association with mango and guava trees at vegetative stage



Fig. 3. Sweet gourd cultivation in association with mango and guava trees at harvesting stage

**Fruit trees:** Yield and yield attributes of mango and guava trees also recorded. Number of fruits per plant and individual fruit weight of mango and guava recorded from represented samples of mango and guava. Number of fruits of each mango and guava tree were recorded during harvesting time and sum of all harvested fruit from each tree also estimated. Average number of fruits of all trees treated as the number of fruit per plant of mango or guava tree. Total weight of all fruits of each mango and guava tree also recorded. Average individual fruit weight of mango and guava was estimated from recorded total fruit weight and number fruits per plant of mango and guava trees.

**Yield reduction estimation:** In this study, sweet gourd was grown in association with mango and guava trees. We may considered during combined production with mango and guava trees yield of sweet gourd reduced compare to its sole cropping yield. Sweet gourd yield reduction was estimated separately for per plant and per unit area as percentage and it was measured using the following equation. % yield reduction = [(Yield without fruit tree) - (yield with fruit tree)] ÷ 100].

**Land Equivalent Ratio (LER) estimation:** LER of this study was recorded from sole and intercrops yield of fruit trees and sweet gourd. The equation of LER is; LER = Ci/Cs + Ti/Ts; Where, Ci = Sweet gourd yield with mango or guava trees, Cs = Sweet gourd yield without mango or guava trees, Ti = Mango or guava yield with sweet gourd,

Ts = Mango or guava yield without sweet gourd combination.

**Statistical analysis:** The data on various growth and yield contributing characters of sweet gourd and fruit trees were statistically analyzed by using WASP2 software package to examine the significant variation of the results. The recorded data were compiled and analysed by RCBD design to find out the statistical significance of the experimental results. The means for all recorded data were calculated and analyses of variance for all the characters were performed. Mean comparisons were done by Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984) and also by Least Significant Difference (LSD) test.

## Results and Discussion

**Morphological parameters of sweet gourd:** Growth of sweet gourd in this study was observed by recording different morphological parameters with or without fruit trees combination during vegetative and harvesting period of sweet gourd.

**At vegetative stage:** Morphological parameters of sweet gourd at vegetative stage viz. length of plant (cm), number of primary branch per plant, number of leaves per primary branches, number of leaves per plant, average leaf petiole length (cm), leaf blade length (cm) and leaf blade breath (cm) were significantly influenced by mango and guava trees under agroforestry ecosystem (Table 1). Longest Vine (98.1 cm) of sweet gourd was produced without fruit tree condition followed by treatment T<sub>2</sub> i.e. in association with guava trees (92.1 cm) and relatively shorter vines were found in association with mango tree (90.8 cm). Like vine length, highest number of primary branches per plant (6.2) of sweet gourd were also found in without fruit tree condition and statistically similar number of primary branches per plant were found in association with mango (4.0) and guava (4.1) trees which were near 35% lower compare to open field condition. Highest number of leaves per primary branch (9.8) of sweet gourd were found in sole cropping system of sweet gourd. Statistically similar

number of leaves per primary branch of sweet gourd plant were found in association with Mango (8.4) and Guava (8.5) trees. Similar trend of variation was also observed in case of number of leaves per plant where highest value were in open field condition (60.0) and significantly similar number of leaves of sweet gourd per plant were found in association guava (36.6) and mango (35.9) trees. At vegetative stage, relatively larger size (Leaf petiole × leaf blade length × breadth) and statistically similar leaf of sweet gourd was also found in association with fruit trees compare to sole cropping of sweet gourd i.e. without mango and guava combinations (Table 1). Average leaf size (petiole length × blade length × blade breath) of sweet gourd in association with mango, guava and open field condition were (15.0 cm, 14.6 cm and 14.0 cm), (15.2 cm, 14.8 cm, and 13.9 cm) and (14.1 cm, 13.7 cm, 12.8 cm), respectively, (Table 1).

It was found that at vegetative stage, length of plant (cm), number of primary branches per plant, number of leaves per primary branch, number of leaves per plant of sweet gourd remarkably affected by mango and guava trees where near 35% reduction was recorded. It might be due to different negative interaction effect of mango and guava trees viz. shade effect, competition for solar radiation above the ground, competition for moisture and nutrients below the ground etc. on the growth of sweet gourd. Hossian *et al.* (2014) reported that growth of lettuce remarkably affected by six years old Lohakat tree after passing its initial growth stage. Leaf size of sweet gourd in this stage i.e. at vegetative stage was not so variable in different treatments where only 8-9 lower sized leaf was found in open field condition which indicate different interaction effect of mango and guava trees were not prominently affected the leaf size of sweet gourd before or during fruiting stage. Similar type of information also recorded by Habib *et al.* (2012) in case of amaranth cultivation along with four years old *Xylia dolabriformis* trees as agroforestry practice.

**Table 1.** Morphological parameters of sweetgourd at vegetative stage in agroforestry practice with fruit trees

Treatments	Morphological parameters						
	Length of plant (cm)	No. of primary branches plant <sup>-1</sup>	No. of leaves primary branch <sup>-1</sup>	No. of leaves plant <sup>-1</sup>	Average leaf size		
					Petiole length (cm)	Blade length (cm)	Blade breadth (cm)
T <sub>4</sub>	90.8 c	4.0 b	8.4 b	35.9 b	15.0 a	14.6 a	14.0 a
T <sub>2</sub>	92.1 b	4.1 b	8.5 b	36.6 b	15.2 a	14.8 a	13.9 a
T <sub>3</sub>	98.1 a	6.2 a	9.8 a	60.0 a	14.1 b	13.7 b	12.8 b
CV (%)	0.678	4.563	3.966	1.64	0.529	2.412	2.323
LSD (0.05)	1.126	0.494	0.795	1.644	0.171	0.781	0.717
LSD (0.01)	1.855	0.826	..	2.723	0.298	..	..
Level of significance	**	**	*	**	**	*	*

Mean in column followed by the different letter are significantly different by DMRT at P< 0.05 and P< 0.01. T<sub>1</sub> = Sweetgourd with mango tree, T<sub>2</sub> = Sweetgourd with guava tree, T<sub>3</sub> = Sweetgourd without fruit trees; DAE = Days After Emergence.

**At harvesting stage:** Different morphological attributes of sweet gourd at harvesting stage in agroforestry practices with fruit trees viz. number of primary branches per plant, average length of primary branches (cm), number of leaves per primary branch, number of male flowers per plant, number of female flowers per plant, number of fruits

setting per plant were remarkably affected by mango and guava trees (Table 2). Similar trend of variation was observed in case of all studied attributes at harvesting stage where highest value was recorded in open field condition. Statistically similar values of all morphological parameters were recorded in association with mango and

guava trees but numerically 5-10% more reduction was found in combination with mango trees. Among the different studied morphological parameters of sweet gourd number of primary branches, number of female flowers plant and number of fruits setting per plant severely affected by mango and guava trees where more than 50% reduction was recorded. Number of primary branches per plant, average length of primary branches (cm), number of leaves per primary branch, number of male flower, number of female flower and number of fruit setting per plant in association with mango, guava and in open field condition were 5.5, 60.8cm, 8.9, 43.1, 9.3 and 2.95, 5.7, 61.3cm, 9.1, 43.5, 9.6 and 3.07, 8.3, 75.5cm, 10.7, 51.2, 14.5 and 5.35, respectively (Table 2).

From the above results it was found that all studied morphological parameters of sweet gourd were remarkably affected by mango and guava trees. This might

be due to different negative interaction effect of mango and guava trees above and below the ground viz. shade effect, competition for solar radiation, moisture and nutrients, host of disease and insect etc (Singh *et al.*, 1989, Jiang *et al.* 1984). Number of primary branches, number of female flower plant and number of fruit setting per plant severely ( $\geq 50\%$ ) affected by mango and guava trees. This might be also due to above reasons and in addition with another fact is that associated fruit trees are not leguminous and leaves are not easily decomposed which indicates that their leaf biomass are not so capable for adding organic matter or nutrients to the soil (Szott *et al.*, 1991). Similar type of results also reported by Alam *et al.*, (2012) in different summer vegetables in association with different fruit and timber trees.

**Table 2.** Morphological parameters of sweetgourd during harvesting stage in agroforestry practice with fruit trees

Treatments	Morphological parameters					
	No. of primary branches plant <sup>-1</sup>	Av. length of primary branch (cm)	No. of leaves primary branch <sup>-1</sup>	No. of male flower plant <sup>-1</sup>	No. of female flower plant <sup>-1</sup>	No. of fruit setting plant <sup>-1</sup>
T <sub>1</sub>	5.5 b	60.8 b	8.9 b	43.1 b	9.3 b	2.95 b
T <sub>2</sub>	5.7 b	61.3 b	9.1 b	43.5 b	9.6 b	3.07 b
T <sub>3</sub>	8.3 a	75.5 a	10.7 a	51.2 a	14.5 a	5.35 a
CV (%)	5.661	1.758	3.62	1.217	1.532	4.498
LSD (0.05)	0.832	2.619	0.781	0.526	0.621	0.382
LSD (0.01)	1.388	4.332	1.302	0.879	1.121	0.645
Level of significance	**	**	**	**	**	**

Mean in column followed by the different letter are significantly different by DMRT at P<0.05 and P<0.01. T<sub>1</sub> = Sweetgourd with mango tree, T<sub>2</sub> = Sweetgourd with guava tree, T<sub>3</sub> = Sweetgourd without fruit trees; DAE = Days After Emergence.

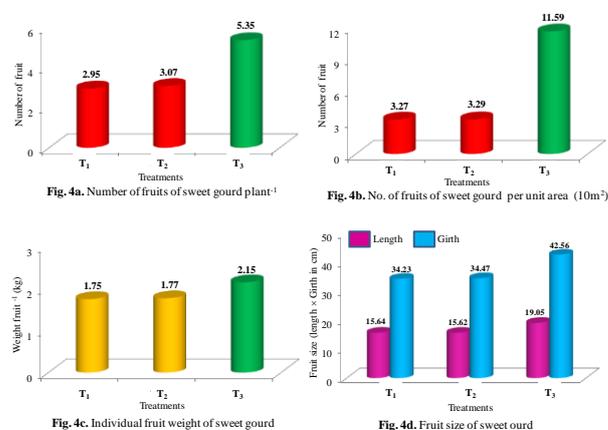
**Yield attributes of sweet gourd:** Like growth parameters, yield attributes of sweet gourd also significantly influenced by mango and guava trees (Fig. 4). Different yield attributes of sweet gourd viz. number of fruit of sweet gourd plant<sup>-1</sup>, number of fruit of sweet gourd per unit area (10 m<sup>2</sup>), individual fruit weight (kg) and fruit size (length × breadth) were recorded which are presented here separately as:

**Number of fruit of sweet gourd per plant:** Number of fruit of sweet gourd moderately affected by mango and guava trees (Fig 4a). Highest number of fruits of sweet gourd (5.35) per plant was recorded when cultivated as mono or sole cropping but in association with mango and guava the number of fruits of sweet gourd was reduced up to 40%. The number of fruit per plant of sweet gourd in association with mango and guava were 2.95 and 3.07 respectively (Fig. 4a).

**Number of fruit of sweet gourd per unit area (10 m<sup>2</sup>):** In this study number of fruits of sweet gourd per unit area severely reduced in association with mango and guava trees (Fig. 4b). Remarkably highest number of fruits of sweet gourd (11.9) per unit area (10 sq. m.) was found in sole cropping system where as in association with mango and guava its were reduced upto 70%. The number of fruits of sweet gourd per unit area (10m<sup>2</sup>) in association with mango and guava were 3.27 and 3.29 respectively (Fig. 4b).

**Individual fruit weight of sweet gourd:** Like number of fruits, single fruit weight of sweet gourd was also

significantly influenced by mango and guava trees (Fig. 4c). Highest individual fruit weight (2.15 kg) was found in mono or sole cropping system but in association with mango and guava its were reduced upto 20%. Individual fruit weight of sweet gourd in association with mango and guava were recorded as 1.75 kg and 1.77 kg respectively (Fig. 4c).



**Fig. 4.** Yield attributes of sweet gourd in different treatments (T<sub>1</sub> = with mango tree, T<sub>2</sub> = with guava tree and T<sub>3</sub> = without tree)

**Fruit size of sweet gourd:** The fruit size (length and girth size in cm) of sweet gourd also significantly influenced by mango and guava trees (Fig. 4d). Relatively highest fruit length (19.05 cm) and girth (42.56 cm) were recorded in mono cropping system where in association with mango and guava its were reduced upto 20%. The fruit length and

girth of sweet gourd in association with mango trees 15.64 cm and 34.23 cm and in association with guava trees were 15.62 cm, 34.47cm, respectively (Fig. 4d).

From the above results it was found that individual fruit weight and fruit size (length and girth) were not much more affected by mango and guava trees where only 20% reduction recorded compare to without fruit condition but in of case of fruit setting or number of fruit per plant reduction was 40%. This indicate pollination or fertilization remarkably affected beneath the fruit trees compare to open field condition. Sweet gourd is a C3 plant where maximum photosynthesis occurred in 50% sun light a result fruit size and weight not so affected. Rahman (2013) reported minimum reduction of fruit size and weight but more reduction of fruit setting in chilli during combined production with *Acacia auriculiformis* tree. From the above results it was also found that number sweet of gourd fruit in association with mango and guava per unit area were 30% more reduced compare to per plant because mango and guava trees occupy more space as a result reduction was increased per unit area.

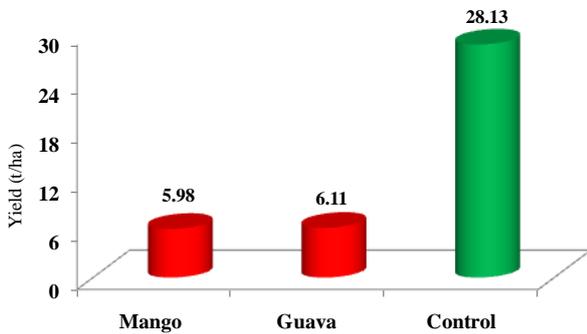


Fig. 5. Yield of sweet gourd in association mango and guava trees

#### Yield (t/ha) and yield reduction (%) of sweet gourd:

Like growth and yield attributes of sweet gourd yield was also significantly affected by mango and guava trees (Fig. 5). Yield of sweet gourd in association with mango was 5.98 t/ha and with guava was 6.11 t/ha which was near 77-78% lower compare to sole cropping yield (28.13 t/ha) (Fig. 5). Yield reduction of sweet gourd in association

with mango and guava also estimated, it was found that per unit area yield was severely reduced where as per plant yield reduction was moderate (Fig. 6). 2-5% more yield reduction of sweet gourd was recorded in association with mango trees compare to guava trees (Fig. 6).

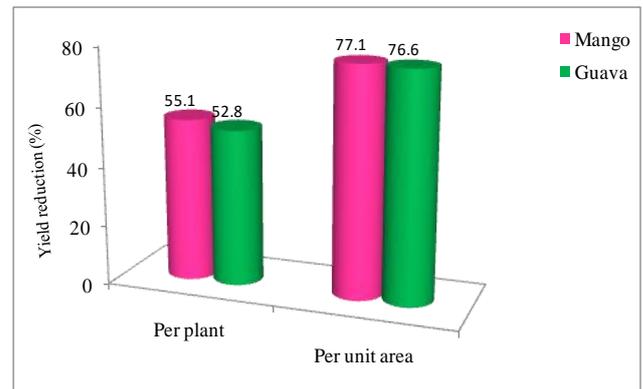


Fig. 6. Yield reduction of sweet gourd in association mango and guava trees

Increased yield reduction sweet gourd per unit area compare to per plant may be due to more area occupying by mango and guava trees itself. Overall yield reduction of sweet gourd in association with mango and guava trees might be due to several reasons as: (i) shade effect of mango and guava trees (Singh *et al.*, 1989), (ii) competition for different growth resources viz. PAR (Photosynthetically Active Radiation), moisture, nutrient elements etc. (Ong *et al.* 1991), (iii) host of disease and insect etc (Jiang *et al.*, 1984) (iv) Another fact is that associated trees are not leguminous and leaves are not easily decomposed which indicates that their leaf biomass are not so capable for adding organic matter or nutrients to the soil (Szott *et al.*, 1991). Mango tree create more shade compare to guava tree as a result more yield reduction of sweet gourd was observed in association with this trees. Mallick *et al.* (2013) and Rajput *et al.* (1989) found lower yield of strawberry and bitter gourd plant in association with *Xylia dolabriformis* and *Mangifera indica* tree.

Table 3. Average number of fruit and individual fruit weight of mango and guava with and without sweet gourd

Fruit trees	Av. number of fruit/tree		Av. weight per fruit (g)	
	With sweet gourd	Control (without sweet gourd)	With sweet gourd	Control (without sweet gourd)
Mango	119.2	115.5	167.05	165.16
Guava	57.1	55.4	122.54	121.05

**Yield and yield attributes of mango and guava:** As yield attributes of fruit trees, average number of fruit and individual fruit weight of mango and guava were recorded. It was found that all yield attributes of mango and guava with and without sweet gourd combination was almost similar more over 2-3% increased value was recorded in association with sweet gourd combination (Table 3). Average number of fruit/tree of mango and guava without sweet gourd were 115.5 and 55.4 respectively. Average number of fruit/tree of mango and guava with sweet gourd were 119.2 and 57.1 respectively (Table 3). Average individual fruit weight of mango and guava with tree were

165.16 and 121.05 g respectively. Average individual fruit weight of mango and guava without tree were 167.05 and 122.54g, respectively (Table 3). Due to intensive management of sweet gourd during cultivation period more nutrients and moisture added to the soil which also used by mango and guava trees. As a result mango and guava yield not decreased moreover sometime increased. Rahman *et al.* (2014) and Rajput *et al.* (1989) recorded similar type of results incase of different fruit trees in association with different winter vegetables.

**Land Equivalent Ratio (LER):** LER is the sum of relative yields of the components species. Relative yield is

the ratio of component yield as intercrop and its sole stands in any agroforestry system. In this study yield of sweet gourd, mango and guava were separately measured for sole and combined stands. Using the above yield values LER were determined mango-sweet gourd and guava-sweet gourd and the LER values for these combination were 1.257 and 1.261, respectively (Table 4). If LER = 1, there is no advantage (i.e., neutral) to intercropping or agroforestry in comparison to sole cropping. If LER > 1, indicate better use of resources or positive interaction between the components. If LER < 1, indicate the competition i.e., negative interactions between the components. So, from this study it was found that the

values of LER > 1 both combination with more than one which indicate combined production system of mango and guava with sweet gourd in char land ecosystem is beneficial. Alam *et al.* (2014) also opined similar type of LER information during combined production of different winter vegetables and *Acacia auriculiformis* tree.

From the above discussion, it is clear that vegetable yield was severely decreased and income from fruit trees i.e. mango and guava trees will increase due to intensive management of sweet gourd. LER analysis indicate that these combined production system in char land ecosystem are more productive compare to sole cultivation of fruit trees or vegetable crops.

**Table 4.** Land Equivalent Ratio (LER) of mango and guava based agroforestry practices

Tree vegetable combination	LER
Mango and sweet gourd	1.257
Guava and sweet gourd	1.261

Considering the result and discussion of this study it is clear that vegetable yield was severely reduced and income from fruit trees i.e. mango and guava trees will increase due to intensive management of sweet gourd. LER analysis indicate that these combined production system in char land ecosystem are more productive compare to sole cultivation of fruit trees or vegetable crops. So, from this study it may be concluded that agroforestry practices in char areas of Bangladesh by combining fruit trees with sweet is profitable than mono cropping system.

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