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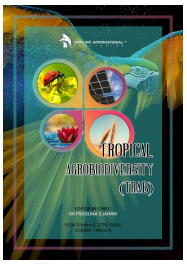

RESEARCH ARTICLE

INTERCROPPING MAIZE WITH GROUNDNUT IN CHAR LAND

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ABSTRACT

Intercropping is a farming practice involving two or more crop species, or genotypes, growing together and coexisting for a time. On the fringes of modern intensive agriculture, intercropping is important in many subsistence or low-input/resource-limited agricultural systems. Intercropping in order to improve land use efficiency, take advantage of intercropping facilitation and improve economic benefits. Also, linked with the higher yield, the associated higher amount of cereals-legume by-product is preferred for animal feed or human consumption. The objective of this study is to find out the suitable groundnut - maize intercropping system and increase productivity, economic and nutritional development of charland farmers of Bangladesh. In the experiment, intercropping system such as One row of maize in between two normal rows of groundnut, one row of maize (leaf cutting at the age of 115 days) in between two normal rows of groundnut, which was compared with sole maize, Sole maize (leaf cutting at the age of 115 days) and sole groundnut production. Total yields of maize /groundnut intercropping were higher than that of sole maize and groundnut. Maize /groundnut intercropping is the efficient use of light because of complementary use of space between the maize plants and the groundnut plants. Maize /groundnut intercrop gross return and BCR per hectare were found higher than from sole crop system. The total yield of intercropped crops was greater than sole cropping shown by LER>1. The overall advantage of intercropping ranged from 73 to 86%. The highest land equivalent value of 86% was recorded from paired row maize (leaf cutting at the age of 115 days) in between four normal rows of groundnut sowing arrangements indicated a yield advantage of 86% over sole crop.

KEYWORDS

Intercropping, maize, groundnut and Charland

1. INTRODUCTION

Intercropping is the practice of growing two or more crops in the same field for a significant part of their growing period (Li et al., 2020). Intercropping is the cultivation of two or more crop species in close intermingling on the same field for the whole or a part of their growing period (Vandermeer, 1989; Willey, 1990). Intercropping generally produces more yield per unit of land than sole cropping (Yu et al., 2015; Zhang and Li, 2003) and reduces the risk of crop failure due to pests and diseases (Boudreau, 2013; Horwith, 1985; Lithourgidis et al., 2011; Zhang et al., 2019). These advantages mainly arise from complementary patterns of resource uptake (light, water and nutrients) between crop species, better nutrient cycling, and through suppression of pests, weeds and diseases (Vandermeer, 1989). Intercropping also has the potential to counteract resource degradation (Feike et al., 2012; Lichtfouse, 2009), it can contribute to increases in soil carbon due to increased root biomass input, and it can increase organic soil nitrogen as a result of better nitrogen cycling (Cong et al., 2015). Intercropping is receiving increasing global interest as an agricultural practice as farmers strive to be more sustainable and maintain soil health (Glaze-Corcoran et al., 2020). Groundnut (*Arachis hypogaea* L.) is an important leguminous oilseed crop which is commonly known as poor man's nut as it is a cheaper source of protein when comparable to other nuts like cashew nut. It is also called as peanut, monkey nut and goober nut. Groundnut seed contains 44 to 56% oil and 22 to 30% protein on dry seed basis and is a rich wellspring of minerals (Phosphorus, Calcium, Magnesium and Potassium) and vitamins (Kaba *et al.,* 2014). The most commonly reported is the cereal-legume intercropping system; the most typical example is the intercropping of soybean and maize (Simbine et al., 2018). Maize (Zea mays L.) is an important crop in many parts of the developing world. It occupies the third place after wheat and rice (Food and Agriculture Organization of the United Nations (FAO, 2016). In Bangladesh, there are about 0.82 million hectares of char land (Ahmed *et al.*, 1987). "Charland" is the Bengali term, its English meaning is "Riverine Island" for mid-channel island that emerges periodically from riverbed as a consequence of accretion (Elahi, 1991). In Bangladesh the *char* lands can be divided into five sub areas which has highly potential for groundnut production (The Jamuna, the Ganges, The Padma, The upper Meghna and the lower Meghna River)

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where Tista and old Brahmaputra also constitute some *char* land areas (Islam et al., 2012). Due to decreasing cultivable land, farmers of char areas (Riverine Island) in Bangladesh have been practicing intercropped garden pea with onion (Rahman et al., 2015), coriander with onion (Talukder *et. al 2015*), sweet gourd with onion (Talukder *et. al 2015*), vegetables, pulse and oilseed crops with wheat (Talukder *et. al 2016*), different gourds with brinjal (Rahman et al., 2020) are common practice to the farmers of char areas. Groundnut and brinjal are the most important oil/vegetable crop production in Bangladesh especially in char land and cultivated all over the country in Rabi and Kharif seasons. Groundnut (87131 acres) maize (1099884 acres) of land with an annual production of groundnut (62832 M Ton) maize (3569321 M Ton) in Rabi and Kharif seasons respectively (BBS, 2020). Farmers of charland area cultivate sole groundnut or sole maize as a result productivity also reduced for this situation intercropped practice may increase productivity, economic and nutritional development of charland farmers. In this case the experiment is undertaken in charland.

2. Materials and Methods

The experiment was conducted at Nawvanger char, sadar, Jamalpur, Bangladesh 24°57´ north latitudes and 89°55´ east longitudes. The annual average temperature of this district varies from maximum 36.63°C to minimum 9.4°C. Annual average rainfall is 1549.45mm (Regional Research Report 2019-2020). The experimental site was of medium high land belonging to the agro-ecological zone Old Brahmaputra Floodplain under Agro-Ecological Zone 9 (UNDP & FAO, 1988). The experiment was conducted at the during *rabi* 2019-2020 and 2020-2021 to find out the suitable groundnut - brinjal intercropping system for increase productivity, economic and nutritional development of charland farmers. Design of the experiment was RCB with 03 (three) replications having the unit of plot 3.6m × 3.2m. BARI Badam-9 was used as a variety in the experiment. Treatments included in the experiment were: T_1= Sole Maize, T_2= Sole maize (leaf cutting at the age of 115 days), T_3= Sole groundnut, T_4= One row of maize in between two normal rows of groundnut, T_5= One row of maize (leaf cutting at the age of 115 days) in between two normal rows of groundnut, T_6= Paired row maize (leaf cutting at the age of 115 days) in between four normal rows of groundnut. ½ N and all other fertilizers as basal. Rest N will be applied at 30-35 and 55-60 DAS after irrigation (FRG, 2018). Crops were sown on October 29, 2020 and harvested from March 21, 2021 to April 25, 2021. Intercultural operations like watering, weeding and spraying insecticides were followed as and when necessary. Collected data were analyzed statistically with the help of STAR software and mean separation was done as per LSD test at 5% level of significance.

2.1 Nutrient status of initial soil

Location	PH	OC (%)	OM (%)	N (%)	K Meq 100g-1	P	S	Zn	B
						µg g-1			
Naovangar char, Jamalpur	6.3		0.98	0.049	0.22	4.56	1.41	0.71	0.39

3. Results and Discussion

Although total grain yields of maize/groundnut intercropping were higher than that of sole maize and groundnut. Another important aspect for maize/groundnut intercropping is the efficient use of light because of complementary use of space between the maize plants and the groundnut plants. The complementary effect is also shown for the length of the growth period because their life cycles are different, with the maturity of intercropped. The yield, gross return, variable cost and BCR of maize/groundnut are presented in Table 1. From the Table, it was revealed that maize/groundnut intercrop gross return and BCR per hectare were found higher than from sole crop system. In sole crop system which delivered less BCR than intercropped system which range 1.6-3.42. Groundnut Equivalent Yield (GEY) was highest from sole maize (4.97 t/ha) system which was statistically similar to other intercropped system except sole groundnut system.

Table 1: Two year polled data of intercropping maize with groundnut at 2019-2020 and 2020-2021

Treatment combination	Yield (t/ha)		Gross return (Tk.ha-1)	TVC (Tk. ha-1)	BCR	GEY	LER
	Groundnut	Maize					
Sole Maize	-	10.3	206000	75000	2.7	4.97	-
Sole maize (leaf cutting at the age of 115 days)	-	9.1	182000	80000	2.3	4.63	-
Sole groundnut	2.03	-	142100	90000	1.6	2.03	-
One row of maize in between two normal rows of groundnut	1.50	10.2	315000	92000	3.42	4.41	1.73
One row of maize (leaf cutting at the age of 115 days) in between two normal rows of groundnut	1.60	10.1	314000	94000	3.34	4.49	1.77
Paired row maize (leaf cutting at the age of 115 days) in between four normal rows of groundnut	1.90	9.5	323000	95000	3.4	4.61	1.86

Maize = 20 Tk per kg and Groundnut= 70 Tk per kg

4. Conclusion

The increased yield with the intercropping was largely due to improved interspecies interaction and facilitation. Intercropping in order to improve land use efficiency, take advantage of intercropping facilitation and improve economic benefits. Also, linked with the higher yield, the associated higher amount of cereals-legume by-product is preferred for animal feed or human consumption. Therefore, maize/groundnut intercropping systems increase productivity, economic and nutritional development of charland farmers.

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