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Interspecies Competition, Growth and Yield in Barley-Peanut Intercropping

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Abstract: An experiment was carried out to study the effect of barley/peanut intercropping on the interspecies competition, growth and yield performance of the crops. The barley was considered as main crop and peanut as intercrop. The experiment comprised of four treatments viz., (i) SB, sole barley, (ii) SP, sole peanut, (iii) BP1, barley/peanut alternate intercrop (one row of barely and one row of peanut, alternately) and (iv) BP2, one row of barley with two rows of peanut intercrop. The plant height, leaf number, tiller or branch number per plant, leaf area index, total dry matter per plant and grain or seed yield were significantly affected by the different intercropping systems and were maximum in SB as well as in SP while those were minimum in BP1. Maximum grain yield of peanut (3.21 t ha^{-1}) was harvested from its sole cropping followed by that of BP2 (2.39 t ha^{-1}). The barley yield was declined by 56% in BP2 and that of peanut yield by 26% compared to their respective sole crops. However, intercropping of peanut with barley exhibited a remarkable change in land equivalent ratio (LER). The highest LER (1.18) was obtained from BP2 followed by BP1 (1.07) intercropping, i.e., land-use efficiency was increased by 18% for BP2 and 7% for BP1. The LERs exhibit that both the intercropping systems are encouraging for harvesting more seed yield. Barley equivalent yield (ca. 6.20 t ha^{-1}) was maximum for the BP2 followed by BP1 intercropping (ca. 4.56 t ha^{-1}). The competitive ratio of each stand approached unity indicates that barley-peanut association effectively balanced the competition between both species. These results strongly suggest that peanut can profitably be intercropped with barley as one row of barley with two rows of peanut.

Key words: Association, competitive ratio, equivalent yield, land-use efficiency

INTRODUCTION

Intercropping is the growing of two or more crop species simultaneously in the same field during a growing season (Ofori and Stern, 1987). It is a simple and inexpensive strategy and has been recognized as a potentially befitted technology to increase crop production due to its substantial yield advantage than sole cropping (Awal *et al.*, 2006). Besides the additional income form companion crop of an intercropping systems, it has another advantages such as insurance against the total or partial failure of main crop, nitrogen fixation (if legumes), suppression of weed growth, protection of soil erosion, efficient utilization of environmental resources such as solar radiation, soil water and nutrients (John and Malecela, 1980; Rao and Willey, 1980; Keating and Carberry, 1993).

Crop compatibility is the most essential factor for a feasible intercropping system. Thus the success of any intercropping system depends on the appropriate selection of partner species especially companion crop where competition between them for radiation, CO_2, nutrients, moisture, spaces etc are minimum (Willey, 1979). Usually crops belonging to the same family or types or growth durations are competitive for natural resources but the crops of different categories, such as cereals and legumes, are usually complementary in nature i.e., they are mutually benefited (Keating and Carberry, 1993). The common intercrop mixture comprises a tall stature cereal and dwarf legume. A lot of cereal vs legume intercropping studies have been conducted globally over the past four decades (Ofori and Stern, 1987; Tsubo *et al.*, 2001, 2005). However, the barley/peanut association has not yet been analyzed although these crops have enough potentiality to mitigate world food shortage. Among the cereals, barley (*Hordeum vulgare* L.) ranks fourth position after wheat, rice and maize in the world (FAO, 2002). Barley contains mainly carbohydrates with considerable amount of proteins, minerals and vitamins (Pal *et al.*, 1996). Similarly, peanut (*Arachis hypogaea* L.) is an important oil crop in the world which contains oil, protein, carbohydrate together with vitamins B and E (Woodroof, 1966). It fixes atmospheric N_2 through *Rhizobium* bacteria in its root nodule which helps to maintain sustainable soil fertility (Lee *et al.*, 1998). Both barley and peanut plants have ability to grow in diverse environmental conditions

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and are well adapted in Bangladesh climate (Martin and Leonard, 1967). Due to over increasing population cultivable land is reducing in the world especially developing countries like Bangladesh where about 2 million metric tons of cereals are imported every year (BBS, 2004). To intensify crop production we should increase the land-use efficiency. Therefore, the aim of the present study is to evaluate the growth and productivity of barley/peanut intercropping with spatial orientation and to assess their compatibility or feasibility as intercrops under the existing agroclimatic conditions of Bangladesh.

MATERIALS AND METHODS

Field experiment: A field study was conducted at the experimental farm of the Department of Crop Botany, Faculty of Agriculture, Bangladesh Agricultural University, Mymensingh, Bangladesh (24°25' N, 90°50' E, 18 m above sea level) during the winter/spring cropping season extended from December 2003 to May 2004. The site is an old Brahmaputra alluvial flood plain. The experimental field is a medium low land, fairly levelled and silt loam in texture having a soil pH of 6.32. The basal fertilizers of N, P_2O_5 and K_2O were applied at a rate of 83, 55 and 48 kg ha^{-1}, respectively. Total amount of P_2O_5 and K_2O and half of N were applied during the final land preparation. Rest half of the N was equally applied in the two equal splits one at 25 days after sowing (DAS) and the other at 45 DAS (BARC, 1997). Seeds of barley (cv. 'BARI Barley-1') and peanut (cv. Dhaka-1) were sown by hand on 25 December 2003 in rows oriented north to south (N-S). Soon after emergence, the seedlings were thinned keeping the plantlets at appropriate distance (Fig. 1). Pest control and other cultural practices were performed to optimize growth and development.

Experimental design: The experiment comprised four treatments: sole crops of barley and peanut (referred as SB and SP, respectively) and two kinds of barley/peanut intercrop (referred as BP1 and BP2, respectively). The experiment was laid out in a Randomized Complete Block Design (RCBD) with four replicates. The unit plot size was 5×5 m. The row spacing was 40 cm for both SB and SP. In the BP1 intercrop plot, the barley inter-row distance was the same as for SB and the peanut rows were grown between the barley rows, i.e., 20 cm from the barley rows. In the BP2 intercrop plot, the barley inter-row distance was 80 cm and two peanut rows (40 cm apart) were grown between the barley rows where the distance between barley row and adjacent peanut row was 20 cm. In both intercrop plots, the row to row distance for peanut was remained same as sole peanut (SP), i.e., 40 cm. For both sole and intercrops, the intra-row spacing was 10 cm for barley and 25 cm for peanut. Detailed plot layout for all treatments is presented in the Fig. 1.

Data collection: The destructive sampling for recording data on different growth parameters were started from 44 DAS and continued at an interval of 14 days till maturity of barely (100 DAS) or peanut (142 DAS). Five representative plants were uprooted carefully in order to ensure maximum root to be retained. The morphological data were recorded on plant height, number of effective

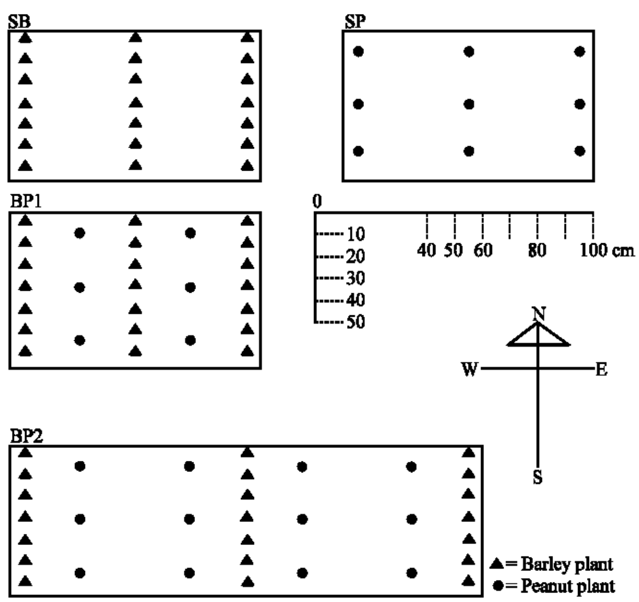

Fig. 1: Spatial layout of the various sole and intercropping systems of barley and peanut

tillers i.e., spikes per hill (for barley) or branches per plant (for peanut), number of leaves per hill or plant, leaf area (LA) etc. The LA was calculated from the relationship between the leaf DM (dry matter) and the specific leaf area, which were derived separately for each plot and sampling date. LA of representative sample was measured with an electronic area meter (LI 3000, LiCor, USA). The leaf area index (LAI) was calculated as the leaf area/ground area ($m^2 m^{-2}$). The plant parts were separated in to root, stem, leaf and spike or pod and dried to a constant weight in an oven at 70°C.

Computation of equivalent yield, production efficiencies and competitive ratio (CR): Barley equivalent yield (BEY) was computed by converting yield of intercrop into the yield of barley on the basis of prevailing market prices of individual crops as (Anuaneyulu *et al.*, 1982):

$$\text{BEY} = y_B + \frac{y_{IP} \times p_{IP}}{p_B} \quad (1)$$

where, Y_B and Y_{IP} are the yield of barley and peanut in an intercropping system and p_B and p_{IP} are the selling price of barley and peanut, respectively.

The land equivalent ratio (LER) was calculated following Mead and Willey (1980):

$$\text{LER} = \sum_{i=1}^{n} \left(Y_i^I / Y_i^S \right) \quad (2)$$

where, Y_i^I and Y_i^S are the yield of crop I in intercropping and sole cropping, respectively and n is the total number of crops in the intercropping system.

The area time equivalency ratio (ATER) was calculated as (Hiebsch, 1978):

$$\text{ATER} = \sum_{i=1}^{n} \frac{t_i^S}{t_I} \left(Y_i^I / Y_i^S \right) \quad (3)$$

where, t_i^S is the growing period of crop I in sole cropping and t_I is the total growing period for the intercropping system.

The competitive ratio (CR) was calculated following Willey and Rao (1980) and Leihner (1983):

$$\text{CR} = \left(\frac{I_a / S_a}{I_b / S_b} \right) \left(Q_b / Q_a \right) \quad (4)$$

where, I_a and I_b are the yield of crop a and crop b in intercropping, respectively and that of S_a and S_b are the respective yield in sole cropping. The term Q_a is the relative space occupied by species a and that of Q_b by species b in the intercrop association.

Statistical analysis: The collected data were statistically analyzed and the mean differences were evaluated by Duncan's New Multiple Range Test (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Micrometeorological parameters: Although the air and soil temperatures gradually increased throughout the growing season (Table 1), the relative humidity (RH) was nearly unchanged in all the months except February and March, when the RH was lowest due to minimum rainfall. Maximum rainfall (246 mm) was occurred at April that curtailed the total sunshine duration.

Stands height: The above ground stand growth under different cropping systems was evaluated in terms of plant height from 44 DAS till maturity on 100 DAS (barley) or 142 DAS (for peanut). Maximum plant height was observed for sole crops and minimum for BP1 plants (Table 2). The plant height of peanut increased slowly with time up to 100 DAS followed by a sharp increase after harvesting of main crop (barley) at 100 DAS. Sole barley and peanut produced the tallest plants over the plants under the both intercropping treatments and lowest height in BP1 plots. The plants height in BP2 treatment was intermediate compared to BP1 and other sole crops (i.e., SB and SP). This variation in stands height may be attributed to the low competition for nutrient, moisture, light, space, etc. in plants from sole cropping compared to that in BP1 or BP2 association (Bray, 1954; Wahua, 1983).

Number of tillers/hill or branches/plant: In peanut, number of branches per plant varied significantly both in vegetative and reproductive stages but in barley, significant variation was found in reproductive stage only (Table 3). In sole cropping, both barley and peanut produced the maximum number of tillers/hill or branches/plant followed by BP1 or BP2 treatments. For example, barley plants in sole plot (i.e., SB) produced 14 and 7% more tillers than the BP1 and BP2, respectively at crop maturity. However, peanut sole plants (SP) produced maximum number of branches (7) which was about 29 and 21% higher in than that of BP1 and BP2 intercropped, respectively. Such increase in number of tillers/hill or branches/plant in sole cropping might be due to the contribution of more available spaces for horizontal spreading of the plants along with less competition for nutrients and moisture (Rabotnov, 1977; Shackel and Hall, 1984).

Table 1: Monthly mean micrometeorological parameters at the onsite agricultural meteorological station during the growing period from December 2003 to May 2004

Months	Air temperature (°C) Max	Min	Av	Soil temperature[1] (°C)	Relative humidity (%)	Rainfall[2] (mm)	Sunshine duration[2] (h)
Dec, 2003	25.9	14.4	20.1	21.9	80.3	10.2	226
Jan, 2004	23.7	12.2	17.9	19.4	80.5	6.4	195
Feb, 2004	27.3	14.7	21.0	21.2	72.9	1.5	249
Mar, 2004	31.1	21.3	26.2	26.3	75.4	14.9	206
Apr, 2004	30.0	21.8	25.7	28.1	82.0	245.5	177
May, 2004	33.0	25.4	29.2	30.9	81.6	146.0	223
Mean	28.5	18.3	23.4	24.6	78.8	424.5[3]	1276[3]
(±)	(3.5)	(5.2)	(4.3)	(4.5)	(3.7)		

[1]Average value from 5, 10 and 15 cm soil depths, [2 and 3] Monthly and seasonal total, respectively, Values in parentheses represent the standard deviation (±) of the values for all months

Table 2: Variation in height of (a) barley and (b) peanut plants over the growth period as influenced by intercropping

Cropping systems	Days after sowing (DAS) 44	58	72	86	100	114	128	142
(a) Plant height (cm) in barley								
SB	7.7a	16.4	30.8a	42.2a	35.0a			
BP1	6.3b	15.9	28.6c	38.7b	32.5b			
BP2	7.2a	15.8	29.5b	41.5a	33.8ab			
(b) Plant height (cm) in peanut								
SP	10.3	12.7a	14.6	22.5a	32.6a	48.4a	69.8a	88.8a
BP1	9.8	10.8b	13.5	21.1b	27.7b	40.5c	56.8b	76.5b
BP2	10.1	11.3ab	14.1	21.5b	29.2b	41.9b	64.3a	80.8b

In a column for each crop, figures having dissimilar letter(s) differ significantly at 5% level of probability and that of without letter(s) do not differ significantly

Table 3: Effect of barley-peanut intercropping on the (a) number of tillers (spikes)/hill in barley and (b) branches/plant in peanut stands

Cropping systems	Days after sowing (DAS) 44	58	72	86	100	114	128	142
(a) Number of tillers or effective spikes/hill in barley								
SB	3.9	4.3	5.2a	6.4	7.0a			
BP1	3.8	4.1	4.5b	5.9	6.0b			
BP2	3.8	4.1	5.0a	6.4	6.5ab			
(b) Number of branches/plant in peanut								
SP	2.0	4.0a	5.0a	5.3a	5.5a	6.0a	6.5a	7.0a
BP1	2.0	3.4b	3.5b	3.8b	3.9c	4.1c	4.8c	5.0b
BP2	2.0	3.7ab	3.8b	4.1b	4.3b	4.9b	5.0b	5.5b

In a column for each crop, figures having dissimilar letters differ significantly at 5% level of probability and that of without letters do not differ significantly

Table 4: Effects of intercropping on the number of leaves/plant or hill in barley (a) and peanut (b) over the growth period

Cropping systems	Days after sowing (DAS) 44	58	72	86	100	114	128	142
a) Barley								
BP	7.7a	16.4	30.8a	42.2a	35.0a			
BP1	6.3b	15.9	28.6c	38.7b	32.5b			
BP2	7.2a	15.8	29.5b	41.5a	33.8ab			
b) Peanut								
SP	5.6	16.4a	27.4a	41.7a	56.7a	103.0a	143.3a	119.5a
BP1	5.2	12.8b	14.2c	25.6c	31.7c	55.5c	77.8b	63.3c
BP2	5.3	13.1b	19.1b	36.8b	42.7b	61.0b	91.8b	75.0b

In a column for each crop, figures having dissimilar letter(s) differ significantly at 5% level of probability and that of without letter(s) do not differ significantly

Number of leaves/plant: Significant variation in number of leaves per plant was found towards maturity due to the effect of different cropping systems (Table 4). The number of leaves produced per plants steadily increase until about 100 DAS in barley and 128 DAS in peanut. Thereafter, the number of leaves per plant slowly and continuously declined until maturity. Sole barley plants produced 7 and 3% more leaves than that from BP1 and BP2 intercrops, respectively. While in sole peanut plants produced 47 and 37% more leaves from BP1 and BP2, respectively. The probable cause to produce larger number of leaves/plant in sole treatments might be due to the absence of interspecies competition which helped to vigorous growth than intercropping treatments (Wahua, 1983). Additionally, sole crop enjoyed much solar radiation than intercrop stands which might be

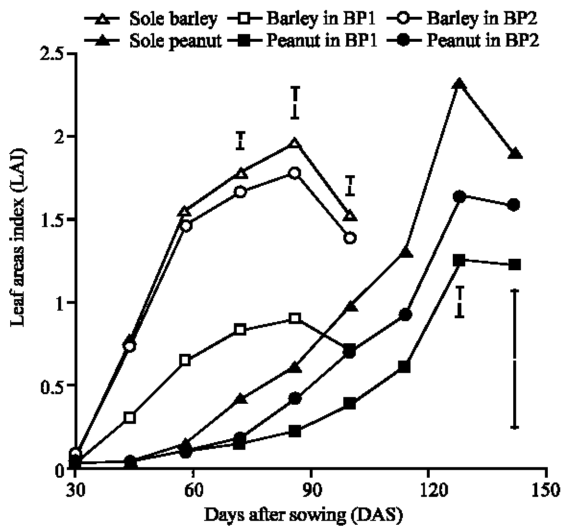

Fig. 2: Leaf area index (LAI) of barley (open symbols) and peanut plants (closed symbols) under different cropping systems. Vertical bars indicate the LSD (at 5% level) among the cropping systems

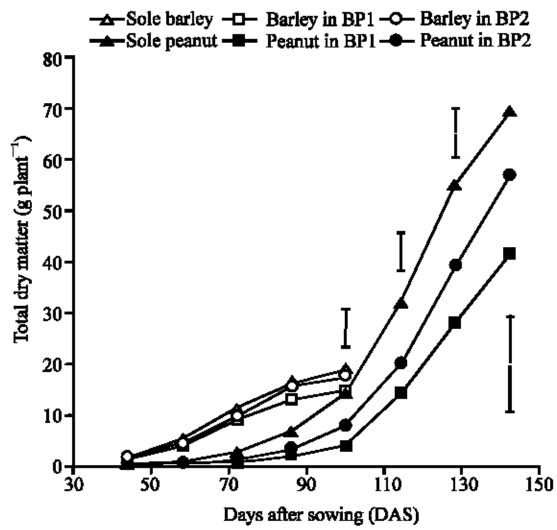

Fig. 3: Seasonal time-course of total dry matter accumulation (per plant basis) in barley (open symbols) or peanut plant (closed symbols). Vertical bars indicate the LSD (at 5% level) among the cropping systems

contributed to produce greater number of leaves in sole crops and the results are supported well by Stirling *et al.* (1990).

Leaf area index (LAI): LAI, a measure of leafiness and photosynthetic area of a crop plant at a particular time depends on the leaf growth, leaf number, branch number and leaf sequence. The ontogenic variation in the assimilatory structures (LAI) of barley and peanut in different cropping systems is presented in Fig. 2. The LAIs were significantly changed with progressing maturities both in barley and peanut. Initial low LAI in all the treatments rapidly increased to a maximum at about 86 DAS in barley and 128 DAS in peanut followed by a sharp decline with the advancement of maturity. Plants in sole plots had higher LAI than intercrop plots. For example, at 86 DAS, sole barley produced 15 and 53% higher LAI and that of at 128 DAS sole peanut produced 44 and 28% higher LAI than the respective plants grown in BP1 and BP2 treatments.

The variation of LAI among the treatments could mainly be attributed to the variation of tillers/hill or branches/plant (Table 3) and number of leaves/plants (Table 4). Initial poor vegetative growth resulted insignificant variation in LAI and has been reported by Prasad *et al.* (1978). Thereafter, with the development and expansion of new leaves and tillers or branches per plant, LAI increased and reached to the maximum at 86 DAS in barley and at 128 DAS in peanut and subsequently declined sharply (Fig. 2) due to abscission of leaves for mutual shading and senescence of older leaves in lower tiers (Watson, 1958).

Total dry matter (TDM): The cumulative DM accumulation in the whole plant is a crude measure to assess its performance in a given environment. The TDM accumulation was recorded from 44 DAS at an interval of 14 days up to maturity of barley (100 DAS) or peanut (142 DAS). TDM production affected significantly both of them for intercropping (Fig. 3). The TDM in peanut increased slowly when grown with barley till 100 DAS but after harvesting of the main crop (barley) at 100 DAS, the TDM increased sharply till harvesting. Sole barley and peanut accumulated maximum DM throughout the growth period followed by the plants grown under BP1 and BP2 treatments. For example, sole barley plants accumulated maximum amount of DM at 100 DAS which was about 19 and 7% higher than the BP1 and BP2 and that of sole peanut accumulated 14.4 g plant^{-1} which was about 60 and 40% greater than BP1 and BP2, respectively.

The DM production of a crop dependent on the size of the photosynthetic system and its activity as well as the length of its growth period (Watson, 1958; Evans, 1975). Generally, DM accumulation is positively correlated with leaf area (Pandey *et al.*, 1978). Initially there was incomplete canopy cover (due to lower LAI values) in all the treatments, which resulted in maximum utilization of natural resources without any competition or less competition for light, soil water and nutrients commensuration with the linear growth of DM accumulation (Awal *et al.*, 2006). Stop of further increase of DM accumulation following 86 DAS in barley could be attributed for dropping LAI (Fig. 2) which happens due to morpho-physiological event of plants (Khan, 1981).

Yield components and grain or seed yield and equivalent yield: Yield components of peanut and barley such as number of spike/plant (Table 3), spike or pod dry weight/plant, weight of thousands seed or grain (Table 5) and number of pod/plant or filled seed/pod (data not shown) were severely affected due to different intercropping which ultimately resulted in grain or seed yield reduction in peanut and barley. The results indicate that among the intercropping, BP2 was the best and BP1 intercropping was the worst in respect of grain yield for both of barley and peanut.

Seed yield of both barley and peanut significantly affected by the intercropping system (Table 5). Maximum barley grain yield (1.56 t ha^{-1}) was obtained from sole and minimum from BP2 plots (0.68 t ha^{-1}). The yield of sole barley was 43 and 56% higher than that of BP1 and BP2 intercrops. In intercropping system, the yield reduction of barley comparing to its sole crop might be due to higher competition for light, soil nutrients and water (Bray, 1954; Wahua, 1983) and yield reduction of individual crop in intercropping system is a common phenomenon (Ofori and Stern, 1987; Awal *et al*., 2006).

Barley equivalent yield (BEY) was found to be higher compared to sole crop in all the intercropped treatments (Table 5). BP1 and BP2 intercrop plots had, respectively 192 and 297% higher BEYs than that of sole barley plot (1.56 t ha^{-1}).

Sole peanut (seed yield, 3.21 t ha^{-1}) produced 50 and 26% higher seed yield than that of BP1 and BP2 peanut plants. This result is in agreement with that of Lal *et al.* (1998), who reported that yield of wheat, lentil, linseed, mustard and peas were decreased by intercropping. Tomar *et al.* (1997) also stated that seed yield of respective crops were decreased by cereal/legumes intercropping. The highest seed yield was produced in sole peanut due to taller plant (Table 2) and the highest number of branches/plant (Table 3) and was good agreement with Rasul *et al.* (1990) and Nigem *et al.* (1991).

Land equivalent ratio (LER), area time equivalent ratio (ATER) and competitive ratio (CR): LER indicates the ratio of land required by pure crop stand to produce the same yield as that of intercrop. Thus, it refers to the relative area of pure crop or crops required to produce the same yield or yields as achieved in intercropping of the same crops (Willey, 1979). So, LER was calculated for comparison of the barley/peanut intercropping system. LER varied significantly due to the different intercropping in barley with peanut (Table 6).

Barley-peanut intercropping exhibited productivity advantages ranging between 7 and 18% (Table 6). Higher LER (1.18) was obtained from the BP2 and minimum (1.07) from BP1 treatments. An LER value of 1.18 for BP2 plot indicates that by intercropping barley and peanut a farmer could produce 2.39 tons of peanut and 0.68 tons of barley from one hectare of land instead of growing them separately in 1.18 hectare to obtain the same yields. In other words, by intercropping of barley with peanut for the BP2 treatment, the land-use efficiency could be increased up to 18%. This result corresponds well with the previous findings (Rahman *et al.*, 1982) due to improve of radiation-use efficiency of subordinate (i.e., peanut) species (Marshall and Willey, 1983; Harris *et al.*, 1987; Awal *et al.*, 2006).

Due to the land occupation time by the partner stands was different, ATER would provide better estimate than LER (Hiebsch, 1980) as it permits an evaluation of crops on a yield-per-day basis (Hiebsch and McCollum, 1987). Only combined BP2 intercrop stands have crossed the ATER more than unity (Table 6) indicating their

Table 5: Spike dry weight (SDW)/plant, pod dry weight (PDW)/plant, thousands seed weight (TSW), seed or grain yield and barley equivalent yield (BEY) in sole and intercropping treatments

			TSW (g)		Yield (t ha^{-1})		
Cropping systems	SDW (g $plant^{-1}$)	PDW (g $plant^{-1}$)	Barley	Peanut	Barley	Peanut	BEY (t ha^{-1})
SB	7.9a	-	34a	-	1.56a	-	1.56c
SP	-	27a	-	288a	-	3.21a	-
BP1	5.7b	13c	30ab	248b	0.89b	1.59c	4.56b
BP2	6.9a	21b	32a	284a	0.68c	2.39b	6.20a

In a column, figures having dissimilar letter(s) differ significantly at 5% level of probability, Price: Barley grain, BDT (Bangladesh Taka) 13 kg^{-1} and peanut seed BDT 30 kg^{-1}

Table 6: Land equivalent ratio (LER), area time equivalency ratio (ATER) and competitive ratio (CR) of the partner stands of the intercrop or combined intercrop

	BP1			BP2		
Crops in intercrop mixtures	LER	ATER	CR	LER	ATER	CR
Barley	0.57b	0.40c	1.15a	0.44c	0.31c	1.18a
Peanut	0.50c	0.50b	0.87b	0.74b	0.74b	0.85b
Combined intercrop	1.07a	0.90a	-	1.18a	1.05a	-

In a column, figures having dissimilar letter(s) differ significantly at 5% level of probability best performance (McCollum, 1982). The CR of each stand approached unity (Table 6) indicates that the intercropping cultural practices and genotypes used in this study effectively balanced the competition between the species, leading to 7 to 18% greater land-use efficiency for intercropping as compared to sole cropping systems and the results keep pace with Mason *et al.* (1986) for cassava-peanut intercropping. Efficiency of an intercrop production might be increased by minimizing interspecies competition between the component crops for growth limiting factors (Willey, 1979). Although barley crop had little higher CR than unity, lower CR value of peanut has successfully counterbalanced the competition between these species.

CONCLUSIONS

Barley/peanut association significantly affects the growth and yield of these crops. The plant height, leaf number, branch or tiller number per plant, leaf area index, total dry matter per plant were significantly affected by the different intercropping systems and were maximum in sole barley as well as in sole peanut while those were minimum in alternate intercropping (i.e., BP1; one row of barley with one row of peanut). Maximum peanut yield (3.21 t ha^{-1}) was harvested from its sole crop followed by that of BP2 (one row of barley with two rows of peanut) intercropping (2.39 t ha^{-1}). The barley yield was declined by 56% in BP2 intercropping and that of peanut yield by 26% compared to their respective sole cropping. However, intercropping of barley with peanut exhibited a remarkable increase in land equivalent ratio (LER). The highest LER (1.18) was obtained from BP2 followed by BP1 (1.07) intercropping i.e., land-use efficiency was increased by 18% for BP2 and 7% for BP1 intercropping. The LER values exhibit that both the intercropping systems are encouraging for harvesting more grain yield. Barley equivalent yield (ca. 6.20 t ha^{-1}) was maximum for the BP2 followed by BP1 (ca. 4.56 t ha^{-1}) intercropping. The results strongly suggest that barley can profitably be intercropped with peanut at the rate of one row of barley and two rows of peanuts. Every year Bangladesh expenses about US$ 1.7 and 0.07 millions to import peanut and barley grains, respectively (BBS, 2004), hence the information of this study could help to save such foreign currency to a great extent.

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