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Economic Gain from Sunflower-Mungbean Intercropping Systems under Rainfed Conditions

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Economic gain from sunflower-mungbean intercropping systems was assessed at University of Arid Agriculture, Rawalpindi, Pakistan, during spring and summer, 1996. Land equivalent values showed a significant advantage of intercropping in both the systems and the seasons. Economic analysis showed that sunflower + mungbean (1:1) during spring season and sunflower + mungbean (1:2) during summer season provided higher benefit cost ratio (BCR) and net income.

Key words: Intercropping, Benefit-cost Ratio, Sunflower, Mungbean.

Introduction

Intercropping is considered to be an effective and the most potential way of increasing production per unit area, particularly at small farms. Maximum benefits are realized when component crops have the least competition. This can be achieved by utilizing the row space of tall plants without reducing their density and without changing their optimum sowing time in order to ensure maximum utlization of resources by the dwarf crop. Sindagi (1982) reported that intercropping of sunflower in groundut was found to bring higher returns. Under unfavourable weather conditions, groundnut may fail but sunflower brings some return, while under favourble conditions, both crops in combination bring still higher returns as compared to sole crops. Mittal *et al* (1985) found that due to efficient utilization of space, light, water and nutrients by intercrop treatments higher benefit cost ratio (BCR) was recorded. They further mentioned that although there was reduction in the yield of major maize crop but the additional income from legume crop increased the total income per unit area. Ibrar (1995) studied sunflower-summer legumes intercropping and concluded that intercropping gave higher net income ha^{-1} than the sole cropping of component crops. In another study, the highest financial return was given by 2 rows of sesame alternating with 2 rows of mungbean at a row spacing of 37.5 cm (Sarkar and Pramanik 1992).

Intercropping gives higher yields than sole crops (Gill 1990; Sandhu 1988; Nasrullah 1987) and better net return (Umrani *et al* 1987). Keeping these findings in view, the present study was designed to assess the economic gain from sunflower-mungbean intercropping systems under rainfed conditions in Rawalpindi region.

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Materials and Methods

The investigations to assess the economic gain from sunflower-mungbean intercropping systems were carried out at the University of Arid Agriculture Rawalpindi during spring and summer seasons of 1996. Sunflower hybrid (PARC-92E) was sown as the main crop and mungbean (variety NM-92) was sown as intercrop. The experiment comprised of sunflower sole, mungbean sole, sunflower + mungbean (1:1) and sunflower + mungbean (1:2). The crops were planted at the end of February and in the first week of July during spring and summer seasons respectively. Sunflower was planted as 60 cm row spacing and one or two rows of mungbean were intercropped in between the rows of sunflower. Mungbean sole was planted at 30 cm row spacing. The crops were grown under rainfed conditions with normal agronomic practices following Randomized Complete Block Design with four replications. For determining economic yield, two central rows of each crop from each plot were harvested and the yield was converted to kg ha^{-1}. Land equivalent ratio was calculated following the formula described by willey (1979), LER=La + Lb = (Ya/Sa) + (Yb/Sb). Where La and Lb are the LERs for the individual crops, Ya and Yb are the individual crop yields in intercropping and Sa and Sb are the individual crop yields in sole crops.

All the cultural practices and inputs of all the treatments were same except the seed. Total expenditure was calculated based on the varying cost of the seed. Economic analysis was performed by calculating gross income and total expenditure in rupees per hectare. Gross income values were divided by respective total expenditure values to calculate BCR values for all the treatments.

Results and Discussion

Sunflower was main crop and mungbean was intercrop in this study. The seed yields of component crops were significantly better in pure stand than intercropping in both the seasons. Nasrullah (1987), Gill (1990) and Sandhu (1988) have already reported that yield is significantly reduced by intercropping as compared to pure stand. The yield reductions in sunflower were significantly higher in 1:2 system than, 1:1 system that indicated more competition by higher population pressure of the intercrop. Individual crop yield reductions in the intercorpping systems may be attributed to the competition posed by the component crops for available resources. The yields of sunflower were better in spring season than in summer season whereas in case of mungbean it was reverse. It showed the adaptibility of individual crops.

Relative area of sole crop required to produce the yield achieved in intercropping is the land equivalent ratio (LER). If the toal LER of an intercropping system is above the value of 1.0, it indicates overall advantage of the system. The component crop having higher LER value is dominant in the intercropping system. The LER clearly indicated that sunflower crop was dominant in intercropping systems in both seasons. It is clear from the Table 1 that maximum LER value of 1.46 was obtained for sunflower + mungbean (1:2) intercropping, the minimum being 1.34 in sunflower + mungbean (1:1) intercropping in spring season. It is also evident from the Table 2 that maximum LER value of 1.46 was obtained for sunflower + mungbean (1:2) intercropping, the minimum being 1.32 in sunflower + mungbean (1:1) intercropping in summer season. In other words there was 45% advantage in sunflower + mungbean (1:2) intercropping over sole crop of the component as it resulted in saving of 46% area in both seasons whereas there was 34% and 32% advantage in sunflower + mungbean (1:1) intercropping over sole crop of the component in spring and summer season, respectively. The results are in line with the findings of Ibrar (1995) who stated that maximum LER value of 1.38 was obtained in sunflower-mungbean intercropping system.

The profitability of an intercropping system in determined by its ultimate economic return. Data pertaining to the details of economic analysis alongwith all relevant calculations in spring and summer seasons, presented in tables 1 and 2 respectively, revealed that intercropping systems under study gave higher net income ha^{-1} than the sole crops. Amongst intercropping systems, the maximum net income of Rs.25344 ha^{-1} was obtained in case of sunflower + mungbean (1:1) intercropping system as aginst Rs.24748, 21772 and 7951 for sunflower + mungbean (1:2) sunflower sole and mungbean sole,

Table 1

Economic analysis of sunflower-mungbean intercropping system in spring season

Treatments	Seed yield (kg ha^{-1})		Land equivalent ratio			Income (Rs ha^{-1})		Gross income (Rs ha^{-1})	Total expenditure (Rs ha^{-1})	Net income (Rs ha^{-1})	BCR
	Sunflower	Mungbean	Sunflower	Mungbean	Total	Sunflower	Mungbean				
Sunflower sole	3468.88a	-	-	-	-	33388	-	33388	11616	21772	2.87
Mungbean sole	-	922.89a	-	-	-	-	16612	16612	8661	7951	1.92
Sunflower+ Mungbean (1:1)	3179.13b	389.67c	0.92	0.42	1.34	30599	7014	37613	12269	25344	3.07
Sunflower+ Mungbean (1:2)	2684.25c	631.76b	0.77	0.69	1.46	25835	11371	37206	12458	24748	2.99

Table 2

Economic analysis of sunflower-mungbean intercropping system in summer season

Treatments	Seed yield (kg ha^{-1})		Land equivalent ratio			Income (Rs ha^{-1})		Gross income (Rs ha^{-1})	Total expenditure (Rs ha^{-1})	Net income (Rs ha^{-1})	BCR
	Sunflower	Mungbean	Sunflower	Mungbean	Total	Sunflower	Mungbean				
Sunflower sole	3252.38a	-	-	-	-	31304	-	31304	11408	19896	2.74
Mungbean sole	-	1023.11a	-	-	-	-	18416	18416	8841	9575	2.08
Sunflower+ Mungbean (1:1)	2921.80b	428.99c	0.90	0.42	1.32	28122	7721	35843	12092	23751	2.96
Sunflower+ Mungbean (1:2)	2567.81c	687.17b	0.79	0.69	1.46	24715	12369	37084	12446	24638	2.98

Market price of one kg seed: Sunflower, Rs.9.63; Mungbean, Rs.18.00. Rs ha^{-1}, Rupees per hectare. BCR, Benefit cost ratio.

respectively during spring. During summer, the maximum net income of Rs.24638 ha^{-1} was obtained in case of sunflower + mungbean (1:2) intercropping system as against Rs.23751, 19896 and 9575 for sunflower + mungbean (1:1), sunflower sole and mungbean sole, respectively. However in terms of percentage, there was 16.41 and 13.68% increase in the net income ha^{-1} as a result of sunflower + mungbean (1:1) and sunflower + mungbean (1:2) intercropping systems, repectively, over sunflower sole in spring season. During summer, there was 23.83 and 19.38% increase in the net income ha^{-1} as a result of sunflower + mungbean (1:2) and sunflower + mungbean (1:1) intercropping systems, respectively, over sunflower sole. The advantage of intercropping over sole cropping was consistent over the seasons but the difference between the intercropping systems (intercropping of one or two rows of mungbean) during both the seasons was not outstanding.

The highest benefit cost ratio (BCR) of 3.07 was obtained in sunflower + mungbean (1:1) intercropping system as against 2.99, 2.87 and 1.92 for sunflower + mungbean (1:2), sunflower sole and mungbean sole, respectively, in spring season. During summer, the highest BCR of 2.98 was obtained in sunflower + mungbea (1:2) intercropping system as against 2.96, 2.74 and 2.08 for sunflower + mungbean (1:1), sunflower sole and mungbean sole, respectively. The results are in accordance with the findings of Umrani *et at* (1987) who concluded that highest net income and BCR was obtained in intercropping system than sole cropping of component crops.

The net income and benefit cost ratio was relatively better in spring season. It may be attributed to the dominance of sunflower crop because sunflower yields were relatively better in spring season. The results have confirmed that intercropping is advantageous over sole cropping and this advantage is consistent over seasons. As intercropping is more labour intensive and allows less mechanization of the farm; it is more practicable at the farms where the holdings are small and manual labour is available. The most important aspect of intercropping is the compatibility and population density of the component crops. This study has shown that intercropping one row of mungbean in sunflower is profitable. Further work with different crop combinations for higher returns is suggested.

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