

Agro Economic Expression of Different Relay Crops after Rice Harvest under Conventional and Zero Tillage

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ABSTRACT

Studies on comparative productive efficiency and feasibility of different rice-based cropping systems both at conventional and zero tillage were carried out at the Agronomic Research Area, University of Agriculture, Faisalabad during the year 1999-2000. The experiment was laid out in a randomized complete block design (RCBD) with three replications by maintaining a net plot size of 3.6 x 6 m. The treatments comprised relay cropping like rice-wheat, rice- barley, rice- chickpea, rice-lentil and rice- berseem. All the crops were sown during 3rd week of November, 1999 and harvested (except berseem) in the 1st week of May 2000. Out of various rice-based cropping systems rice-chickpea turned up with the maximum monetary benefit both at conventional and zero tillage.

Key Words: Economics; Relay crop; Rice; Zero tillage

INTRODUCTION

Rice (*Oryza sativa* L.) is a crop of great agro-economic value in Pakistan. Besides being staple food of the millions people, it is a major source of earning foreign exchange. In Pakistan, rice is grown on an area of 2.32 million hectares with total annual production of 4.33 million tons giving an average yield of 1912 kg ha⁻¹ (Anonymous, 1998).

At present, rice-wheat-cropping system is very common in the rice growing areas of the Punjab, occupying 1.1 million hectares (Amir & Aslam, 1992). However, this system presents special problem in agronomic management. For example, rice requires puddled soils to maintain submergence during the growing season while wheat grows best in well-drained soils, which allow deep penetration of the root system (Hobbs *et al.*, 1987). Moreover, sowing of wheat is delayed due to late harvest, particularly of Basmati rice. Hence, wheat yields in the rice tract are much lower compared to other irrigated areas of the Punjab (Hamid *et al.*, 1987). Rice yields are also stagnated despite steadily increasing dosages of fertilizers (Amir, 1985). Thus it is imperative to find out other rabi crops as a sustainable for wheat and to develop such a system of planting rice, which may facilitate easy relaying of these crops. In view of this, the present study has been planned to develop a sustainable and economically viable cropping system as a sustainable for rice-wheat cropping system under the agro-ecological conditions of Faisalabad.

MATERIALS AND METHODS

The proposed research pertaining to determining production potentials of different rice-based relay cropping systems was conducted during 1999-2000 at the Agronomic Research Area, University of Agriculture, Faisalabad. For

this purpose, an experiment was laid out in a randomized complete block design with three replications and a plot size of 3.6 x 6 m. Wheat, barley, chickpea, lentil and berseem were grown as relay crops after the harvest of rice.

Rice (Basmati-385) was transplanted on July 19, 1999 in 75 cm spaced 4-row strips and just after the harvest of transplanted rice, all the relay crops, i. e. Wheat, barley, chickpea, lentil and berseem were planted only in the space between the rice strips both at zero tillage and on normally prepared seed beds during 3rd week of November, 1999. All the crops were harvested at their maturity except berseem, which was harvested as forage. Data on the agronomic traits of the relay crops were also recorded.

RESULTS AND DISCUSSION

The suitability of a cropping system is ultimately determined by the monetary gain. Data (Table I) reveal that there were pronounced differences among the various rice-based cropping system under conventional and zero tillage in terms of net income ha⁻¹. The net income of rice-based cropping systems at conventional tillage were recorded as Rs. 37, 845.49, 35, 748.58, 28,416.55, 19,070.08 and 18,345.04 ha⁻¹ for rice-berseem, rice-chickpea, rice-barley, rice-lentil and rice-wheat, respectively as against Rs. 33519.38, 27290.50, 21609.38, 15213.58 and 6778.18 ha⁻¹ for rice-chickpea, rice-berseem, rice-barley, rice-lentil and rice-wheat cropping system at zero tillage, respectively. The benefit-cost ratio of rice-based cropping systems at conventional tillage were recorded as 3.98, 3.84, 2.76, 2.66, 2.43 and 2.32 for rice-chickpea, rice-berseem, rice-barley, rice-lentil and rice-wheat, respectively as against 3.98, 3.17, 2.53, 2.41 and 1.57 for rice-chickpea, rice-berseem, rice-barley, rice-lentil and rice-wheat cropping system at zero tillage, respectively.

Table I. Agro- economic expression of different relay crops grown after rice at conventional and zero tillage

Relay Crop	Conventional Tillage					Zero Tillage						
	Grain Yield (t ha ⁻¹)	Straw/forage Yield (t ha ⁻¹)	Gross Income (Rs.ha ⁻¹)	Total Expenditure (Rs.ha ⁻¹)	Net Income (Rs.ha ⁻¹)	B.C.R	Grain Yield (tha ⁻¹)	Straw/forage Yield (t ha ⁻¹)	Gross Income (Rs.ha ⁻¹)	Total Expenditure (Rs.ha ⁻¹)	Net Income (Rs.ha ⁻¹)	B.C.R
T ₁ =Wheat	3.47	4.95	32212.50	13867.46	18345.04	1.32	2.00	2.83	18537.50	11759.32	6778.18	1.57
T ₂ =Barley	4.46	7.69	44522.50	16105.95	28416.55	2.75	3.47	4.06	35715.00	14105.62	21609.38	2.53
T ₃ =Chickpea	2.09	2.82	47730.00	11981.42	35748.58	3.98	1.96	2.46	44760.00	11240.42	33519.58	3.98
T ₄ =Lentil	1.20	2.23	30557.50	11487.42	19070.08	2.66	1.02	1.84	25960.00	10746.42	15213.58	2.41
T ₅ =Berseem	-	63.94	51152.00	13306.51	37845.49	3.84	-	49.82	39856.00	12565.50	27290.50	3.17

Prices					
	Wheat	Barley	Chickpea	Lentil	Berseem
Grain	Rs.7500 t ⁻¹	Rs.10000 t ⁻¹	Rs.22500 t ⁻¹	Rs.25000 t ⁻¹	-
Straw/forage	Rs.1250 t ⁻¹	Rs.250 t ⁻¹	Rs.250 t ⁻¹	Rs.250 t ⁻¹	Rs.800 t ⁻¹

The results further indicate that rice–chickpea cropping system gave the highest profit both at conventional and zero tillage among different rice-based cropping systems and was followed by rice–berseem, rice–barley, rice–lentil and rice–wheat.

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