



# Economics and productivity of biological efficient and profitable cropping systems in central plain zone of Uttar Pradesh

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**Abstract :** An experiment was executed with nine crop sequences during 2006-10 at C.S. Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh. All these sequences were evaluated for their system productivity, energy productivity, production efficiency, land use efficiency and economic analysis. Highest system productivity 392.94 q REY / ha. was obtained through maize + black gram – potato – onion crop sequence followed by maize – garlic – green gram (319.30 q REY /ha) while highest energy productivity (54055 K. calory ) was worked out for hybrid rice- wheat – green gram(G+R) crop sequence. Highest land use efficiency (90 %) measured through maize – mustard – onion crop sequence while maximum production efficiency 136.4 kg/ha/ day was achieved by maize + black gram – potato – onion crop sequence. The highest net return of Rs.210997/ha and profitability of Rs.578/ha / day was obtained through maize + black gram – potato – onion followed by maize – garlic – green gram (G+R) crop sequence, while highest return per rupee investment (1:2.81) was computed on hybrid rice- wheat cropping system followed by maize + black gram – potato – onion crop sequence (1: 2.72). On the basis of different biological indices and economical analysis maize + black gram – potato – onion crop sequence observed as biological efficient followed by maize – garlic – green gram (G+R) crop sequence over all other cropping systems.

**Key Words :** Economics, Productivity, Biological efficient, Profitable cropping systems

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## INTRODUCTION

The rice –wheat system is dominant cropping system of irrigated areas of Central Plain Zone of Uttar Pradesh. This system requires high input resources for higher productivity resulted higher cost per unit area and time. Following continuously the same system has adverse effect on soil health, ultimately decline in factor productivity of the system (Kumar and Yadav, 1993). In addition, leguminous crops in the system have favourable impact on soil health as well as improving the productivity of succeeding crop. The evolution of a large number of high yielding short duration varieties coupled with efficient technologies and implements for tillage has paved the path to substitute with a number of crops.

Inclusion of pulses, oilseeds and vegetables in the system is more beneficial and fetching higher return per unit area than cereals after cereals (Kumpavat, 2001). Therefore, the study was carried out to explore the possibilities of biological efficient and profitable cropping systems with regard to productivity and economic return.

## MATERIALS AND METHODS

The field experiment was conducted during 2006-07, 2007-08, 2008-09 and 2009-10 at Student's Instructional Farm, C.S. Azad university of Agriculture and Technology, Kanpur under All India Coordinated Research Project on Cropping Systems to identify the biological efficient and economically

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profitable systems. The soil was neutral to slightly alkaline of alluvial type having pH 8.1, 0.56 per cent organic carbon, available nitrogen (275 kg/ha) low in available phosphorus (18.5 kg/ha) and medium in available potash (180 kg/ha). A total nine cereal based crop (Three rice based and six maize based) T<sub>1</sub>-Rice- Wheat, T<sub>2</sub>-Hybrid rice – Wheat, T<sub>3</sub>-Hybrid rice –Wheat–Green gram (G+R), T<sub>4</sub> – Maize – Wheat , T<sub>5</sub> – Maize – Mustard – Onion, T<sub>6</sub> – Maize – Mustard-Green gram, T<sub>7</sub> – Maize + Green gram-Potato – Wheat, T<sub>8</sub> – Maize + Black gram-Potato – Onion , T<sub>9</sub> – Maize –Garlic –Green gram(G+R) sequences were tested in randomized block design with four replications. The yields of each rotation were converted into rice equivalent yield (REY) on price basis to compare the different crop sequences. The system productivity and economic analysis of each consecutive years have been computed to evaluate the efficiency of different crop sequences. Production efficiency values kg/ha/day were worked out by total production in crop sequence divided by total duration of crop in that sequence. Land use efficiency was worked out by taking total duration of crop in individual crop rotation divided by 365 days (Tomar and Tiwari, 1990). The profitability values in terms of Rs./ha/day were calculated by net monetary return of the rotation divided by total duration of the crop in that rotation. The computation of calories was worked out on the basis of calories found in a particular crop on per 100g.

## RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

### Biological yield and system productivity:

The mean analysis of four years revealed that the highest

biological yield of rice was obtained in hybrid rice-wheat-green gram (G+R) crop sequence where green gram was incorporated in soil after picking the pods in summer (Table 1). It was due to beneficial effect of incorporation as well as inclusion of legumes in the system. In maize based crop, highest biological yield was achieved in maize + black gram-potato – onion crop sequence followed by maize + greengram-potato – wheat sequence. The highest system productivity 392.94 q /ha in terms of rice equivalent yield was obtained through maize + black gram-potato – onion crop sequence followed by maize –garlic –green gram(G+R) cropping system 319.30 q REY/ha over all crop sequences evaluated.

### Energy productivity:

The maximum productivity in terms of calories (54055 K. calory) was worked out under hybrid rice-wheat–green gram (G+R) crop sequence followed by hybrid rice–wheat (49980 K. calory) and maize + greengram-potato – wheat sequence (48198 K.calory). maize + black gram-potato–onion crop sequence produced an energetic value of 43392 K. calories from the system as a whole (Table 1).

### Production efficiency and land use efficiency:

The highest production efficiency 136.4 kg/ha /day was recorded through maize + black gram-potato – onion crop sequence while maize + greengram-potato-wheat crop sequence yielded 108.5 kg/ha/day of efficient production and maize –garlic –green gram(G+R) crop sequence showed 97.9 kg/ha/day of production efficiency over all other sequences. The highest land use efficiency (90 %) was measured through maize-mustard –onion while 89 per cent land use efficiency was obtained with maize –garlic –green gram (G+R) crop sequence. The third best sequence hybrid rice-wheat-green gram (G+R) crop sequence utilized 87 per cent of the land over 365 days (Table 1).

**Table 1 : Biological yield, rice equivalent yield (REY), calory productivity, land use efficiency and production efficiency of different crop sequences (mean data of 4 years, 2006-2010)**

Crop sequences	Biological yield kg/ha						REY kg/ha	Total calories (Kx1000)	Land use efficiency (%)	Production efficiency kg/ha/day
	Kharif		Rabi		Summer					
	Grain	Straw	Grain	Straw	Grain	Straw				
T <sub>1</sub> : Rice- Wheat	5442	6450	4871	5696	-	-	14065	35683	67	57.4
T <sub>2</sub> : Hybrid rice -Wheat	9389	16042	5056	5894	-	-	18799	49980	67	76.7
T <sub>3</sub> : Hybrid rice-Wheat-GG (G+R)	9612	10833	5172	6023	869	-	22322	54055	87	70.4
T <sub>4</sub> : Maize-Wheat	2930	10523	5444	6252	-	-	12924	28857	61	58.5
T <sub>5</sub> : Maize- Mustard-Onion	3372	10242	1967	7818	13713	-	21572	29030	90	65.6
T <sub>6</sub> : Maize-Mustard -GG	3395	10200	2034	7227	1047	-	13792	26112	79	48.1
T <sub>7</sub> : Maize+GG-Potato-Wheat	3298	10015	21194	-	-	-	30587	48198	77	108.5
T <sub>8</sub> : Maize+BG-Potato-Onion	3396	10364	21611	-	18684	-	39294	43392	79	136.4
	441	1668	-							
T <sub>9</sub> : Maize-Garlic-GG (G+R)	3451	10993	8516	-	1222	-	31930	28999	89	97.9
C.D. (P=0.05)	-	-	-	-	-	-	761	-	-	-

**Table 2 : Economics and profitability of different crop sequences ( mean of 4 years, 2006-10)**

Crop sequences	REY (kg/ha)	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B: C ratio	Profitability (Rs./ha/day)
T <sub>1</sub> : Rice- Wheat	14065	53805	119554	65749	2.22	180
T <sub>2</sub> : Hybrid rice -Wheat	18799	56895	159788	102893	2.81	282
T <sub>3</sub> : Hybrid rice – Wheat-GG (G+R)	22322	72656	189737	117081	2.61	321
T <sub>4</sub> : Maize – Wheat	12924	46919	109853	62934	2.34	172
T <sub>5</sub> : Maize- Mustard-Onion	21572	82315	183363	101048	2.23	277
T <sub>6</sub> : Maize-Mustard –GG	13792	59476	117228	57752	1.97	158
T <sub>7</sub> : Maize+GG-Potato-Wheat	30587	110355	259987	149652	2.36	410
T <sub>8</sub> : Maize+BG-Potato-Onion	39294	123005	334002	210997	2.72	578
T <sub>9</sub> : Maize-Garlic-GG (G+R)	31930	107624	271408	163784	2.52	449
C.D. (P=0.05)	761	-	-	-	-	-

### Economics and profitability:

The economic analysis revealed that highest gross return of Rs. 334002 /ha was recorded through maize +blackgram- potato- onion crop sequence followed by Rs. 271408/ha by maize –garlic –greengram (G+R)crop sequence. Maize +blackgarm- potato- onion cropping system fetched highest net monetary return of Rs.210997/ha while maize –garlic –greengram (G+R) ranked as next best remunerative crop sequence ( Rs. 163784/ha). Hybrid rice –wheat cropping system was observed as best economical sequence by fetching Rs. 2.81 on per rupee investment while maize +blackgram- potato- onion cropping system was the next best economical sequence by fetching Rs. 2.72 on investment of Re1. On the profitability front, maize +blackgram- potato- onion crop sequence produced maximum of Rs. 578/ha/day while maize –garlic –greengram (G+R) sequence produced at the tune of Rs. 449/ha/day of profitability followed by maize+green gram- potato-wheat (Rs. 410 /ha/day) over all crop sequences evaluated (Table 2).

### Conclusion :

Thus it may be concluded that traditional rice-wheat system could not able to improve the profitability as well as biological efficiency per unit area and time. Replacing traditional rice –wheat system with hybrid rice and maize based intensive and biological efficient crop sequences could

enhance the total productivity, economic return and favourable impact on soil health. On the basis of overall productivity biological efficiency and economic return it may infer that maize+ blackgram-potato- onion and maize – garlic-greengram (G+R) crop sequences were treated as best biologically efficient systems while next best biological efficient crop sequences were maize +green gram –potato- wheat and hybrid rice –wheat –greengram (G+R),if adopted by the farmers can go a long way in enhancing the productivity return and calorific value as well as sustainability in Central Plain Zone of Uttar Pradesh.

### REFERENCES

- Kumar, Alok and Yadav, D.S. (1993).** Effect of long term fertilization on soil fertility and yield under rice-wheat cropping system. *J. Indian Soc. Soil Sci.*, **41** (1) : 178-180.
- Kumpavat, B.S.( 2001).** Production potential and economics of different crop sequences. *Indian J. Agron.*, **46** (3) : 421-424.
- Tomar, S.S. and Tiwari, A.S.(1990).** Production potential and economics of different crop sequences. *Indian J. Agron.*, **35**(1&2): 30-35.

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