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Assessment Of Need Based Intensive Cropping System Under Irrigated Condition

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ABSTRACT:

Present field study entitled"Assessment of need based intensive cropping system under irrigated condition" has been taken under AICRP on integrated farming system during 2021-2022 and 2022-2023. The study reveals that grain yield of rice was affected significantly under the residual response of preceding barley, gram + mustard – green manure, Pea + mustard - green manure, potato -Green Gram and pea - green gram, wheregrain yield of rice was increased by 7.38 % to 9.97%as compared to wheat taken in rabi. Rice equivalent yield 272 .06 q/ha was maximumunder rice - garlic cropping system followed by Rice- potato - green gram. Soil health improvement was better under Rice- Pea+ mustard - green gram. Rice – potato - green gram gave good family nutrition, whilerice - barley – bajra[fodder] gave more fodder yield. The Income enhancement was more under rice –garlic cropping system.

KEYWORDS: Soil Health, Climate, Rice, Crop.

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INTRODUCTION:

Rice is the predominant crop in Madhya Pradesh in rice-wheat region, which covers an area of 19.29 lakh hectares and has an average productivity of 2789 kg/ha. Rice is grown on 6.09 lakh hectares, producing 5.57 lakh tonnes with the productivity of 917 kg/ha in Rewa region, which is quite low as compared to the national and state averages. Soil and climate conditions are more suitable to grow rice in kharif at Rewa. Thus, the only option left for diversifying a rice-based cropping system by changing wheat in rabi by some other more remunerative crops. Pulses and oil seeds are found more advantageously than cereal-cereal sequence (Umarani *et al., 1992*). According to Kumpawat (2001), adding pulse, oilseed and vegetable crops to a cropping system is more advantageous than just adding cereals.

According to experimental results, intercropping offers significant yield improvements over sole cropping. These benefits may be especially significant because they are obtained without the use of expensive inputs and utilising the straight forward method of growing crops in pair. Rice-wheat, rice-potato-wheat, rice-berseem, rice-garlic, rice-gram, rice- gram + linseed, rice - toria- onion, rice-barley, and rice-mustard have been found to be effective and profitable cropping sequences in different parts of the country, giving the net profit of Rs. 3062 to 11449/ha (Singh and Singh 1998). The growing of berseem after medium-duration rice has been proven to be more financially rewarding than other rice-based cropping sequences (Upadhayay *et al.2007*)

Continuous cropping has also been linked to the development of soil sickness for wheat and rice crops (Kharub *et al.* 2003). Due to the exhaustive nature of both crops, the soil productivity is decreasing day by day (Chaudhary *et al. 2007*). The rice-wheat cropping system needs to be diversified, especially in the rabi season, with need-based high value crops like gram, linseed, mustard, berseem, potato, garlic, pea and other crops to different groups of farmers that are most compatible, productive and sustainable in the rice-based cropping sequence. Residual effect of different rabi crops (wheat, barley, berseem, potato, garlic, toria and onion) on succeeding rice have not been studied at Rewa region of Madhya Pradesh. Keeping above facts in view different cropping system have been taken for study.

MATERIAL AND METHODS:

Present experiment was taken under all India coordinated research project integrated farming system, Kuthuliya farm. College of agriculture J.N.K.V.V, Rewa (M.P) during2021-2022 and 2022-2023.The experimental field was silty clay loam in texture, neutral in soil reaction (ph-7.1), low in organic carbon(0.39%) and low in available nitrogen (163.8 kg /ha)and potash (219.76 kg/ha).Rice crop was transplanted on 7th of July 2021 and on 13th July 2022. The present experiment was taken in RBD with 3 replications. Cropping system were ten ($\mathbf{T_1}$-Rice -Wheat, $\mathbf{T_2}$-Rice - Green Manure- Barley, $\mathbf{T_3}$ – Rice – Gram + Mustard – Green Manure, $\mathbf{T_4}$–Rice -Pea + Mustard - Green Gram, $\mathbf{T_5}$-Rice - Potato - Green Manure,$\mathbf{T_6}$ -Rice - Pea Arkil - Green Gram,$\mathbf{T_7}$-Rice – Berseem, $\mathbf{T_8}$-Rice-Barley Fodder- Bajra fodder $\mathbf{T_9}$ -Rice - Garlic and $\mathbf{T_{10}}$ – Rice – Toria - Onion,

Rice variety was Danteshwari in Rice -Wheat, Rice-Barley, Rice-Gram + Mustard -Green gram, Rice -Pea + Mustard -Green manure, Rice – Potato - Green Gram, Rice – Pea – Green Gram, Rice – Barley – Bajra (Fodder)and Rice – Toria – Onion cropping system. Rice variety PS -5 was taken in rice – berseem and rice – garlic cropping system. The recommended variety of different crops have been taken which are recommended for irrigated condition of Rewa region. All the

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recommended package of practices were adopted for Rewa region of Madhya Pradesh. Error variance for grain yield data were found homogenous therefore data has been presented on pooled basis.

RESULT AND DISCUSSION:

1.Performance of rice:

Grain yield data of rice has been given in Table 1 under the influence of residual effect of different rabi crops reveal that grain yield or rice was affected significantly. Cultivation of rice after barley, gram + mustard – green gram and pea green manure gave 7.38 % to 9.97% higher grain yield as compared to rice grown after wheat. Rice variety PS 5 gave low yield i.e., 39.76 q /ha, when rice was grown after berseem and 41.7 q/ha when rice was grown after garlic. It may be due to favorable effect of gram+ mustard – green manure, pea + mustard – green manure, potato – green gram and pea – green gram. Positive residual effect of preceding rabi and summer crop like green manure – barley and potato – green gram, favors luxurious growth of rice which resulted to superior yield attributes and productive tiller in rice. Apart from this inclusion of pulses and green manure in cropping sequence ameliorate the soil fertility. Positive effect of gram + mustard, pea + mustard - green manure, Potato - Green Gram, Pea – green gram and barley – bajra on yield of succeeding rice were also reported by Chouriya *et al*. (2016) Jugnahake *et al*. (2018), Sirse *et al*. (2019) and Pradhan *et al.* (2020)

The grain yield of rice 39.76 q/ha was minimum for rice variety PS-5 in rice - berseem and 41.57 q/ha in rice – garlic cropping system. In these cropping system rice yield was decreased 6.34 q/ha to 8.15 q/ha. It is due to varietal potential yield difference rice variety PS-5 gave poor yield as compared to rice variety Danteshwari.

Table 1- Economical yield of differet cropping system (2 years pooled)

Treatment	Rice yield q /ha	Rabi yield q /ha	Summer yield q /ha	Total rice equivalent yield q /ha	System productivity Rice yeld kg/ha /day
T_1 Rice (Danteshwari)- Wheat (HD02864)	47.91	54.05	-	96.14	34.28
T2 Rice (Danteshwari)- Green manure-Barley(Geetanjali)	52.68	92.22	50.85	108.39	36.98
T3 Rice (Danteshwari)-Gram(JG-322)+mustard (Pusa bold) - GM	52.70	10.34 G 10.12 M	90.10	100.85	33.24
T4 Rice (Danteshwari)- Pea (Arkel) - mustard (Pusa bold) - green manure	52.59	29.55 P 9.78 M	88.30	113.00	37.35
T5 Rice (Danteshwari)- Potato (Kurfi chandramukhi) - Green gram (PDM-139)	52.26	29.56	5.74	200.70	63.98
T6- Rice (Danteshwari)- Pea arkil - Green gram	52.56	9.78	8.51	135.01	43.33
T7 Rice (PS-5) - Berseem (JB-1)	39.76	204.78	3.79	130.46	43.03
T8 Rice (Danteshwari)- Barley fodder (JB-58) - Bajra fodder (WCC- 75)	51.45	60.93	622.93	153.44	48.82
T9 Rice (PS-5)- Garlic (G-1)	41.57	716.13	-	272.07	89.7
T10 Rice (Danteshwari)-Toria (T-9) - Onion (AFLR)	46.68	512.86	124.24	140.85	53.61
SEM +_	1.56			3.31	
SD 5%	4.60			9.81	

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Table 2 : Gross return, Net Return and B:C ratio of different cropping system . (2 years pooled)

Treatment	Gross return Rs/ha	Cost of cultivation Rs/ha	Net profit Rs/ha	B:C ratio Rs/ha
T_1 Rice (Danteshwari)- Wheat (HD02864)	209958	101325	105919	2.03
T2 Rice (Danteshwari)- Green manure-Barley(Geetanjali)	226049	95177	130872	2.39
T3 Rice (Danteshwari)-Gram(JG-322)+mustard (Pusa bold) - GM	210151	88145	122006	2.39
T4 Rice (Danteshwari)- Pea (Arkel) - mustard (Pusa bold) - green manure	237037	112209	124828	2.11
T5 Rice (Danteshwari)- Potato (Kurfi chandramukhi) - Green gram (PDM-139)	400941	130489	287119	2.71
T6- Rice (Danteshwari)- Pea arkil - Green gram	240696	124333	156364	2.26
T7 Rice (PS-5) - Berseem (JB-1)	271678	106458	164887	2.55
T8 Rice (Danteshwari)- Barley fodder (JB-58) - Bajra fodder (WCC- 75)	318280	107976	210305	2.94
T9 Rice (PS-5)- Garlic (G-1)	541513	201905	339608	2.68
T10 Rice (Danteshwari)-Toria (T-9) - Onion (AFLR)	336561	162836.5	173728	2.12

Effect of rice equivalent yield: -

The productivity of individual crop of different nature under any cropping system has its own importance to contribute the productivity of entire cropping system. Thus, it is possible to assess the productivity of any cropping system, with the productivity of only an individual crop component. Therefore, combine yield of different kharif and rabi crop grown under cropping sequence were converted to rice equivalent yield based on prevailing market price of the produce. The rice equivalent yield of different cropping system is presented in Table 1. It is evident from the result that rice equivalent yield was affected significantly under different cropping system, It is varied from 96 q/ha to 272.06 q/ha. Rice equivalent yield 272.06 q/ha was maximum in rice – garlic cropping system followed by rice – potato – green manure (200.69 q/ha). Other cropping system also gave higher rice equivalent yield as compared to existing rice – wheat system which were 4.91 % to 59.6 % higher than existing rice – wheat system. Rice – pea + mustard – green manure was found best for soil health improvement while rice – potato – green gram was better for family nutrition which gave rice equivalent yield 200.69 q/ha. Rice- barley – bajra gave rice equivalent yield 153.44. q/ha and found best for supply of fodder to cattle as compared to rice - berseem. Maximum rice equivalent yield 272 .06 q/ha was noted under rice- garlic which was better for income enhancement. These cropping systems were found superior than existing rice - wheat because, higher yield and higher market price gave more rice equivalent yield as compared to rice - wheat system. Similar finding was also reported by Jugnahake *et al. (*2018) and Pradhan *et al*. (2020).

SYSTEM PRODUCTIVITY:

System productivity of different cropping system have been given in Table 1 reveals that system productivity was minimum 33 .23 kg rice per hectare per day under rice - gram + mustard - green manure which was almost equal to rice - wheat cropping system bracket (34.28 kg rice/ha/day). Maximum system productivity 89.7 kg rice grain/ha/day was noted under rice - garlic followed by 63.98 kg rice/ha/ per day in rice – potato- green gram. System productivity in rice- garlic, rice – potato- green gram, rice – toria - onion, rice - pea - green gram was found higher over rice - wheat due to higher productivity per day basis. Similar result was also reported by Pradhan *et al*. (2020)

EFFECT ON GROSS AND NET RETURNS:

Data pertaining to gross and net return and net return of different cropping system have been presented in Table 2. It is clear from the data that net profit of Rs.3396084/ha was maximum in rice - garlic followed by Rs. 287119/ha in rice potato -green gram and Rs.164887/ha in rice - berseem cropping system. All other cropping system were also found profitable than existing rice-wheat System. It may be due to higher yield and higher market price gave more net return. These findings are inconformity with the finding of Jugnahake *et al*.2018 and Pradhan *et al*. (2020)

CONCLUSION:

Benefit cost ratio under different cropping system is given in Table 2 reveals that the benefit cost ratio 2.93 was maximum in rice- barley - bajra fodder cropping system followed by rice - potato - green gram and rice - garlic cropping system (2.68). Benefit cost ratio 2.02 was found in rice-wheat existing cropping system. Higher B:C ratio in rice – berseem, rice- barley - bajra fodder cropping system was due to higher fodder yield and lower cost of cultivation. B:C ratio under rice - garlic and rice – potato - green gram was due to higher yield with higher market price. Similarfindingwas also made by Pradhan *et al*. (2020)

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