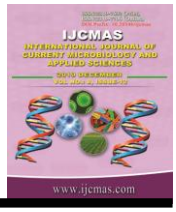
Int.J.Curr.Microbiol.App.Sci (2019) *8*(12): 982-988

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 8 Number 12 (2019)**
Journal homepage: http://www.ijcmas.com



Original Research Article https://doi.org/10.20546/ijcmas.2019.812.126

Evaluation of Different Cropping System Module under Irrigated Condition

Sirse Shreya[1], S. M. Kurmavanshi[2*], R. Muniya[1] and B. M. Maurya[2]

[1]All India Coordinated Research Project on Integrated Farming System, [2]College of Agriculture, JNKVV, Rewa (M.P.), 486001, India

Keywords

Cropping system
Rice equivalent yield, Intercropping

Article Info

Accepted:
10 November 2019
Available Online:
10 December 2019

A B S T R A C T

The field experiment on evaluation of different cropping system module in irrigated area was taken under All India Coordinated Research Project on Integrated Farming System during 2017-2018 to 2018-19. The study revealed that residual effect of rice-barley – bajra fodder cropping system was more as it gave grain yield of rice 51.44q/ha followed by 51.17q/ha in rice-gram + mustard-green manure cropping system. These cropping systems gave 14.7% to 15.31% higher yield of rice than existing rice-wheat system. Rice equivalent yield 222.48q/ha was maximum in rice-garlic followed by 136.9q/ha in rice-potato-green gram and 118.33q/ha in rice-gram+mustard-green manure cropping system. Net profit was maximum Rs.267732/ha in rice-garlic followed by Rs.184624/ha in rice-gram+ mustard-green manure and Rs.183745/ha. in rice-potato-green gram. Benefit cost ratio 3.6/ha was maximum in rice-gram+ mustard-green manure cropping system followed by 3.33 in rice-pea+ mustard-green manure while rice-garlic cropping system gave B:C ratio 2.49.

Introduction

Rice-wheat, rice-gram and rice-barley are main cropping systems of Rewa region of Madhya Pradesh in rice-wheat crop zone. Rice-wheat cropping systems cover an area of 3.19 lakh ha. Rice-gram cropping system occupies 1.55 lakh hectares while rice-barley cropping systems are widely adopted by the farmer due to stable production and less labour requirement (Kumar *et al.*, 2001). But continue adoption of these cropping systems had led to the problem of specific weeds, reduced soil fertility in specific root zone, development of soil sickness and infestation of similar kind of pest which ultimately resulted in decline the efficiency and productivity of system (Katyal 2003 and Kumar and Yadav 2005). The problem in further aggravated as irrigation facility in Rewa region of Madhya

Pradesh is limited which affect the cultivation of wheat to a great extent. Rice-pea+mustard cropping systems are found most water efficient cropping system as compare to rice-wheat and rice- barley existing cropping system. The inclusion of pulses, garlic, oil seed and vegetable in rabi season are found more beneficial than cereal after cereal (Kumpawat 2001). Rice is predominated crop in Rewa region of Madhya Pradesh.

It is difficult to replace the rice by other crop in rainy season due to soil and climatic condition. Hence only option left is to replace the wheat or gram or barley in winter by crops like garlic, potato, Toria-onion, Berseem to fulfill the needs of soil health, human nutrition, income generation and livestock for sustainable resource management under existing climatic condition of Rewa region of Madhya Pradesh. Different cropping systems module based on rice has not been evaluated. Keeping above facts in view present experiment was taken.

Materials and Methods

The study was made under All India Coordinated Research Project on Integrated farming system, Kuthulia farm of JNKVV, college of Agriculture Rewa (M.P.) during 2017-18 and 2018-19. The soil of experimental field was silty clay loam in texture, neutral in reaction (pH 7.1), low in organic carbon (0.39%), low in available nitrogen (163.83kg/ha), medium in available phosphorus (16.33kg/ha) and available potash 219.7kg/ha.

Ten cropping systems (Rice-wheat, rice-green manure-Barley, rice-gram+mustard (3:1)-green manure, rice-pea-green gram, rice-potato-green gram, rice-pea+mustard, rice-berseem, rice-barley-Bajra fodder, rice-garlic and rice-toria-onion were taken in Randomized block design with three replication. All the recommended package of practices for irrigated conditions were adopted. Immediately harvest of previous crop succeeding crops was sown under different cropping systems.

Results and Discussion

Effect of cropping system on rice

The grain yield of rice in response to residual effect of different cropping system has been presented in Table 1. It is evident from the Table that grain yield of rice 51.44q/ha was maximum in rice-barley-Bajra fodder cropping system followed by 51.17q/ha in rice-gram-mustard-green manure cropping system. These cropping system gave 14.7% to 15.31% higher grain yield of rice than existing rice-wheat cropping system. Grain yield of rice was also increased by 6.45% in rice-green manure-Barley, 9.88% in rice-pea-green gram, 8.97% in rice-potato-green gram and 8.2% in rice-toria-onion cropping system. It may be due to positive residual effect preceding rabi and summer crops like green manure- barley-bajra-potato- green gram and toria- onion by which growth and yield contributing character of rice were higher as compared to existing rice-wheat cropping system. It may also be due to amelioration of organic carbon in soil and available nitrogen and Potash. Combine effect of all these had positive effect on performance of rice by which grain yield of rice was increased considerably. The positive effect of preceding Berseem, green manure, mustard, potato and gram + mustard was also reported by Sharma and Jain (1997), Yadav *et al.*, (2014), Chouriya (2016) and Jugnahake *et al.*, (2018). The grain yield of rice 42.59q/ha was minimum in rice-garlic cropping system followed by 44.49q/ha in rice-pea+mustard cropping system. Grain yield of rice was reduced by 2.69% to 5.82% in comparison to existing rice-wheat cropping system but were at par to existing rice-wheat cropping system.

Effect on Rice equivalent

The productivity of individual crop component of different nature under any cropping system have its own importance to contribute the productivity of entire cropping system. Thus it is possible to asses the productivity of any cropping system with the productivity of only and individual crop component. Therefore combine yield of different kharif and rabi crops grown under cropping sequence converted to rice equivalent yield on the basis of prevailing market price of the produce for an individual crop component under a particular cropping system play an important role on the rice equivalent yield. The rice equivalent yield is presented in Table 2. It is clear from the result that all the cropping system gave 3.91% to 147.7% higher rice equivalent yield than existing rice-wheat cropping system. Rice equivalent yield was reduced by 2% in rice-pea-green gram cropping system. The maximum rice equivalent yield 222.48q/ha was noted in rice-garlic followed by 136.9q/ha in rice-potato-green gram and 118.33q/ha in rice-gram+mustard-green manure cropping system. These cropping system were found significantly superior than all other cropping system. The similar result were also reported by Jugnahake *et al.,* (2018).

Effect on gross and net return

Data pertaining to Gross and Net profit of different cropping system module have been given in Table 2. After perusal of the result it is clear that minimum gross return Rs. 159812/ha was in rice-pea-green gram followed by Rs. 161644/ha in existing rice-wheat cropping system. All other cropping system gave 3.93% to 147.74% higher gross return in comparison to existing rice-wheat system. Similarly Net profit of different cropping system were higher by 2% to 120.31% and maximum net profit Rs. 267732/ha was noted in rice-garlic followed by Rs. 184624/ha in rice-gram+mustard-green manure and Rs. 183745/ha. in rice-potato-green gram cropping system. These cropping system gave 51.2% to 120.31% higher net profit than existing rice-wheat cropping system. It may be due to higher yield and higher marketable price with more investment gave higher net return. Similar finding were also reported by Mourya *et al.,* (2011) and Jugnahake (2018).

Benefit: Cost ratio under different cropping system module is given in Table 2. Reveals that B:C ratio 3.60 was maximum in rice-gram+ mustard-green manure cropping system followed by 3.33 in rice-berseem,3.28 in rice-pea +mustard- green manure while rice-garlic cropping system gave B:C ratio 2.49. The B:C ratio of rice-pea-green gram and rice-toria-onion was lower than existing rice-wheat system on the basis of Per rupee investment.

Effect on chemical properties of soil

The chemical properties of soil after completion of three crop cycle have been given in Table 3. Which reveals that soil pH and electrical conductivity were almost normal as compare to initial status. Organic carbon status was found to increase by 7.69% to 38.46% under rice-green manure-barley, rice-gram+ mustard-green manure, rice-pea-green gram, rice-potato-green gram, rice-pea +mustard-green manure, rice-berseem and rice-barley-bajra fodder cropping system while organic carbon status was reduced in rice-garlic cropping system by 2.56% and in rice-toria-onion by 5.12% as compared to initial status. It may be due to addition of green manure, pulses, berseem and other crops which add more organic matter into soil as compared to rice-garlic and rice-toria-onion cropping system.

Table.1 Economical yield of kharif rabi and summer crops under different cropping system module

Treatment				Yield	q/ha				
	Kharif		Mean	Rabi		Mean	Rabi/	Summer	Mean
	2017-18	2018-19		2017-18	2018-19		2017-18	2018-19	
T_1Rice(Danteshwari)-Wheat(HD 02864)	50.29	38.94	44.61	55.53	56.3	55.91			
T_2Rice(Danteshwari)-Green manure-Barley(Geetanjali)	54.54	40.45	47.49 (6.45%)	146.6	128.4	137.5	56.62	55.1	55.86
T_3Rice(Danteshwari)-Gram(JG-322)+Mustard(Pusa bold)-GM	56.62	45.73	51.17 (14.70%)	13.43 23.23	12.3 19.9	12.86 21.56	125.9	132.2	129.05
T_4Rice(Danteshwari)-Pea(Arkel)-Green gram(PDM)-139)	53.91	44.13	49.02 (9.88%)	82.14	60.9	71.52	9.16	11.9	10.53
T_5Rice(Danteshwari)-Potato (Kufrichandramukhi) -Green gram	54.97	42.19	48.58 (8.97%)	219.23	193.4	206.31	7.86	10.66	9.26
T_6Rice(Danteshwari)-Pea (Arkel)+ Mustard (Pusa bold)-Green manure	50.63	38.36	44.49 -(2.69%)	19.00 15.05	14.2 17.3	16.6 16.17	116.8	129.3	123.05
T_7Rice(PS-5)-Berseem(JB-1)	45.84	47.27	46.55 (4.34%)	751.73	721.9	736.81	1.5	3.4	2.45
T_8Rice(Danteshwari)-Barley fodder(JB-58) Bajra fodder (WCC-75)	57.04	45.84	51.44 (15.31%)	458.73	568.6	513.66	502.33	490.1	496.21
T_9Rice(PS-5)-Garlic (G-1)	42.06	43.12	42.59 -(5.52%)	131.55	150.2	140.87	-	-	-
T_{10}Rice(Danteshwari)-Toria(T-9)-Onion	56.18	40.36	48.27 (8.20%)	7.86	9.3	8.58	173.5	193.7	183.6
SEM±	1.13	1.50	1.31						
CD at 5%	3.13	4.44	3.89						

Figures in parenthesis are % increase/decrease over rice- wheat system.

Table.2 Rice equivalent yield, gross and net return Rs/ha. And B:C ratio under different cropping system module

Treatment	REY q/ha		Mean	Gross return Rs/ha	Net Profit Rs/ha	B:C ratio
	2017-18	2018-19				
T_1 Rice (Danteshwari)-Wheat (HD 02864)	117.67	61.93	89.8 (0.00)	161644	121521	2.55
T_2Rice (Danteshwari)-Green manure- Barley (Geetanjali)	129.73	71.81	100.77 (12.21%)	181389	142144 (16.97)	2.91
T_3 Rice (Danteshwari)-Gram (JG-322) + Mustard (Pusa bold)-GM	151.52	85.15	118.33 (31.77%)	213004	184624 (51.92)	3.90
T_4 Rice (Danteshwari)-Pea (Arkel)-Green gram (PDM)-139)	117.66	59.90	88.78 -(1.13%)	159812	123152 (1.34)	2.52
T_5 Rice (Danteshwari)-Potato (Kufrichandramukhi) -Green gram	165.06	108.75	136.90 (52.44%)	246446	183745 (51.20)	2.92
T_6 Rice (Danteshwari)-Pea (Arkel)+ Mustard (Pusa bold)-Green manure	124.33	72.7	98.51 (9.69%)	177334	144275 (18.72)	3.28
T_7 Rice (PS-5)-Berseem (JB-1)	128.78	78.78	103.78 (15.56%)	186822	166978 (37.40)	3.33
T_8 Rice (Danteshwari)-Barley fodder (JB-58) Bajra fodder (WCC-75)	98.80	87.84	93.32 (3.91%)	167998	145145 19.44	3.07
T_9 Rice (PS-5)-Garlic (G-1)	195.64	249.33	222.48 (147.7%)	400473	267732 (120.31)	2.49
T_{10} Rice (Danteshwari)-Toria(T-9)-Onion	148.69	105.86	127.27 (41.72%)	229098	130996 (7.79)	1.78
SEM±	2.5	3.72	3.11			
CD at 5%	7.40	11.01	9.20			

Figures in parenthesis are % over rice-wheat system.

Table.3 Chemical properties of soil after completion of three crop cycle

Treatment	pH	EC Mmhos/cm^{-1}	OC g/kg	N avail. Kg /ha^{-1}	P avail. Kg /ha^{-1}	K avail. Kg /ha^{-1}
T_1 Rice (Danteshwari)-Wheat (HD 02864)	7.3	0.21	0.39(0)	112.69(-3.12)	10.2(-37.53)	372(69.32)
T_2Rice (Danteshwari)-Green manure- Barley (Geetanjali)	6.6	0.26	0.42(7.69)	106.2(-35.16)	11.7(-28.35)	368(67.50)
T_3 Rice (Danteshwari)-Gram (JG-322) + Mustard (Pusa bold)-GM	6.7	0.28	0.58(48.71)	198.4(21.12)	14.2(-13.04)	416(89.34)
T_4 Rice (Danteshwari)-Pea (Arkel)-Green gram (PDM)-139)	7.3	0.41	0.47(20.51)	197.9(20.81)	13.8(-15.49)	380.5(73.19)
T_5 Rice (Danteshwari)-Potato (Kufrichandramukhi) -Green gram	6.6	0.48	0.46(17.94)	116.3(-28.99)	12.6(-22.84)	295.4(34.45)
T_6 Rice (Danteshwari)-Pea (Arkel)+ Mustard (Pusa bold)-Green manure	6.4	0.33	0.48(23.07)	119.4(-27.10)	14.3(-12.63)	332.4(51.29)
T_7 Rice (PS-5)-Berseem (JB-1)	6.2	0.41	0.52(33.33)	123.6(-24.54)	16.2(-0.79)	410.6(86.89)
T_8 Rice (Danteshwari)-Barley fodder (JB-58) Bajra fodder (WCC-75)	7.9	0.32	0.54(38.46)	181.2(10.62)	15.3(-6.30)	418.3(90.39)
T_9 Rice (PS-5)-Garlic (G-1)	6.7	0.38	0.38(-2.56)	132.8(-18.92)	16.0(-2.02)	381.8(73.78)
T_{10} Rice (Danteshwari)-Toria(T-9)-Onion	7.2	0.69	0.37(-5.12)	136.2(-16.84)	13.5(-17.33)	363.7(65.54)
Initial	7.1	0.5	0.39	163.8	16.33	219.7

Figures in parenthesis are % increase (+) 0r decrease (-) over initial

Available nitrogen status after completion of three crop cycle is given in Table 3 reveals that available nitrogen status was increased by 10.62% to 21.12% in rice-gram +mustard-green manure, rice-pea-green gram and rice-barley- bajra fodder cropping system as compared to initial status. Available nitrogen status in all other cropping system was reduced by 3.12% to 35.16% as compared to initial status under different cropping system and maximum reduction in available phosphorus was noted in rice-wheat cropping system as compared to initial status. Available potash status was increased by 34.45% to 89.34% over initial status. Similar result were also reported by Jugnahake *et al.*,(2018).

On the basis of present field experiment that rice-garlic, rice-potato-green gram and rice-gram +mustard cropping system were found more remunerative for income generation and family nutrition while rice-barley- bajra fodder cropping system gave more fodder yield for livestock raising than rice- berseem cropping system. These cropping system were also found superior than rice-wheat and rice-barley existing cropping system.

References

Chouriya SR, Chouhan M, Kurmanvanshi SM and Maurya BM. 2016. Performance of different Bio-Intensive need based cropping systems under irrigated condition. Mysore journal of Agriculture Science 50(4):716-720.

Jugnahake M, Prajapat R, Maurya BM and Kurmavanshi SM. 2018. Identification of Cropping system module for irrigated farming system of Rewa region. International Journal of Current microbiology and applied science 7(10): 678-694.

Katyal JC. 2003. Soil fertility management A key to prevent diversification, Journal of the Indian Society of soil Science 51(2): 379-387.

Kumar A and Yadav DS. 2005. Influence of continuous cropping and fertilization on nutrient availability and productivity of an alluvial soil. Journal of the Indian Society of soil science 53(2): 194-198.

Kumar A, Yadav DS, Singh RM and Achal R. 2001. Productivity, Profitability and stability of *(Oryza sativa*) based cropping system in eastern Utter Pradesh. Indian Journal of Agronomy 46(4): 576-577.

Kumpawat BS, 2001. Production potential and economics of different crop sequence. Indian Journal Agronomy 46(3): 421-424.

Maurya BM, Upadhyay VB and Mishra Sandhya.2011. Crop diversification based on rice in Kymoresatpura agroclimatic zone of Madhya Pradesh. Mysore Journal of Agriculture science 45(4): 916-917.

Sharma RS and Jain KK. 1997. Agronomic research advance in rice-wheat system in M.P. Advances in Agricultural Research in India 7: 139-157.

Yadav PS, Maurya BM and Kurmavanshi SM. 2014. Growth and development of rice under different irrigated Cropping system. Mysore Journal of Agriculture science 48(3): 451-455.

How to cite this article:

Sirse Shreya, S. M. Kurmavanshi, R. Muniya and Maurya, B. M. 2019. Evaluation of Different Cropping System Module under Irrigated Condition. *Int.J.Curr.Microbiol.App.Sci.* 8(12): 982-988. doi: https://doi.org/10.20546/ijcmas.2019.812.126