__Original Research Article__

Impact Assessment of Integrated Pest Management technology on Kharif Paddy cultivation in Vidarbha region of Maharashtra State

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ABSTRACT

The Eastern Vidarbha region consist of Bhandara, Gondia, Gadchiroli and Chandrapur and some part of the Nagpur district is famous for specialized farming and paddy as major crop. The total area in Maharashtra state was 15.53 lakh hectares with annual production 34.81 lakh tons of rice (Anonymous 2023-24). About 80.00 per cent gross cropped area in this region is under paddy. IPM has been proved to be a cost minimization technique (Birthal et al (2000). Losses in Paddy yield the tune 10 to 25 per cent occurs due to attack of insect pest and disease. Being the topic of such high importance from cultivators point of view, the research topic has been selected i.e. "**Impact Assessment of Integrated Pest Management technology on Kharif Paddy cultivation in Vidarbha region of Maharashtra State"** its economic investigation in different level of adoption of IPM technologies.

The study was carried out with the main goals of determining the extent to which recommended technology has been adopted in Kharif paddy production by using principle component analysis approach and for develop the composite index, examining the input utilization of Kharif paddy at varying levels of IPM adoption, and workout cost effectiveness and profitability of kharif paddy at different level of adoption of IPM technology.

The study was conducted in the districts of Gadchiroli in the Vidarbha region of Maharashtra State, India. Three tahasil, Gadchiroli, Chamorshi and Dhanora were chosen from these districts, and a total of 120 farmers were selected from seven villages, namely Gadchiroli, Indala, Hirapur, Chamorshi, Krishna Nagar, Heti, Kanartola. The primary data, which cover the years 2023–2024. Total 120 farmers, 25 farmers were classified as high adopters, 76 farmers were classified as medium adopters, and 19 farmers were classified as low adopters.

As a result of input usage, the group with a high adoption level utilized the most human labour. Farmyard manure is used most in the high adopter group (49.87 quintal per hectare), followed by low adopters (31.73 qtl/ha) and medium adopters (34.45 qtl/ha) because the farmers can apply only owned farm FYM. The reasons of lower used of FYM, due to shortage of cattle's population. The reasons of low adopter, high expenditure of Integrated pest management components was the 89.00 per cent farmers can use chemically control that means 2 to 3 spraying was use in kharif paddy in low adopter group.

The B:C ratio at Cost 'A_1' was 1.79, 1.85 and 1.92 in low, medium and high adopters, respectively, while B:C ration at Cost 'C_2' for low, medium, high adopter were 1.12,1.19,1.25 respectively. The results concluded that the low adopters group are not making more profit. It indicates that, as adoption of technology increases the yield level of crop and so that the net returns also increases. The reduction in per quintal production cost at Cost 'C_2' over low adopter group were Rs. 188.06/-. Paddy productivity has been reported increased by 19.84 per cent with the reduction in the cost of Rs. 7375.89 in high level of adoption of Integrated Pest Management Technology.

The findings of the present study with regards to overall adoption of integrated pest management practices of paddy by paddy growers were observe for wide adoption of IPM technology in Kharif Paddy, Government should take initiative for production of bio-agents and available the pheromane trap and yellow sticky trap through establishing unit in Government Agricultural Offices and Krishi Vigyan Kendra and encourage the rural youth for establishing Units at taluka level.

Key words : IPM technology, Principal Component Analysis, Composite Index and extent of adoption, Cost effectiveness and Profitability.

INTRODUCTION :

In India, the first IPM programme was the Operational Research Project (ORP) during 1974–75 (Swaminathan, 1975) in Cotton and Rice. The main objective of IPMP is to promote and support safe, effective and environmentally sound pest management. Nearly 70 species of insect pests occur on Indian Kharif Paddy with a dozen of these arthropods requiring their management for realizing better paddy yields. Sucking pests viz. Stem borer, Gall midge, Yellow stem borer, Rice Leaf folder, Hispa, Green leaf hopper, Brown plant hopper, White backed plant hopper, Gundhi bug are deleterious to the process of paddy growth and development with their ability to build up to serious proportions as a result of rapid and prolific breeding in cotton plant. IPM is a essential component for a sustainable paddy production system having two essential elements. First comprises a series of measures which help in keeping insect pests below economic threshold levels(ETL). Such control methods include natural control agents, host plant resistance, manipulation of agronomic factors such as rotation, spacing, time of sowing and fertilizer applications beside biological control and use of botanicals IPM is accepted as the only relevant means of reducing dependence on chemical input. It is environmentally safe, ecologically sound and sustainable alternative, which sheet to minimize the use of pesticide by placing greater relevance on biological control. The judicious and timely use of IPM practices is of prime importance to minimize the use of pesticides and control of insect.

Research Objective:

1. To assess the extent of adoption of selected technology of kharif paddy.
2. To study the input utilization of kharif paddy at different level of adoption of IPM technology.
3. To workout cost effectiveness and profitability of kharif paddy at different level of adoption of IPM technology.

METHODOLOGY:

The study was undertaken in Gadchiroli district of Eastern Vidarbha region. The study is based on Primary data. The data was selected based on Kharif Paddy area cultivation.

Three tahasil, Gadchiroli, Chamorshi and Dhanora were chosen from these districts, and a total of 120 farmers were selected from seven villages, namely Gadchiroli, Indala, Hirapur, Chamorshi, Krishna Nagar, Heti, Kanartola. The primary data, which cover the years 2023–2024,

Pest of Kharif Paddy crop:

The kharif paddy crop is affected by more than 70 pests found damaging in India. In Maharashtra some 8 to 9 pests are found more predominant i.e. Stem borer, Gall midgem, Whorl maggot, Leaf folder, Hispa, Green leaf hopper, Brown plant hopper, White backed plant hopper, Gundhi bug.

Integrated pest Management of kharif paddy:

Various components of IPM in kharif paddy production,

1. Cultural Control 2. Mechanical Control 3. Biological Control 4.Chemical Control

Technology developed by Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola in Kharif Paddy

Table 1. Recommended technologies developed by Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola in Kharif Paddy

S.N.	Particulars	Units	Recommendation
A	**Cultural Control**		
1	Ploughing/Levellling		1 (In the Month of May)
2	Sowing time in Nursary		First week of June
3	Puddling		Yes
4	Method of Seedling		Trasplanting
5	Time of transplanting		First week of July
6	Variety		Medium duration Variety
7	Seed rate	kg/ha	35 to 40 kg/ha
8	FYM	Qtl/ha	100 Quintals/ha
9	Fertilizer		
	N	kg/ha	100
	P	kg/ha	50
	K	kg/ha	50
10	Crop sequence		Paddy – Gram
B	**Mechanical Control**		
1	Use of Proper Spacing between plant		20 x 20 & 20 x 15
2	Removal & destruction of pest infested plant		Remove and destroy the pest affected plant, clipping of rice seedling tips and collection of egg masses and larvae of pest and their placement in bamboo cages for conservation of biocontrol agents
3	Use Pheromone trap/Light trap/Yellow Sticky trap	Per/ha	P.T. : 20 trap per ha/ Y,S.T.: 25 per ha./ L.T. : 1 per ha
4	Installation of Bird patches	Per/ha	10-12 per ha
5	Use of Tricho Card		40-50 DAS
C	**Biological control**		
1	Use of Biological control		Spray of Beuveria Bassinal, Metrahizzium Anosoplli
D	**Chemical Control**		
1	Use of Pesticide		If etl level cross spray pesticide Eg. : Ethion, Fipronil, Chlorpyriphos Acephate etc.

Analytical techniques:

1. **To assess the extent of adoption of selected technologies.**

For the first objective of the study, the extent of adoption of technologies of Kharif Paddy following formulae was used (Dhendge S.A., & etal, 2013, Shekhar D. Khade and T.N.Roy, 2020),

$$TAI = \frac{1}{k}\left[\frac{AX_1}{RX_1} + \frac{AX_2}{RX_2} + \cdots + \frac{AX_K}{RX_K}\right] X\ 100$$

Where,

TAI = Technology Adoption Index

K = No. of technologies

AXi = Actual use of selected technology

RXi = Recommended use of selected technology.

The Principle components of technology recommended by the University for Kharif Paddy crop expressed in terms of adoption score (X_1, X_2, --------- X_n) were utilized for developing technological adoption index of technology adopted. A technological adoption index is a single numerical value representing the net adoption of all components of technologies whose value lies between 0 to 1.

Development of composite Index :

The Principle component analysis (PCA) approach (Snehal Datarkar, & etal, 2016) was used for developing composite index. The principle components based on 19 x 19 co-rrelation matrix of 19 component of technology were computed. A set of 19 principle component explaining 100 per cent of total variation of all components of recommended technology were considered.

Consider 19 eigen vectors in the form of 19 x 19 matrix where rows represent variables and columns represent eigen vectors from which weight (Wi) coefficient of component of technology say Σ was determined as under.

$$Wi = \frac{Mi}{\Sigma Mi}$$

Where,

Wi = Weight

Mi = Maximum element in i^{th} row

ΣMi = Sum of maximum element in i^{th} row.

Estimation of Composite Index(scores) of technology:

The estimated composite adoption score (Si) is;

$$S_i = W_1X_1 + W_2X_2 + \text{------------------------------} + W_{19}X_{19}$$

Where,

S_i = Composite Index, X_1 = Farm Preparation, X_2 = Puddling, X_3 = Sowing Time of Nursery, X_4 = Transplanting, X_5 = Time of Painting, X_6 = Medium duration Variety, X_7 = Seed, X_8 = FYM, X_9 = Nitrogen, X_{10} = Phospourus, X_{11} = Potassium, X_{12}= Crop Sequence, X_{13} = Proper Spacing, X_{14} = Removal & destruction of pest infested plant

X_{15} = Use Pheromone trap/Light trap/Yellow Sticky trap, X_{16} = Installation of Bird perches, X_{17} = Use of Tricho Card, X_{18} = Biological Spraying, X_{19} = Chemical Spraying & W_i = Weight of i^{th} technology

Which provides adoption index (of all component of technologies) for each cultivators. The composite index obtained in the process lie in between 0 & 1.

The net adoption of recommended technologies expressed in terms of "Technological adoption Index" of the 120 farmers are classified as below.

Low adopter = Mean - SD

Medium adopter = Mean - SD to Mean + SD

High Adopter = Mean + SD

2. To study the input utilization at different level of adoption of IPM technology.

The objective of the input utilization at different level of adoption of IPM technology were worked out by on the basis of level of adoption i.e. low, medium and high level of adoption of technologies.

3. To workout cost effectiveness and profitability at different level of adoption of IPM technology.

After developing technologies adoption index, farmers were classified into low, medium and high adopters on the basis of technological adoption index. The standard cost concept viz; Cost 'A_1', Cost 'A_2', Cost 'B_1' Cost 'B_2' Cost 'C_1' Cost 'C_2' and Cost 'C_3' were used to estimate per ha cost of cultivation of Kharif Paddy.

Gross Return :

Return obtained from the sale of crops output i.e. Main Produce and by-produce.

Net Return :

Net returns were computed at different costs i.e. Cost 'A_1' , Cost 'A_2', Cost 'B_1' Cost 'B_2' Cost 'C_1' Cost 'C_2' and Cost 'C_3' by deducting respective costs from the gross returns.

Benefit Cost Ratio :

The Benefit cost ratio were worked out with reference to Cost 'A_1' , Cost 'A_2', Cost 'B_1' Cost 'B_2' Cost 'C_1' Cost 'C_2' and Cost 'C_3'.

RESULTS AND DISCUSSION:

Adoption range of different adopter group on the basis of Composite Index:

The adoption index calculated the levels of adoptions and the distribution of 120 farmers as per their adoption level of recommended technologies is presented in table 2.

Table: 2 Adoption range of different adopter group in Kharif Paddy.

S.N.	Particular	Low adopter	Medium adopter	High adopter
1	**Total number of farmers**	120		
3	**Adoption Range (%)**	Below 63.64	64.52 to 78.14	Above 78.28 to 92.36
4	**No. of farmers**	19	76	25
5	**Percentage to number of farmer**	15.83	63.34	20.83

The table 2. show that the farmers whose adoption index was below 63.34 per cent were distributed into low adoption group, The farmers whose adoption index was between 64.52 to 78.14 per cent were distributed into medium group and similarly the farmers with composite adoption index more than 78.11 per cent were categorized among the high level of adopters. Out of 120 selected farmers, 25 farmers had high level of adoption with composite adoption index, above 78.28 to 92.36 per cent, 76 farmers had medium level of adoption with composite adoption index 64.52 to 78.14 per cent while 19 farmers had low level of adoption with composite adoption index of below 63.64 per cent. It is concluded that the highest percentage of adoption level of technology was above 92.36 per cent. It means recommended technologies were not fully adopted in high adoption level categories.

Extent of Adoption technology:

Actual level of adoption of each item of technologies by farmer's was identified with the help of recommended technologies developed by Dr.P.D.K.V., Akola. The efficiency of each technology was calculated. All efficiency score was scaled down to 0 to 1.

Table 3 : Extent of Adoption of selected technology of Kharif Paddy

S.N.	Particular	Extent of Adoption		
		Low adopter (N = 19)	**Medium adopter (N = 76)**	**High adopter (N = 25)**
A	**Cultural Practices**			
1	Farm preparation	79.00	80.05	85.00
2	Sowing time of Nursary	84.21	93.42	96.00
3	Puddling	95.51	97.37	100.00

4	Trasplainting	100.00	100.00	100.00
5	Time of Planting	92.47	94.74	96.00
6	Medium duration variety	88.95	93.42	96.43
7	Seed Rate	89.47	94.74	96.40
8	FYM	36.99	41.39	55.71
	Ferilizer			
9	N	63.68	65.59	81.26
10	P	77.21	80.00	92.79
11	K	65.45	71.53	80.72
12	Crop sequence	58.95	75.53	86.00
B	**Mechanical Control**			
13	Propar Spacing	84.21	86.84	96.00
14	Removal & destruction of pest infested plant	47.37	61.84	86.00
15	Use Pheromone trap/Light trap/Yellow Sticky trap	15.79	26.32	52.00
16	Installation of Bird patches	15.79	43.42	56.00
17	Use of Tricho Card	5.26	14.47	28.00
D	**Biological Spraying**	10.53	23.68	56.00
E	**Chemical Control**			
19	Use of Pesticide	89.47	68.42	49.77

It is observed from the table 3. that among the recommended technologies all level, the cultural control technology of IPM, the use of method of transplainting has been adopted at 100.00 per cent. Planting time of paddy crop was followed by the nearer to recommended time i.e. 92.47, 94.74 and 96.00 per cent in low, medium and high adopter categroeies respectively. Seed Rate used in paddy growers was 89.47, 94.74 and 96.40 per cent respective categories. Among the comparison of all three adoption levels, the Nitrogen, Phosphorus and Potassium was not used at recommended level in all three categories. It means the fertilizers was not used by, at recommended level, in all three categories. The lowest adoption was observed in farm yard manure application i.e. 36.99, 41.39 and 55.71 per cent in low, medium and high adopter categories. The resones of low application of FYM, farmers used only owned farm FYM. In case of mechanical control of IPM technology, the highest adoption was proper spacing and Removal of Rosette flower and removal of infested plant parts in both high and medium adopter categaories. For use of pheromone trap/ Yellow Sticky trap it was highest in high adopter group i.e 52.00 per cent followed by medium and low adopter category i.e 26.32 and 15.79 per cent respectively.

In biological control of IPM technology has been adopted 56.00 per cent in high adoption group. In case of low adopter group is negligibal used in biological control. It meanse Farmers was not aware and lack of knowledge of biological control. In case of chemical control, was used 89.47 per cent in low adopter group followed by medium(68.42 %) and high adopter group (49.77 %).

In overall study, concluded that the adoption of all 19 technologies were highest in high adoption level group. Moreover, technology of Removal & destruction of pest infested plant, use of trichocard, FYM and biological control is very negligible use in low adopter group. It was due to unawareness about the importance and proper knowledge about the technologies.

Input Utilization:

Table 4. Input utilization at different level of adoption of IPM technology of Kharif Paddy (Per ha)

S.N.	Input Utilization	Unit	Low adopter (N = 19)	Medium adopter (N = 76)	High adopter (N = 25)
1	Male Labour	Days	29.30	32.94	35.27
2	Female Labour	Days	79.73	76.10	77.94
3	Total Human Labour	Days	109.03	109.05	113.21
4	Bullock Labour	Days	0.30	0.34	0.38
5	Machine Labour	hrs	6.98	9.07	10.32
6	Seed rate	Kg/ha	39.85	39.13	38.51
7	FYM	Qtl/ha	31.73	34.45	49.87
8	Fertilizer				
	N	Kg/ha	63.68	64.20	70.02
	P	Kg/ha	38.61	40.00	46.40
	K	Kg/ha	32.73	35.77	39.22

From the table 4, it was revealed that per hectare labour utilization was observed in low, medium and high levels of group i.e. 109.03, 109.05 and 113.21 days respectively. It was observed that the human labour utilization was highest in high adoption level group. Per hectare seed rate was used at recommended level in all three categories i.e. 39.85 kg to 39.13 kg per hectare. It shows that, in all three adoption level, seed rate was recommendation level.

Machinery charges were the highest for high adopter group i.e 10.32 hours per hectare followed by medium adopter with 9.07 hours per hectare.

Among the farm yard manure, highest used in high adopter group i.e. 49.87 quintal per hectare followed by medium adopter(34.45 qtl/ha) and low adopter(31.73 qtl/ha). In low adopter group shows that negligible use in FYM. The resons of low application of FYM, farmers is apply only owned farm FYM due to shortage of cattles population.

In case of use of nitrogen fertilizer for low, medium, high adopter group was 63.68 kg per hectare, 64.20 kg per hectare, 70.02 kg per hectare respectively. And for the phosphorus, was adopted 38.61 kg per hectare, 40.00 kg per hectare, 46.40 kg per hectare for low, medium, high adopter groups respectively. Among potassium fertilizer were used 32.73 kg per hectare, 35.77 kg per hectare and 39.22 kg per hectare for low, medium, high adopter group respectively. The results of application of fertilizer shows that NPK was used less at recommended level in all three categories.

Cost effectiveness and profitability at different level of adoption of IPM technology:

Economics of production of Kharif Paddy:

Table : 5 Economics of Production of different level of adoption of IPM technology

(Per ha)

S.N.	Particulars	Units	Low adopter (N = 19)	Medium adopter (N = 76)	High adopter (N = 25)
1	Yield	qtl/ha	32.73	35.77	39.22
2	Rate	Rs./qtl	2275.79	2317.11	2337.60
	Byproduce		5314.27	5572.81	5651.88
	Gross Produce	Rs.	**79800.88**	**88455.83**	**97332.55**
3	**Cost**	Rs.			
	Cost 'A_1'		44592.97	47830.59	50710.21
	Cost 'A_2'		44592.97	47830.59	50710.21
	Cost 'B_1'		48478.81	51842.24	54895.22
	Cost 'B_2'		61749.92	66554.04	71082.52
	Cost 'C_1'		57820.81	59821.13	61625.48
	Cost 'C_2'		71091.92	74532.94	77812.78
	Cost 'C3'		78201.11	81986.23	85594.06
4	**Net Return at**	Rs.			
	Cost 'A_1'		35207.91	40625.25	46622.34
	Cost 'A_2'		35207.91	40625.25	46622.34
	Cost 'B_1'		31322.06	36613.60	42437.33
	Cost 'B_2'		18050.96	21901.79	26250.03
	Cost 'C_1'		21980.06	28634.70	35707.07
	Cost 'C_2'		8708.96	13922.90	19519.77
	Cost 'C3'		1599.77	6469.60	11738.49
5	**Benefit Cost Ratio at**				
	Cost 'A_1'		**1.79**	**1.85**	**1.92**
	Cost 'A_2'		1.79	1.85	1.92
	Cost 'B_1'		1.65	1.71	1.77
	Cost 'B_2'		1.29	1.33	1.37
	Cost 'C_1'		**1.38**	**1.48**	**1.58**
	Cost 'C_2'		**1.12**	**1.19**	**1.25**
	Cost 'C3'		1.02	1.08	1.14

From the table 5, it is observed that the per hectare yield of low, medium and high adopters was 32.73 quintals, 35.77 quintals and 39.22 quintals per hectare, respectively. The gross return of low adopter, medium adopter and high adopters was Rs. 79800.88/-, Rs. 88455.83/-. and Rs. 97332.55 /-, respectively.

The per hectare Cost 'A_1' of low, medium and high adopters was Rs. 44592.97/- Rs. 47830.59/- and Rs. 50710.21/- respectively. The per hectare Cost 'B_2' was Rs. 61749.92/-, Rs.

66554.04/- and Rs. 71082.52/- of low, medium and high adopters, respectively. The per hectare Cost 'C_2' of low, medium and high adopters was Rs. 71091.92/- Rs. 74532.94/- and Rs. 77812.78/-, respectively.

The net returns at Cost 'A_1' Cost 'B_2' and Cost 'C_2' was in high adopters i.e. Rs. 46622.34/-, Rs. 26250.03/- and Rs. 19519.77/- respectively followed by medium adopter i.e. Rs. 40625.25, Rs 31306.25/- and Rs. 13922.90/- and lowest in low adopters i.e. Rs. 35207.91/-., Rs. 18050.96/- and Rs. 8708.96/- respectivly.

The result of Benefit Cost Ratio at Cost 'A_1' was 1.79, 1.85 and 1.92 in low, medium and high adopters, respectively, while Benefit Cost Ratio at Cost 'B_2' was 1.29, 1.33 and 1.37 for low, medium and high adopters, respectively, In case of Benefit Cost Ratio at Cost 'C_2' for low, medium, high adopter 1.12, 1.19 and 1.25 respectively. The results concluded that the low adopters group are not making more profit. It indicates that, as adoption of technology increases the yield level of crop and so that the net returns also increases. Therefore, the cultivation of paddy was found to be more profitable with the adoption of IPM technology, which is sustainable in every aspect. The same results was obtained by Sehal Mohit, Neeraj Powar and D.P. Malik, 2021.

Reduction in Unit cost of Kharif Paddy:

Unit cost of production (per quintal production cost) was estimated to compare within the technology adopters and is given in the table 6.

Table : 6 Reduction in unit cost of Kharif Paddy

S.N.	Particulars	Units	Low adopter (N = 19)	Medium adopter (N = 76)	High adopter (N = 25)
1	**Cost**	Rs/ha			
a	Cost 'A_1'		44592.97	47830.59	50710.21
b	Cost 'A_2'		44592.97	47830.59	50710.21
c	Cost 'B_1'		48478.81	51842.24	54895.22
d	Cost 'B_2'		61749.92	66554.04	71082.52
e	Cost 'C_1'		57820.81	59821.13	61625.48

f	Cost 'C$_2$'		71091.92	74532.94	77812.78
2	**Kharif Paddy Yield**	qtl/ha	32.73	35.77	39.22
3	**Change in Output**	qtl/ha		3.04	6.49
	% Increase the yield over Low adopter	%			119.83
4	**Unit cost assessments**	Rs/qtl			
a	Unit Cost 'A$_1$'		1362.45	1337.17	1292.97
b	Unit Cost 'A$_2$'		1362.45	1337.17	1292.97
c	Unit Cost 'B$_1$'		1481.17	1449.32	1399.67
d	Unit Cost 'B$_2$'		1886.65	1860.61	1812.41
e	Unit Cost 'C$_1$'		1766.60	1672.38	1571.28
f	Unit Cost 'C$_2$'		2172.07	2083.67	1984.01
5	**Reduction in per quintal production cost**				
a	Reduction in per quintal production cost at **Cost 'A$_1$'** over low adopter	Rs/qtl			69.48
b	Reduction in per quintal production cost at **Cost 'C$_2$'** over low adopter	Rs/qtl			**188.06**
c	**Reduction in the Cost rupees per hectare over the Low level of adoption**	Rs/ha			**7375.89**

From the table 6, it is observed that the cost of cultivation increases as the technology adoption increase. The change in yield was calculated over the low adopters. The change in yield was more (6.49 qtl/ha) in high adopters over low adopters, followed by medium adopter (3.04 qtl/ha). At Cost ‘A$_1$’ the per quintal cost of production in high adoption group was Rs 1292.97/-. which was less than medium adopter (Rs. 1337.17/-) while the per quintal cost of production in low adopters was highest i.e. Rs. 1362.45/- This means the adoption of recommended technology has given the higher yield and so the per quintal cost of production has been reduced. The same results was observed at the Cost ‘C$_2$’ i.e the per quintal cost of production in high adoption group was Rs 1571.28/- which was less, than medium adopter (Rs. 1672.38/-) while the per quintal cost of production in low adopters was highest i.e. Rs 1766.60/-.

It is observed that by adopting the high level of technology the unit cost is reduced by Rs. 69.48 /- and Rs 188.06/- per quintal over low adopter at Cost ‘A$_1$’ and Cost C$_2$’. The overall study, concluded that, the per unit cost reduction of high adopter was more as compare to low adopter because high adopter group were used in to the higher adoption of recommended IPM technology. Paddy productivity has been reported increased by 19.84 per cent with reduction in the cost of Rs. 7375.89/- per hectare in high level of adoption of Integrated Pest Management Technology group.

CONCLUSIONS

The findings from the present investigation are summarized as under:

1. All 120 farmers, 25 farmers under high level of adoption group, 76 farmers under medium level of adoption group while 19 farmers under low level of adoption group i in technology adoption range.
2. Extent of adoption of in all technologies were highest in high adoption level group because in low adopter groups was unawareness about the importance and proper knowledge about the technologies.
3. The result of input utilization, FYM, highest used in high adopter group i.e. 49.87 quintal per hectare followed by medium adopter(34.45 qtl/ha) and low adopter(31.73 qtl/ha). In low adopter group shows that lower used in FYM.
4. The results of application of fertilizer(NPK) shows that, not used at recommended level in all three categories.
5. Per hectare yield was highest in high adopter group i.e. 39.22 quintal followed by medium adopter group i.e. 35.77 quintal while it was lowest for low adopter group i.e. 32.73 quintal.
6. Beneift Cost Ratio at Cost 'A_1' was 1.79, 1.85 and 1.92 in low, medium and high adopters, respectively, while B:C ration at Cost 'C_2' for low, medium, high adopter were 1.12,1.19, 1.25 respectively. The results concluded that the low adopters group are not making more profit. It indicates that, as adoption of technology increases the yield level of crop and so that the net returns also increases.
7. The reduction in per quintal production cost at Cost 'C_2' over low adopter group were Rs. 188.06/-.
8. Paddy productivity has been reported increased by 19.84 per cent with the reduction in the cost of Rs. 7375.89 /- per hectare in high level of adoption of Integrated Pest Management Technology group.

It may be concluded that majority of the respondents suggested that the Input supply, guidance for availability of plant protection appliaces and technical guidance for preparation of organic manure. Hence, there is need to put more importance and emphasis on adoption of integrated pest management practices and to aware the people through booklets to identify the friendly insect respectively and available the pheorman trap, trichocard in krishi seva kendra.

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