International Proceedings of Chemical, Biological and Environmental Engineering, Vol. 92 (2016)
DOI: 10.7763/IPCBEE. 2016. V92. 8

Impact of Field School Program- Integrated Crop Management (FS-ICM) on the Level of Technology Adoption and Efficiency of Rice Farming in East Java Indonesia

M. Saeri [1 +], Suyamto [1]. D.W. Laily [2] and Dan Rahmawiliyanti [3]

[1] Assessment Institute for Agricultural Technology (AIAT) East Java, Jln. Raya Karangploso Km. 4 Malang PO Box 188, 65101 Malang

[2] Islamic University of Lamongan, East Java, Indonesia

[3] WijayaKusuma University of Surabaya, East Java, Indonesia

Abstract. The aim of this study was to know the level of adoption of technology components and efficiency of rice farming practitioners Field School program an integrated crop management (ICM) of rice in East Java. This research was conducted in two villages, Tempurejo and Sidodadi, District of Jember, East Java, Indonesia. Respondents the Tempurejo village is practitioners program, called the group 1, and respondents were non practitioners program is the village Sidodadi, called the group 2, each village 30 respondents. The results showed that the group 1 dominated the senior farmers, aged 40-59 years were 63%, whereas farmers productive age (20-39 years) reached 23%. Level of education 50%, predominantly high school education and 33% of junior high school education, and the remaining 17% educated Academy. While group 2, 53% aged 40-59 years, and 27% aged 20-39 years. Level of education, 67% of secondary schools and 33%. high school education. Application of the main technological components of 67,2% in the group's location 1 and 37.3% in the group's location 2. Application of the technology component of 84.4% in the location selection group 1, and 37.2%. location 2 group. Judging from the level of efficiency, the group 1, 29.4% higher than in group 2, who presented the value of R/C ratio of 1.98 and 1.53.

Keywords: Impact, FS-IPM, Evisiensi, rice, Jember.

1. Introduction

The staple needs will continue increasing in line with the population growth and per capita consumption and the increasing income. The efforts to increase the productivity and rice production have significance role, especially to food self-dependent and farmers' income. Nowadays, the effort seems to be the strategy of the government to increase national rice production. On the other hand, the efforts faces lots of obstacles such as fertile land conversion, the climate anomalies, technology fatigue, and soil sickness affecting the decreasing of productivity. The problem solving that has been partially implemented so far is unable to answer the complex problems and considered inefficient. [1]. The IPM is an approach that emphasizes on the land, plant, water, and pests management in an integrated manner. The management considers the synergy and complementary relationships among the components.

ICM emphasizes on the participation principle which puts farmer's experience, desire and ability as important roles in implementing a technology [2]. Based on the results of the review, the implementation of ICM may increase the rice production significantly. The experiments in 28 locations in Indonesia results the increasing production for about 20% and farming income for 25% [3]. Similar experiences have been carried in Madagascar, with the implementation of the system of rice intensification (SRI) with the application of technology components are integrated (8-15 days of planting young seedlings, spacing, planting one

+ Corresponding author. Tel.: + 62-341- 494052; fax: +62-341-471255.
E-mail address: saerimoh@yahoo.com; ssuyamto@gmail.com

plant/hole, irrigation intermittent, weeding rotary system) has been able to increase rice yields 7-12 tons/ha, above the average national production 2 tons / ha [4]. Other experiences have been conducted in Madura, in the dry season 1, that the use of New Varieties Inpari 10 is able to increase the yield of 23.31% from 5.32 t/ha. to 6.56 t/ha, [5]. The main program to stimulate the productivity is the application of technology components of integrated crop management (ICM) which was developed by Integrated Crop Management of Field School (FS-ICM). The technology component that supports the ICM has been arranged by the Agricultural Research Agency [6]. The component involves two elements, namely the basic components and optional components. The basic components include: variety, good quality and labelled seeds, sufficient organic substance, optimum plant population management, and fertilization based on *Specific Nutrient Management Area*. Moreover, the implementation of Integrated Pest Management (IPM) should be appropriate. While the optional components include: seasonal soil management, the use of young seedlings, planting 1-3 stems seed, intermittent irrigation, weeding by using "osrok" and harvesting on time. Dissemination of ICM technology has been done through various media, both print and electronic, and through various meetings/training, but the adoption of the technology components ICM, both basic components and the choice is still not optimal, so that the diversity of outcomes among farmers is high enough, resulting in increased productivity and efficiency of farming has not been achieved, it is also an impact on the price competitiveness of products is still weak[7].

The aim of this study is to determine the extent of technology component adoption in the implementation of ICM in East Java, and the level of efficiency of rice farming in implementing locations of FS-ICM program in East Java, Indonesia.

2. Research Method

Component technologies applied to the FS-ICM rice there are two groups, namely: 1). basic components, which include: a new superior varieties, quality seed and labeled, organic fertilizer sufficient, optimum plant population, fertilizer dose refers SSNM web, and application of IPM. and 2). The component selection, among others: proper tillage season, young seedlings, clumps of 1-3 rod, intermittent irrigation, weeding with mechanical harvest and timely. The location determined by purposive research in the village, sub-district and regency in East Java as the center of implementing the FS-ICM in 2013, as a comparison, rural non-executive FS-ICM, in the district of the same. Each village taken 30 respondents. The main data were collected through interviews of each of the respondents to the questionnaire, secondary data collected from the relevant agencies, including general information, Agricultural Systems, Institutional and marketing, is done through the FGD. (Focus Group Discussion). The collected data tabulated in the form of a matrix to facilitate the identification and validation of data. The data were analyzed descriptively, and to determine the level of farm efficiency analyzed by Input Output [8]. This research was conducted in two villages namely Sidodadi and Tempurejo villages, the villages entered the subdistrict Tempurejo Jember, East Java. This study began in January-December 2014. Farmers respondents from the village Tempurejo as implementers FS-ICM number of 30 people as a group 1, and farmers from the village Sidodadi as non-executive respondents FS-ICM program also 30 people as a group 2

3. Results And Discussion

The results of the two locations include the Performance of respondents as shown in Table 1.

From the table it appears that responen group 1 predominantly farmers aged 40-59 years senior amounted to 63%, while farmers age (20-39 years) reached 23%. while the groups 2 of respondents aged 40-59 farmers as much as 53% and as much as 27% aged 20-39, the education level of the group, (50%) and 17% high school graduates, while the group 2, 67% and 33% junior high school education. Judging from rice farming experience, respondents categorized quite experienced 80% and 87% of farmers in both groups had 15 years to farm. While looking at the status of plots at both locations, execution of nearly all land is privately owned, either in group 1 and group 2, 83% and 73%, and the rest is profit sharing land and leased land.

Table 1: The performance of Respondents Based on Age, Education, Number of Family Members, and Farming Experience in the District of Jember in East Java in 2013

No.	Characteristics of the Respondents	Group 1		Group 2	
		Amount	(%)	Amount	(%)
1	Age ≤ 20-39 years	7	23	8	27
	Age 40-59 years	19	63	16	53
	Age ≤ 60 years	4	13	6	20
2	Education				
	≤ junior high	10	33	20	67
	≤ senior high	15	50	10	33
	> senior high	5	17	0	0
3	Farming Experience				
	< 15 (Years)	6	20	4	13
	>15 (Years)	24	80	26	87
4	Arable status				
	Private	25	83	22	73
	Lease	2	7	5	17
	Sharing	3	10	3	10

The adoption rate of six major components FS-ICM Rice is shown in Table 2, are as follows. New Varieties highest adoption levels reaching 90% in group 2 and 80% in group 2. Seed labeled adopted by a group 1 of respondents 63.3%, and 10% by the group 2. Furthermore, determination of the dose for fertilizer referring web Nutrient Manager For Rice Mobile (NMRM) has not been adopted by both groups of respondents, having to use the computer or mobile phone, it is still considered difficult for farmers, so that in determining the dose of fertilizer farmers refer to their own experiences. The other major components are already pretty well adopted is the use of organic fertilizer, in both locations is about the same, namely 86.7% and 73.3%. While the rate of adoption of integrated pest management on a group 1 of respondents at 90% and 66.7% in the group 2 of respondents. Optimization of plant spacing pretty well adopted by a group 1 of respondents (80%), and has not been adopted by the group 2 of respondents (0%).

Table 2: The Application of Six Major Components of FS-ICM in Jember, in 2013

No	Characteristics of Respondents	Group 1		Group 2	
		Amount	(%)	Amount.	(%)
1.	Use VUB	27	90	24	80.0
	Not Use VUB	3	10	6	20.0
2.	Labelled Seed	19	63.3	3	10
	Not Labelled Seed	6	20.0	25	83.3
	Sometimes	5	16.7	2	6.7
3.	Using organic fertilizers				
	Using organic fertilizers	26	86.7	22	73.3
	Not use organic fertilizers	4	13.3	8	26.7
4.	Dose of fertilizer with NMRM	0	0.0	0	0.0
	Dose of fertilizer Not NMRM	30	100.0	30	100.0
5.	Optimize density/Legowo	24	80.0	0	0.0
	Not Optimize density/Legowo	6	20.0	30	100.0
6.	I.P.M	27	90.0	20	66.7
	Not I.P.M	3	10.0	10	33.3
Average adoption component			67,2		37,2

The other main components with a good level of adoption is the use of organic fertilizers and management of integrated opt. in both locations is almost the same level of adoption that organic fertilizer is 86.7% in group 1 and 73.3% in group 2. While the application of IPM, 90% in group 1 and 66.7% in group 2. Legowo row planting system or optimization of planting density, good enough adopted by the group 1 ie by 80%, and 0% in group 2. After a recapitulation of all the main components can be concluded that on average the adoption of the respondent group 1 amounted to 67.2% and 37.2% in group 2. Furthermore, in Table 3

indicated that some of the components of choice has been adopted by both groups of respondents completely, for example 100% perfect soil tillage has been adopted. Planting young seedlings (15-20 days.) At both locations adoption is still low at 53.3% in group 1 and 13.3% in group 2. Furthermore, plant 1-3 stems / clump, 80% of respondents adopted the group 1 and 43 % in group 2. Irrigation intermittent, in group 1 the adoption rate of 80%, and 33.3% in group 2. Weeding usi of the tool, already entrenched in both groups, because the adoption rate is quite high, at 93% in group 1 and 80 % in group 2. Timely harvest has also been adopted by the group 2 in the amount of 100%, it is supported by the sale of the system is done in the field, and harvest time is determined by the buyer, the maturity level of 95%.

Table 3: The Application of 6 Optional Components by FS-ICM in Jember district in 2013

No	Characteristics of Respondents	Group 1		Group 2	
		amount.	(%)	amount	(%)
1	Soil Perfec tillage	30	100.0	30	100.0
	Soil not Perfec tillage	0	0.0	0	0.0
2	The use of young seedlings				
	< 21 days	16	53.3	4	13.3
	21 days	4	13.3	14	46.7
	> 21 days	10	33.3	12	40.0
3	Planting 1-3 seeds/hole	24	80.0	13	43.3
	Planting >1-3 seeds/hole	4	13.3	12	40.0
	Sometimes	2	6.7	5	16.7
4	Intermittent irrigation	24	80.0	10	33.3
	irrigation not Intermittent	6	20.0	20	66.7
5	Weeding with tools	28	93.3	24	80.0
	Weeding not use tools	2	6.7	6	20.0
6	Harvesting on time	30	100	30	100.0
	Harvesting not on time	0	0.0	0	0.0
The adoption of 6 Optional components			84,4		61,7
	Not Adopting		15,6		38,3
	Total Adoption (%)		100.0		100.0

Results overall recap of component options can be mentioned that the adoption rate of the average respondent group one greater than the two groups in the amount of 84.4% and 61,7%. The maximum adoption occurred in tillage perfect and timely harvest is 100% in both groups of respondents, while the minimum is the adoption of planting young seedlings (13.3%) in the two groups of respondents.

Analysis of paddy rice farming in both locations are listed in Table 4. The use of seeds on one group of respondents was higher than two groups, ie 53.5 kg: 44,8kg. this is due to the adoption of the group optimal spacing of the higher that needs more seed.

Table 4: The Analysis of Rice Farming FS-ICM Program Implementers and FS-ICM non-program in Jember, East Java in 2013

No.	Description	Group 1	Group 2
1	Average seeds (Kg/ha)	53,5	44,8
2	Organic Fertilizer (Kg/ha)	769,6	581,0
3	Total of organic Fertilizer (kg/ha).	807,8	867,3
4	Pesticides (lt)	4,4	3,9
5	Workers (Day of Labor)	100,5	132,0
6	Average Cost (Rp/ha)	14.098.441	16.874.570
7	Average production (Rp/ha)	7.330	6.800
8	Average production cost (Rp/ha)	3.799,3	3.798,4
9	Average income (Rp/kg)	27.849.066	25.829.120
10	Average Profit (Kg/ha)	13.750.625	8.954.550
11	R/C Ratio	1,98	1,53

Adoption of organic fertilizer on the respondent group 1 was also higher than in group 2, which is 769.6 kg/ha and 581 kg/ha, this is because the group 1 of the organic fertilizer is a suggestion, and is not in group 2.

The use of chemical fertilizers, slightly higher in the group 2 of respondents, amounting to 807.8 kg/ha in group 1and 867.3 kg/ha in group 2. The use of pesticides is almost the same in both locations, that is 4.4 liters at group 1 of respondents and 3.9 liters/ha in groups 2. The use of Labor in the respondents of group 1 is more efficient than in group 2, 100.5 and 132.0 person/days, this is because the proper application of herbicides on weed control. The use of average costs in respondent group 1 is more evisien than group2, namely Rp. 14,098,441,-/ha and Rp. 16.87457,-/ha. Furthermore, the average acceptance rice farm on group 1 of respondents is Rp. 27,849,066,- is greater than the acceptance by the group 2 of respondents, namely Rp. 25.82912,- this because rice production is higher in the group 1 of the group 2, namely 7,330 kg/ha and 6,800 kg/ha. Farming profits achieved respondent group 1 was also higher than in group 2, namely Rp. 13,750,625,- and Rp. 8.95455, -. Efficiency levels measured in the value of R/C Ratio indicates that respondents evisien group 1 is more than group2 of respondents with a value of 1.98 and 1.53, but both groups are equally farming evisien because value greater than 1.

4. Conclusion

From the results of the review, in two location in East Java can be summarized as follows:

1). The rate of adoption of the main components of the technology ICM rice adopted by the respondent group 1 is quite high, reaching 67.2%, and 37.2% in group 2. While the adoption of an optional on location of the respondent group 1 was 84.4%, and 37.2% in group 2.

2). Analysis of R/C Ratio farming in a more efficient group one than in group two with a value of 1.96 and 1.53, but in both locations is quite efficient, because the value of the two is greater than one, this indicates that rice farming with IPM approach in East Java worth to be developed.

5. References

[1] Kartaatmadja, S dan A. Fagi. 2000. Pengelolaan Tanaman Terpadu: Konsep dan Penerapan. dalam. Makarim *at.al*. (Eds). Tonggak Kemajuan Teknologi Produksi Tanaman Pangan . Konsep dan Strategi Peningkatan Produksi Pangan. *Simposium Penelitian Tanaman Pangan IV*. Bogor 22-24 November 1999.

[2] Badan Litbang Pertanian. 2007. Pengelolaan Tanaman Terpadu (PTT) Padi Sawah Irigasi. Petunjuk Teknis Lapang. Badan Penelitian dan Pengembangan Pertanian. Departemen Pertanian. Jakarta

[3] Budianto, J. 2003. Kebijakan Penelitian dan Pengembangan Teknologi Peningkatan Produktivitas Padi Terpadu. Prosiding Lokakarya Pelaksanaan Program Peningkatan Produktivitas Padi Terpadu. Pusat Penelitian dan Pengembangan Tanaman Pangan, Badan Litbang Pertanian Bogor

[4] Stoop, W.A., N. Uphoff and A. Kasam. The system of rice intensification (SRI) from Madagaskar: Reflection on possible significance for agriculture research strategies . Paper. Un publised.

[5] Moh. Saeri, *at.al.* 2013. Keragaan Agronomis Dan Ekonomis Varietas Unggul Baru Padi Inbrida Di Kabupaten Sampang Madura. Prosiding Seminar Nasional Fakultas Pertanian dan Peternakan, 2013. "Penguatan Potensi dan Posisi Tawar Komoditas lokal Untuk Mewujudkan Kemandirian Pangan dan Energi"

[6] Suryana, A., Suyamto, S. Abdulrachman, I.P. Wardana, H. Suembiring, dan I.N. Widiarta. 2007. Pengelolaan Tanaman Terpadu (PTT) Padi Sawah Irigasi. Badan Penelitian dan Pengembangan Pertanian. Departemen pertanian. Jakarta. 40p.

[7] Suyamto dan F. Kasijadi, 2000. Konsolidasi Sumberdaya Dalam Sistem Usaha Pertanian Menghadapi Otonomi Daerah dan Pasar Bebas. Makalah Seminar Nasional Arah Kebijakan Sektor Pertanian Dalam Menunjang Otonomi Daerah dan Memenangkan Persaingan Era Pasar Bebas. Surabaya.

[8] Soekartawi, 2002. Analisis Usahatani. Universitas Indonesia Press.p.85-87.