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IMPACT OF INTEGRATED PEST MANAGEMENT- FARMER FIELD SCHOOL (IPM- FFS) ON FARMERS' INSECT PEST MANAGEMENT BELIEF, ATTITUDE AND PRACTICES (KAP) IN VIETNAM

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ABSTRACT

The IPM- FFS training and NES campaign in Viet Nam have reduced insecticide sprays per crop season among IPM trained- and NES received-farmers. However, these strategies were not able to convince all IPM trained – and NES massage received- farmers as well as farmers in remote areas. They still sprayed insecticide at the early stage of the rice plant and sprayed for prevention purpose because of misperception of insecticide as nutrient and yield lost. The analysis shows that insecticide use did not affect on rice yield even farmers increase frequency of insecticide sprays. Although all farmers understood well about negative impact of insecticide to human health, to minimize this affect only 15% of NES farmers, 8% of control farmers, and only more than one- third (35%) of IPM trained – farmers mentioned to reducing insecticide use. The rests protected themselves during spray, and uses resistant plants.

Farmers who are living in the remote area with less opportunity to access to new technological information had low benefit from rice production. Due to low rice intensity in the remote area, farmers were not noticed by extension program, thus they obtain low yield and low benefit- cost ratio.

RATIONALE

Rice is the most important crop of Vietnam. Vietnam became a major exported of rice due to increase in rice productivity and rice crop intensity. This promoted the use of chemical input to control insect pests leading to negative impacts on human health and the environment. These problems have lead to another way of controlling pests, known as integrated pest management (IPM) developed by Botrell (1979). The IPM- FFS approach is a training and extension program that encourages farmers not to spray insecticide until such a time that the threshold level is reached. The IPM- FFS have been introduced in Vietnam since 1992. However, farmers who live in remote areas have no opportunity to participate in IPM- FFS trainings. Thus, "no- early- spray" (NES) campaign started in 1994 in Long An province through the means of poster, pamphlet, cassette tapes with the radio drama. Similar campaign spread in other provinces (Vo Mai, et al. 1995). Farmers' belief and attitude towards these strategies will affect their insect pest control practices. Thus, assessment the impact of Integrated Pest Management- Farmers Field School (IPM- FFS) on farmers' insect pest belief, attitude and practices (KAP) is necessary.

The objective of this study is to see differences in belief, attitude and practices between IPM- FFS trained and non- trained farmers as well as No- Early Spray insecticide campaign received and non- received farmers.

METHOD OF DATA COLLECTION AND ANALYSIS

Five villages from Bac Lieu, Ben Tre and Long An provinces were selected for this studies. The IPM- FFS villages (Vinh Phu Dong -Bac Lieu, An Binh Tay – Ben Tre, and Hiep Thanh- Long An) were selected with strong IPM training (more classes with more participants than other villages in the districts). The No- Early- Spray (NES) villages (Vinh Thanh – Bac Lieu), Phu Le- Ben Tre, and Tam Vu – Long An) are weak in IPM training (less IMP trained farmers

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relatively to other villages) or no training on IPM but it has strong or many farmers access to the means of NES campaign. The control villages (Hung Phu – Bac Lieu and An Duc-Ben Tre) have no IPM training and no NES campaign or means of mass media related to NES.

Ninety- five IPM –FFS trained-farmers, 95 NES campaign received - farmers and 63 control farmers randomly selected were directly interview by the structured questionnaires. The information was conducted at 2 phases. The qualitative data on farmers' belief, attitude and practice were first collected during August to September, 2003. The quantitative data on input and output in rice production was collected in the early 2004.

Data was summarized in the forms of mean, frequency and percentage. The qualitative data were undergone quantified coding to summarize farmers' thought. Regression analysis was used to determine the factors influencing farmers' use of pesticide. It was also used to find the factors affecting rice yield.

RESULTS AND DISCUSSION

1. Farmers' belief, attitude, health and environment

Farmers' belief on biological control:

Majority of IPM (98%) and NES farmers (98%) did not believed that "all insects are harmful". This rate was lower in control farmers (80%), and 20% of them believed that "all insects are harmful" for their rice plants because they were afraid that the rice plants became bad under insect appearance. The ones who did not believe on this matter explained that there are some useful insects called beneficial insects in the rice field (table 1).

Table 1: Beliefs on biological control and plant recovery (%)

Attribute	IPM (n=95)		NES (n=95		Control (n=63)	
	True	Not true	True	Not true	True	Not true
All insects are harmful	2	98	2	98	20	80
Spraying insecticide causes BPH resurgence	77	23	40	60	10	60
If we see any insect in the rice field, we should always spray insecticides	26	74	17	83	30	70
I need to spray when my neighboring farmers spray	3	97	11	89	20	80
Insecticide spraying at an early age of plant, before 40 DAS against leaf folder must be practiced	12	88	26	74	54	46

The IPM and NES farmers listed the names of non- harmful animals in their fields such as spider, *Paederus fuscipes*, damsel fly, water bug, bee or wasp, lady beetle, dragon fly, fish, shrimp, eel, snake, frog... More IPM- FFS trained- farmers and NES received-farmers than control farmers knew about beneficial animals in the field. They also knew that these animals ate the harmful insects (such as BPH, insects, butterfly and stink bug...). These animals protected the rice plants, and helped the development of plants as pollinating in the case of bees. Bees also parasitized the insects' eggs.

More IPM farmers (77%) than the NES (40%) and control farmers (10%) believed that "spraying insecticide cause BPH resurgence". They said that insecticide killed beneficial insects, BPH eggs still hatched. Insecticide resistance in insects also occurred. On the other hand, the control farmers did not know about resurgence phenomenon and half of them (51%) said that insecticide would not cause BPH resurgence because insecticide killed all insects.

Almost IPM, NES, and control farmers (74%, 83% and 70%, respectively) did not spray insecticide when they saw any insect in the

field. They have to observe the field and only spray insecticide when harmful insects are present at high density and cause damage to plants. On the other hand, 27% of control farmers and 12% of NES farmers said that they should spray insecticide when they saw any insect in the rice field because they wanted to prevent damage from insects for good plant growth and to ensure high yield.

Majority of IPM (97%), NES (89%) and control farmers (80%) did not spray insecticide when their neighbors did spraying and only spray when the harmful insects are at high level in the field. More control farmers (19%) than NES farmers (8%) spray to prevent the spread of insects.

More than half of control farmers (54%) and one- fourth of NES farmers (26%) believed that insecticide spraying at an early age of plant, before 40 days after sowing (DAS) against leaf folder must be practiced. They did so because they were afraid of the death of rice plants, or slow plant development leading to yield reduction. They killed leaf folder for good tillering. They applied fertilizer at early stage, the plants became green after fertilizer application. Thus, the insects were attracted by green plants, they said. Therefore, they need to spray insecticide. The rests did not believe because at young stage, the rice plants can recover from the damage caused by leaf folder.

Farmers' perception on insecticide yield relationship, plant resistance and insecticide and health:

Majority of IPM farmers (82%) and NES farmers (71%) thought that the rice yield would not change if no insecticide spraying at an early age of plant (before 40 DAS) against leaf folder. However, 43% of control farmers thought that rice yield increased if insecticide spraying at an early age of plant (before 40 DAS) against leaf folder was practiced.

Almost farmers (99% IPM, 93% NES and 100% control farmers) believed that choosing varieties to plant is important. They defined that resistant variety is less or not attacked by insects and disease. Their leaves are thick, hard, strong and erect, straight stem to get more sunlight, hard stem to prevent from lodging. Resistant variety has bitter substances which insects can not eat.

More than half of farmers (63% of NES, 62% of control farmers and 55% of IPM farmers) believed that all varieties are attacked by all insect pests. They explained that all varieties are more or less attacked by insects. The resistant varieties which were planted continuously for many seasons are easily attacked by insects. There is no absolute resistant variety.

Though IPM farmers undergone training, 20% of them and 31% NES farmers believed that insecticide is a plant nutrient. This rate was higher in control farmers (40%) because they misunderstand that the plants grow well after insecticide spraying due to insecticide containing nutrient. This indicates that there are still IPM and NES farmers who do not understand well about insecticide.

Similar trends of belief were found on the statement of "insecticide must always be applied to achieve high yield". Twenty percent of IPM farmers, 34% NES and 40% control farmers believed that insecticide must be applied to achieve high yield because insecticide killed harmful insects or prevented insect to help plant growing well and thus the plants give high yield.

Farmers' knowledge on integrated pest management:

Farmers' knowledge was divided into three domains, knowledge on insects and natural enemies, knowledge on insecticide and its use, and knowledge on host- plant resistance and cultural practices. IPM farmers' knowledge scores on the above three domains were higher than those of NES and control farmers. NES farmers had higher knowledge scores than control farmers (table 2). One fifth of control farmers (21%) had low knowledge level on insects and natural enemies. Twelve percent of NES and 11% of control farmers had low knowledge level on insecticide and its use. Most of farmers (IPM, NES and control) had high knowledge level on host-plant resistance and cultural practices.

Table 2: Farmers' knowledge score

Knowledge domain	IPM (n=95)	NES (n=95)	Control (n=63)
Knowledge on insects and natural enemies	0.90	0.80	0.70
Knowledge on insecticide and its use	0.76	0.68	0.65
Knowledge on Host-Plant resistance and cultural practice	0.79	0.76	0.72

Farmers' attitude towards insect pest management:

Most of farmers preferred to plant rice at the same time with their neighbors to reduce rat, bird and insect pest attack, easy in water management and machine contracting for land preparation, threshing, and harvesting.

More than 90% of IPM, NES and control farmers agreed that applying high dose of nitrogen fertilizer increases insect pest attack. More IPM farmers (71%) than NES (64%) and control farmers (51%) agreed that changing rice crop system by rotation with up-land crop reduces insect incidence. Though the cultural practices could reduce insect pest mentioned by farmers, one-fourth of control farmers (25%) and nearly one- fifth of NES farmers (19%) agree to spray for prevention. They also have misperception on insecticide and yield relationship because half of control farmers (51%) and one- fourth of NES farmers (25%) agreed that applying insecticide before 40 days after sowing would increase yield. Most of IPM farmers (84%), 68% of NES farmers and 49% of control farmers did not agree on this statement.

Most of farmers knew that it is not safe to clean the sprayer after using in irrigation canal. However, there are still nearly one-fourth of control farmers (24%), 22% of NES and 16% of IPM farmers found that this is not a problem. This indicates that not all IPM farmers and NES farmers understood well about insecticide and its affect on the environment. Majority of farmers did not agree that empty insecticide bottles could be disposed of anywhere. The empty insecticide bottles were either buried or burn or sold. Some of control and NES farmers (3% each) threw empty bottles in the fields and holes without attention. Almost of farmers did not reuse empty insecticide bottles. However, 3% of IPM and 1% of NES farmers reused to store seeds; 9% of IPM, 6% of NES and 3% of control farmers used to contain kerosene or gasoline/ petrol; and 1% of NES farmers used to plant flowers.

IPM- FFS farmers' opinion:

When we asked IPM- FFS trained farmers what comes to their mind when mentioning to IPM- FFS, 59% of them said reducing insecticide, no insecticide spraying before 40 DAS and reducing cost. Seventeen percent of them remembered "how to identify insect pests and their life cycles, visiting fields often, spray insecticide when really needed". Only 6% of them mentioned about protecting beneficial insects and balance between them with harmful insects. Eleven percent of them remembered what kinds, doses and methods of insecticide use. Three percent of them mentioned about protecting ourselves during insecticide spraying. Seven percent of them talked about reducing health affect and environmental pollution (table 3).

Table 3: IPM training retained in farmers' mind (%) (*)

Mentioning to IPM-FFS, what comes to your mind (*)	IPM farmers (%)
Reduce insecticide, no insecticide spraying before 40 DAS, reduce cost	59
We spray insecticide when the rice field is really needed by visit field often	17
How to identify the insect/pest, harmful insect development cycle	17
Protect the beneficial insect, balance the biological agents and harmful insect	6
Insecticide, use insecticide kind, quantity and method use correctly	11
Protect ourselves during insecticide spraying	3
Reduce the health affect and environmental pollution	7

(*) Multiple responses

Changes in insecticide spraying:

Before IPM- FFS training, in Winter- Spring, Summer- Autumn and Spring- Summer seasons, they sprayed 5.9; 5.3; and 5.4 times per season, respectively. Now (after training), the number of insecticide sprays was reduced to 2.4; 2.1; and 2.2 times corresponding to the above seasons. From 4 to 8% of IPM farmers did not spray any insecticide for the whole season after training. Fourteen to twenty five percent of them only sprayed one time per season after training. However, 5- 7% of them sprayed insecticide 4 times, even 5 to 7 times per season after training.

Similar trends were found in NES farmers. Before NES campaign, they sprayed 4.6 times in Winter- spring season, 4.5 time in Summer- Autumn and 4.8 times in Spring- Summer season. After NES campaign, the number of insecticide sprays were reduced to 2.9, 2.8 and 3.1 times in Winter- Spring, Summer- Autumn and Spring- Summer season, respectively. After campaign, from 2 to 5 % of NES farmers did not spray insecticide during rice season. From 11- 15% of them only sprayed insecticide one time per season. However, 16-17% of NES farmers still sprayed insecticide 4 times per season. From 9- 17% of them sprayed insecticide from 5-7 times even 8 times per season. This indicates that NES campaign has not convinced all farmers.

Farmers' attitude towards NES (No Early Spray):

Farmers received "No Early Spray" message was from 1994 (8%). Eighteen percent of NES farmers received during 1995- 1996. More farmers (31%) received recent years (1999- 2000). The source of NES information were from television (32%), trained IPM farmers (31%), radio (29%), other farmers (22%), extension technician (18%) and from farmer's club, newspapers and local information vehicle (1- 2%). Farmers' first response when receiving NES information was worrying. They did not believe on it (36%). They were surprised. However, 47% of them like it and accepted it (table 4).

Table 4: Farmers' attitude towards NES (No early spray)

Item	%
First response when receiving NES information	
I' m worried and not believed it yet	36
I was not cared about it, surprised	12
Felt interesting, I considered it	9
I like it and accepted it	47
I tested NES on my field	1
What did you do afterwards, immediately after you heard NES?	
I observed other farmers, I considered it	19
Practiced it	34
I tested NES on the small land	17
Applied by no spray before 40 DAS, only keep water & applied fertilizer for plant grow	9
Worrying damage caused by insect, so I didn't follow NES	21
Total	100
Did you follow NES?	
Yes	72
No	28
Total	100
How did you follow NES?	
Not spraying insecticide in the first 40 days of the rice plant	35
First I tested NES on the limited land, saw good results, then applied for the whole field	13
First I visit rice field to observe insect development	11
Doing water management, releasing ducks to control leaf folder	4
Not spraying insecticide in the first 30DAS, after that I spray when having harmful insect	4
First I applied the NES on the whole land, until now with good result	1

Immediately after hearing NES, 34% of farmers wanted to practice it, 17% of them tested on small portion of their land, 19% of farmers observed other farmers doing it first, and 9% apply not to spray insect before 40 DAS. However, 21% did not follow NES right after hearing NES because they were worried about damage caused by insects.

Sixty six percent of farmers followed NES after one rice season, 2% followed after one year. They practiced not spraying insecticide in the first 40 days of the rice plant (35%). First, they tested NES on the limited land, saw good results, and then applied for the whole field (13%).

The others farmers did not follow NES after receiving information about NES because they were afraid of yield loss, worried of insect damage and they did not believe on NES. During early stage of rice plant (before 40 DAS), they saw harmful insects at high level, and then they still sprayed insecticide.

According to farmers, 79% of them reduced insecticide spraying after receiving NES. The rests still sprayed as usual even more. The ones reduced spraying because they found NES effective, reducing inputs and health improved. They have observed that rice yield would not affect if no spray insecticides before 40 DAS to control leaf folder.

2. Insecticide use and input output analysis

Insecticide used by farmers:

All IPM, NES and control farmers used insecticide to control insect pests and most of them have seen this as an effective method. Only one-fifth of IPM farmers (21%) and more than one- tenth of NES farmers (13%) used water management to control insects on their rice fields. This method was found effective by 18% of IPM farmers and 10% of NES farmers. Only 9% of IPM and 11% of NES farmers used other non- chemical control method as releasing small ducks into the fields to eat insects. This shows that IPM and NES farmers had alternative choices of non-chemical control methods beside insecticide use. The control farmers only depend on insecticide (table 5).

Table 5: Insect control methods used by farmers (%)

Item	IPM	NES	Control
Insecticide			
Yes	100	100	100
Effectiveness of insecticide			
Highly effective	71	81	88
Effective	28	17	12
Low effective	1	1	-
Water management			
Yes	21	13	-
No	79	87	100
Effectiveness of water management			
Highly effective	17	9	-
Effective	1	1	-
Low effective	3	3	-
Other methods			
Releasing ducks	9	11	-
Weeding bunds	-	1	-
Effective of other methods			
Highly effective	7	4	4
Effective	3	9	2

Regarding to distribution of first insecticide spraying, more control farmers (25%) than NES (11%) and IPM (5%) did first insecticide spraying in the first weeks of the rice plants.

This indicates that through the simple rule of not spraying in the early stage of rice plant, farmers still sprayed. IPM and NES still sprayed insecticides before 40 days after sowing (DAS). This may be affected by many factors such as ineffective training and campaign, the information from strong pesticide advertisement, no more incentive form in IPM and NES implementation, weak belief and low knowledge on insect pest control strategies.

IPM (35%) and NES (57%) farmers still sprayed insecticide for prevention purpose before 40 DAS. In this rice plant stage, 44% of control farmers sprayed for prevention purpose. In the later stages of the rice plant, spraying insecticides for prevention purposes were applied by both IPM and NES farmers. Of course, the control farmers also sprayed for prevention (table 6).

The most important insects for the first insecticide spraying were leaf- folder, followed by thrips and case worm, brown plant hopper, stem borer and army worm.

More than half of NES farmers (54%), and 44% of IPM farmers sprayed leaf- folder during 0-40 DAS. They sprayed to control case worm, army worm, stem bores and thrips. Similar target insects were sprayed insecticides by farmers from 41- 60 DAS and after 60 DAS

Table 6: Purpose of spraying insecticide (%)

Purpose	IPM	NES	Control
0- 40 DAS			
Prevention	35	57	44
Control	36	17	35
Both prevention and control	3	1	5
41- 60 DAS			
Prevention	27	33	25
Control	35	26	12
Both prevention and control	3	1	-
> 60 DAS			
Prevention	15	14	14
Control	13	19	7
Both prevention and control	-	1	-

DAS: days after sowing

Input and output in rice production:

NES farmers use higher amount of commercial fertilizer (365 kg/ha) than IPM (334 kg/ha) and control farmers (300 kg/ha). NES farmers also applied higher dose of nitrogen fertilizer (110 kg N/ha) than IPM (87 kg N/ha) and control farmers (88 kg N/ha). This may be the reason leading to using more insecticide by NES farmers. Control and NES farmers used less amount of potassium per hectare (13 kg K_2O/ha and 17 kg K_2O/ ha, respectively). Even IPM farmers also applied low potassium (22 kg K_2O/ha). This happens because farmers had low knowledge on nutrient management. The soil in the Mekong Delta strongly absorbs K^+ and tightly this cation in clay colloid, therefore plants cannot uptake this nutrient (Dobermann et al. 1995). In this case, less amount of potassium applied into soil will not increase rice yield (Tan and et al., 1995).

Regarding to insecticide input, control and NES farmers used higher amount of commercial solid insecticide than IPM farmers. On the other hand, IPM farmers used higher quantity of liquid insecticide than NES and control farmers.

The number of insecticide spraying from 0- 40 DAS was higher in NES and control farmers than IPM farmers. The maximum of number insecticide spraying was from 4- 5 times during 0- 40 DAS, meanwhile it was 3 times in IPM farmers. NES convinced farmers to not spray insecticide from 0- 40 DAS and IPM strategy is reducing insecticide use and it is not necessary to spray insecticide in the

early plant stage to control leaf folder. However, in this study, IPM and NES farmers still sprayed in the early stage. The maximum of total number sprays during a season varied from 5- 7 times. There are few farmers who did not spray insecticide for the whole rice season.

Regarding to labor invests, control farmers had to invest higher labor days/ha (89.6) than NES (72.1) and IPM farmers (62.2). Similar trends were found for male and female labors. Especially control farmers input higher labor days in gap- filling (replanting), hand weeding, fertilizer and insecticide application. The IPM strategy recommended farmers to apply scientific technologies such as cultural practices which can reduce labor in gap-filling, hand weeding and fertilizer and insecticide application.

In the last rice season, the rice yield of control farmers (3.9 t/ha) was lower than IPM (4.4 t/ha) and NES farmers (4.5 t/ha). Therefore, their rice income was lower (7149 thousand dong/ha) than those of IPM (8304 thousand dong/ha) and NES (8535 thousand dong/ha) farmers. The control farmers input for seed cost higher than IPM and NES farmers. Their imputed family labor was higher than IPM and NES farmers. Thus, net return/ha of control farmer was lower than IPM and NES farmers. The Benefit-cost ratio of control farmers (0.76) was lower than NES (0.92) and IPM farmers (0.99).

The control farmers were at remote areas where the information and extension activities did not reach. They had less opportunity to contact with new labor-saving technologies and other new innovation. Their living sites were low rice intensity which was different from IPM and NES sites with high rice intensity. The IPM and NES villages are dominant in triple rice followed by double rice system. Half of farmers in control villages follow double rice system, followed by one rice (35%), triple rice system only 8%. The government and extension staffs usually implemented development strategies in the high rice intensity area rather than the low rice intensity area. According to Adhikarya (1994), the government has increased the investment for extension programs, but extension activities do not reach small land – holding farmers in remote area. Lack of manpower of extension system and difficulty in reaching farmers in remote area limit farmers to access information in order to improve crop yield. Thus, with low rice intensity, control farmers did not know about IPM and NES campaign. They also did not know about nutrient as well as pesticide inputs for the rice field. Therefore they used less herbicide, fungicide, insecticide and fertilizer than other IPM and NES farmers, accordingly, their rice yield was low, and low Benefit- cost ratio (table 7).

Table 7: Rice income, input (1000 VND/ha) in rice production and benefit-cost ratio

Item	IPM	NES	Control
Rice income/ha (1000 VND)	**8304**	**8535**	**7149**
Seed cost /ha	365	382	992
Fuel cost /ha	82	32	26
Fertilizer cost /ha	1074	1185	959
Herbicide cost /ha	136	167	92
Fungicide cost /ha	308	259	234
Insecticide cost /ha	195	197	190
Hired labor cost /ha	1225	1266	1131
Total material inputs/ha	2160	2223	2475
Imputed family labor/ha	1018	1282	1812
Overall cost /ha	**4402**	**4753**	**5419**
Net return /ha	**3892**	**3782**	**1740**
Benefit cost ratio	**0.99**	**0.92**	**0.76**

Factor affecting rice yield and insecticide use:

Commercial fertilizer amount did not affect rice yield. However, potassium (K_2O) significantly and positively affected rice yield. Farmers who applied higher potassium would get higher rice yield. Farmers in all sites applied very low amount of potassium because they may not know the affect of this fertilizer on rice yield. Weed and rice disease control affected on rice yield. The rice field without weeds and disease increased rice yield. Thus, cost of herbicide and fungicide positively influenced the rice yield (table 8).

Table 8: Factor affecting rice yield

Factor	Coefficients	T value	Sig.
(Constant)	3.7401	17.0868	0.0000
Amount of broadcast fertilizer (kg/ha)	0.0004	0.2549	0.7991
N Kg /ha	0.0013	0.3343	0.7385
P_2O_5 (kg/ha)	-0.0023	-0.6243	0.5332
K_2O (kg/ha)	0.0139	2.8350	0.0051
Leaf spraying fertilizer (kg/ha)	0.0004	0.1683	0.8665
Cost of herbicide (kg/ha)	0.0013	2.0289	0.0438
Cost of fungicide (kg/ha)	0.0007	2.0452	0.0422
Total insecticide amount (kg/ha)	0.0000	0.3061	0.7599
Total male labor days/ha	-0.0069	-2.8780	0.0045
Total female labor days/ha	0.0053	1.4400	0.1515
R^2= 0.20	F= 4.874		

Percentage of insect infested area did not influence the amount of insecticide use. On the other hand, the frequency of insecticide sprays during 0- 40DAS and 41- 60 DAS positively and significantly affected insecticide amount used by farmers (table 9). Similarly, amount of liquid insecticide used positively and significantly affected by frequency of insecticide sprays from 0- 40 DAS and 41- 60 DAS. The solid insecticide was positively affected by frequency of insecticide sprays at the early stage (0- 40 DAS).

Table 9: Factor affecting amount of insecticide used

Factor	Coefficients	T-value	Sig.
(Constant)	1.0832	1.1377	0.2566
Percentage of insect infested area	0.0049	0.3902	0.6968
Number of insecticide sprays from 0-40DAS	1.2378	3.9593	0.0001
Number of insecticide sprays from 41-60DAS	1.0814	2.8883	0.0043
N Kg /ha	0.0026	0.3566	0.7218
P_2O_5 (kg/ha)	-0.0176	-1.4799	0.1405
K_2O (kg/ha)	0.0107	0.6168	0.5381
R^2= 0.12	F= 4.667		

DAS: Days after sowing

There is a tendency of increase the number of insecticide sprays from 0- 40DAS with farmers' perception on yield lost. Farmers who perceived high percentage of yield lost by occurrence of insects would increase the frequency of insecticide sprays from 0-40 DAS.

Similar tendency was found with nitrogen fertilizer used. The frequency of insecticide sprays from 41-60 DAS was affected by nitrogen fertilizer application. Farmers who used high amount of nitrogen fertilizer did more sprays of insecticide from 41- 60 DAS.

CONCLUSION

Though the IPM- FFS introduced in Vietnam since 1992 and NES (No Early- Spraying) campaign to control leaf- feeding insects started in 1994 in almost rice provinces, there are still remote hamlets or villages where the labor and input saving-technologies have not yet reached. More than 20% of farmers of in these areas did not believe on biological control. Most of NES received farmers did not understand the affect of insecticide on insect (as brown plant hopper) resurgence. This simple rule (NES) might not able to explain to farmers the negative impact of insecticides. There are NES received farmers (12%) who still sprayed insecticide for prophylactic (insect prevention) purpose. This rate was higher in control farmers (27%). Thus, 54% of control farmers and one- fourth of NES received farmers believed that spraying at an early age of rice plant before 40 DAS must be practiced because they were afraid of yield reduction. Though IPM farmers undergone training, 20% of them and 31% of NES received farmers believed that insecticide is a plant nutrient. This was higher in control farmers (40%). Insecticide is seen as an important method to control insects by all kinds of farmers (IPM trained, NES received farmers and control farmers). All of them sprayed insecticide during 0-40 DAS even IPM- trained farmers and NES received farmers, and they still sprayed for prevention purpose. The target insects to spray insecticide include leaf- folder, thrips, case-worm, brown plant hopper, stem borer, armyworm and bugs. Though after IPM- FFS training, the number of insecticide sprays was reduced from 5.3 - 5.9 to 2.1 - 2.4 times per season by IMP-trained farmers, there are still from 5- 7% of them sprayed insecticide 4 times, even 5 to 7 times per season. Similarly, the numbers of insecticide sprays was reduced from maximum of 4.8 times to 3.1 times/ season by NES received – farmers, however, the NES massage was not able to convince all farmers who received it because from 9 to 17% of NES received farmers still sprayed insecticide more than 5 times per season.

All kinds of farmers understood well about negative impact of insecticide to human health and they have their own strategies to minimize this insecticide affect. Most of them protected themselves during spray as wearing gauze masks, gloves, and long sleeves, avoiding insecticide inhaling; taking a bath, eating mungbean and drinking lemon juice after spraying. They also use cultural practice as resistant rice varieties because they knew the its important role in resistance to insect pest. The important method as reducing insecticide use to reduce human health problem was mentioned by only 15% of NES farmers, 8% of control farmers, and only more than one- third of IPM trained - farmers (35%).

Farmers who are living in the remote area without opportunity to access to new technologies and information had low income from rice production because of low yield. Due to low rice intensity and less access to new technology, they had high input of labors and seeds and did not know about fertilizer and pesticide input as higher rice intensity area. They were not noticed by extension program, thus they applied less agro-chemical input and obtain low yield. They also had low input efficiency because of low Benefit- cost ratio.

Insecticide use did not affect on rice yield even farmers increase frequency of insecticide sprays. Higher dose of nitrogen fertilizer used have led to higher frequency of insecticide spraying.

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SUMMARY IN VIETNAMESE

Chương trình tập huấn IPM và chiến dịch không phun thuốc trừ sâu sớm ở nước ta đã giảm số lần phun thuốc trừ sâu mỗi vụ. Tuy nhiên, các chiến lược này chưa thuyết phục được hết số nông dân tham gia lớp tập huấn IPM, nông dân nhận thông tin không phun thuốc trừ sâu sớm cũng như những nông dân ở các xã ấp vùng sâu. Vì vậy, họ vẫn còn phun thuốc trừ sâu trong vòng 40 ngày đầu sau sạ và phun ngừa do nhận thức sai lầm về thuốc và sự mất mát về năng suất. Sự phân tích cho thấy thuốc trừ sâu không ảnh hưởng gì đến năng suất lúa, dù cho nông dân có tăng số lần phun xịt. Mặc dầu tất cả nông dân đều biết tác hại của thuốc trừ sâu đối với sức khoẻ con người, chỉ có 15% nông dân nhận thông tin không phun thuốc trừ sâu sớm, 8% nông dân ở vùng sâu, và hơn một phần ba (35%) nông dân đã học IPM đưa ra ý kiến giảm sử dụng thuốc trừ sâu để giảm thiểu tác hại này.

Nông dân ở các xã ấp vùng sâu không có cơ hội tiếp cận với thông tin kỹ thuật mới nên lợi nhuận từ sản xuất lúa thấp. Vùng sâu không được chú ý thâm canh nên không được chú ý bởi các chương trình khuyến nông, do vậy hiệu quả đầu tư cho sản xuất thấp.
