IMPLEMENTATION OF "ONE MUST AND FIVE REDUCTIONS" IN RICE PRODUCTION, IN AN GIANG PROVINCE

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ABSTRACT

Household survey and focus group discussion conducted in An Giang province indicated that more FFS-farmers who underwent 13 weeks - FFS training and participating in the model of "1 Must- 5 Reductions" than control farmers used certified seeds which are bought from seed producer, research institute and seed company or farmers' seed production team with guidance from provincial extension center/university. FFS-farmers participating in the model also used row seeding and low seed rate more than control farmers. Water saving (AWD) was trained before the model together with "Three reductions- Three gains" (of which integrated pest management- IPM, balance fertilizer, reducing seed rate was trained). Farmers recognized that AWD increases plant vigor, reduces lodging and insect and disease, increases rice yield and reduces cost of pumping. However, AWD is more effective in dry season than in wet season because farmers need to pump water out. Farmers are confident on applying balance fertilizer due to long time experience, training and information. FFS-farmers reduced amounts of fertilizer and cost as compared with control farmers. FFS- farmers spent less cost for pesticide than control farmers, thus they also had less labor input. Farmers were familiar with combine harvesters and reapers to reduce post harvest loss. However, more FFS-farmers applied machines in harvesting and rice drying than control farmers outside due to some objective conditions as small field parcels. FFS-farmers had better practices and knowledge in relation to "One Must and Five Reductions" than control farmers such as weed management, harvesting, drying and storing. They obtained higher net income in rice production than control farmers. Therefore, the sound strategies in dissemination of the "One Must and Five Reductions" can increase rice quality, quantity and farmer's benefit in the rural areas.

Keywords: *One Must and Five Reductions, FFS- farmers*

INTRODUCTION

Rice plays important roles in both producers' and consumers' life in rice cultivated area. The technology adoption aims to increase both rice quantity and quality not only for national food security but also for exporting. Under severity of market competition, farmers have faced the problem in high cost of material and labor inputs in recent years but low selling price at harvest, the mere benefit from rice can not improve farmers' life and welfare. In addition, the demand of food security in the future is more critical because Vietnam population may reach 120 millions in 2050 and thus, rice production must increase 50%. However, the speed of rice yield increase at present is only from 1-1.5% (Hoai Thanh, 2010). In addition, rice production is subjected to post harvest loss, Hoang Vinh (2008) reported that the post harvest loss in the Mekong Delta is nearly 12% per year. Thus, scientists try to transfer new technologies to farmers to increase rice

quantity and quality toward sustainable agriculture, friendly environment and coping with resource variation from the climate changes. Hence, the integrated technologies called as "One Must and Five Reductions" has been recommended to Vietnamese rice farmers. Of which, "One must" recommends that farmers must use certified seeds; "Five Reductions" include reducing seed rate (use from 80-100kg seeds/ha, use drum seeder), reducing fertilizer (reduce nitrogen fertilizer, apply fertilizer by using leaf color chart), reducing pesticide (only use pesticide when necessary by following the guidance of technical staffs), reducing water (reduce water amount in irrigation and number of water pumping), and reducing post harvest loss (reduce grain loss in and post harvest, use combine harvester to harvest rice and rice dryer to dry rice). The three gains include rice yield, rice quality and economic efficiency. The model of "One Must and Five Reductions" has been applied in An Giang and other provinces (Vinh Long, 2008; Phuong Nguyen, 2008; Minh Dat, 2008 and Tran Trong Trung, 2009) but still at small scale. An Giang province, in particular, established the this model of in wet season 2009 in 11 districts and did launching to other places. Thus, this study attempt to assess the implementation of this model on farmers' rice production and practices, knowledge and attitudes in An Giang province.

METHODOLOGY

Site selection

The household survey was conducted in 6 districts among 11 districts with implementation "One Must and Five Reduction" model. The districts selection was based on the following criteria:

- Two districts- Tinh Bien and Tri Ton- come from the area which is near the mountain or relative higher topography, relatively poor sites with presence of ethnic group.
- Two districts - Long Xuyen site and Chau Thanh - are at center of the province, near to city and relatively better-off districts.
- Two districts - Cho Moi and Phu Tan – are in the area of lowland irrigated ecosystem. These are relatively lower part of the province with medium poor sites.

Table 1. Samples in household survey

District	Commune name	Participated in model (FFS Farmers)	Control in same commune	Control in different commune	Total
Tinh Bien	Nui Voi: FFS	28	20		78
	Tan Lap: Control			30	
Tri Ton	Ta Danh: FFS	30	20		80
	Tan Tuyen: Control			30	
Long Xuyen	My Khanh: FFS	30	11		79
	Binh Duc: Control			38	
Chau Thanh	Vinh An: FFS	30	20		80
	Vinh Hanh: Control			30	
Cho Moi	Long Dien B: FFS	29	20		79
	Tan My: Control			30	
Phu Tan	Cho Vam: FFS	27	18		75
	Phu Thanh: Control			30	
	Total	174	109	188	471
	Percent (%)	37	23	40	100

Sample size

In each selected district, the complete enumeration was employed for farmers participated in the "One must-Five Reductions" model (or FFS farmers who underwent 13 weeks for training) and 50 control farmers (farmers are outside the model). Among the control farmers, targeting of 20 farmers are in the same commune with FFS farmers and 30 farmers from other commune in the same district. Control farmers were selected randomly from the lists of rice farmers given by village/hamlet leaders in the communes.

Data collection

Data were collected by direct interview using the structured questionnaire which was pre-tested. Focus group discussion with farmers was conducted to have the information implementing for the data collection. The interviewers were trained before the survey. The data on socio-economics of households, farmers' practices, knowledge-attitude related technologies in "One Must and Five Reductions" were collected.

Data analysis

Data from household survey were summarized in the forms of mean, frequency and percentage by using descriptive statistics. The T-test (2 tailed) was used to compare the input use and rice production between farmers participated in model and control.

RESULTS AND DISCUSSION

Socio- Economic characteristics of farmers

Farmers participated in the model (FFS farmers) occupied 37% of the total farmers in household survey. The rests (63%) were control, of which 23% were control farmers in the same commune with FFS farmers and 40% were control in different commune with FFS farmers. Household size was from 4.6 to 4.7 and was not different among household categories (FFS farmers, control farmers within commune and control farmers in different commune). Similarly, the other household characteristics as number of children and number of dependents were not different among household categories. Both male head and spouse in all household categories were in middle age at the time of survey. The male heads obtained higher education than their spouses. Household income of FFS farmer was highest, followed by control farmer within commune. Control farmer in different commune had lowest income. However, the differences among the groups were small. Among sources of income, rice contribution to the household income was highest (89 to 92.7%). Off-farm and non-farm income contributed around 5% of the household income. The rests were the income from animal, non-rice crops and aquaculture (Table 2).

Most of household members involved in off-farm and non-farm activities were married and within working labor age with low education (primary school or secondary school). Very few of them reached higher education. There were various sources of income from off-farm and non-farm sector. Of which, salary income from private firms (regular payment) (e.g., factory worker, office worker, shop worker, etc.) was 25%, followed by wages, contract wages from farm labor, farm service (thresher service, harvesting service, Rotovator service, earth driving) with 16%. Salary income from public facilities (government employee, public school teacher, etc.) was 13%. The rests were from fish catching, alcohol production, flowering caring and selling, photographer, selling non-agricultural goods, selling farm products (produced from other farms), construction, selling livestock/fish (produced from other farms), general store owner, cottage industry, transport business, tailor, carpentry and miller.

Table 2. Household income

Income source	Participated in model	Control within commune	Control outside commune	All control group	Total
	(n= 174)	(n= 109)	(n=188)	(n=297)	(n=471)
Income					
Rice income (VND 1,000 /year)	119,888	118,908	110,384	113,512	115,868
Non- rice crop income (VND 1,000 /year)	268	939	445	626	494
Animal income (VND 1,000 /year)	3,619	3,039	3,314	3,213	3,363
Aquaculture income (VND 1,000 /year))	396	0	2,729	1,727	1,235
Off-farm/non-farm income (VND1,000 /year)	5,826	5,369	7,104	6,479	6,228
Total household income (VND 1,000 /year)	129,996	128,254	123,976	125,558	127,188
Contribution of income source to household income (%)					
Rice income	92.2	92.7	89.0	90.4	91.1
Non- rice crop income	0.2	0.7	0.4	0.5	0.4
Animal income	2.8	2.4	2.7	2.6	2.6
Aquaculture income	0.3	0.0	2.2	1.4	1.0
Off-farm/non-farm income	4.5	4.2	5.7	5.2	4.9
Total	100	100	100	100	100
(Source: Analysis from data surveyed in 2009 in An Giang province)					

Farming characteristics

Two-third of the farmers practiced double rice system. The rest farmers followed triple rice system. Rice- upland crop system is negligible. The average rice area per household was from 1.93 to 1.94 ha. One-third of the farmers had less than 1 ha of rice area. Two-fifth of them had from 1 to 2 ha of rice area. The rest had more than 2 ha. More than half of farmers (62%) had only one parcel of land. One-fourth of them had 2 parcels. Only 13% of them had 3 parcels. The ones with 5 parcels occupied less than 1%. Most of rice farmers have land use right certificates. Regarding to cropping calendar, in the double rice system, the first rice season is dry season rice and commonly from November/December of the previous year to March of the following year; and the second crop (wet season rice) from April to July. In the triple rice system, the first rice season is dry season rice and commonly from November/December of the previous year to March of the following year. The second rice crop (wet season) was commonly from April to July. The third rice crop (wet season) was commonly from August to November/December.

Impact of "One Must and Five Reductions" on farming practices

Control farmers in the same commune with FFS farmers had relatively higher cropping intensity index than those of FFS farmers and control farmers in different commune. Rice production per household was similar among farmers in different household categories. However, the rice yield from all rice seasons of FFS farmers was higher than control farmers. Rice yield in dry season (Winter-Spring season) was highest, followed by third season (Autumn- Winter), lowest was in wet season (Summer-Autumn season) (table3). Regarding to seed use, more FFS farmers (53%) used certified seeds than control

farmers (less than 50%). Similarly, more FFS farmers than control farmers obtained seeds from seed producers (as seed company, seed producing center/station, university, research institute or farmers' seed production team with guidance from provincial extension center/university. On the other hand, more control farmers used seeds from self production or exchange with other farmers. In the model of "One Must and Five Reductions", scientists have recommended that farmers must use certified seeds to increase rice head quality for both domestic consumption and export. More FFS farmers practiced drum seeding than control farmers used this technique. The advance of drum seeding included the plants are in rows which are easy in crop care as hand weeding, pesticide and fertilizer application. This technique can help farmers to reduce seed rate and the rice field is uniformed. Thus, it reduced women's back pain in crop care (Thelma and Chi, 2005). FFS farmers also used lower seed rates than control farmers. The control farmers within commune with FFS farmers used lower seed rate than the control farmers in different commune. This indicated that there was diffusion of the information from FFS farmers to other farmers within the commune.

Table 3. Rice production information

Item	Participated in model (n= 174)	Control within commune (n= 109)	Control outside commune (n=188)	All control group (n=297)	Total (n=471)
Cropping area (ha) per household					
Dry season (Winter-Spring)	1.94	1.94	1.93	1.93	1.94
Wet season (Summer-Autumn)	1.92	1.94	1.93	1.93	1.93
Third season (Autumn- Winter)	1.33	1.55	1.15	1.30	1.31
Gross cropped area	5.20	5.42	5.01	5.16	5.18
Net cropped area (maximum area of wet, dry and third season)	1.94	1.94	1.93	1.93	1.93
Cropping intensity index {(Gross cropped area/Net cropped area)*100}	267	279	259	267	268
Rice yield (T/ha)					
Dry season (Winter-Spring)	7.28	7.21	7.06	7.12	7.18
Wet season (Summer-Autumn)	5.79	5.60	5.37	5.45	5.58
Third season (Autumn- Winter)	6.26	5.93	5.69	5.78	5.96
Mean yield of all seasons	6.50	6.32	6.12	6.20	6.31
(Source: Analysis from data surveyed in 2009 in An Giang province)					

Regarding to fertilizer use, there was not different in fertilizer using pattern among farmer groups. Focus group discussion revealed that farmers were confident on applying balance fertilizer due to long time experience, training and information. Household survey showed that all farmers applied granular fertilizer and most of them (79%) used foliar fertilizer. The frequency use of granular fertilizer was higher than those of foliar fertilizer. Nowadays, most of farmers applied foliar fertilizers because they compliment the trace elements for rice growth and seed development which were advertised by fertilizer and chemical companies. The popular number of granular fertilizer application per crop season was 4 times. Foliar fertilizer mostly was applied 2 times per crop season.

Most of farmers used insecticide for their rice crop. There were 3% of FFS farmers and 1% of control farmers did not apply any insecticide for rice crop. The popular number of insecticide application was 2 - 3 times. The

average number of insecticide application was 3 times/crop season. FFS farmers applied insecticide lesser than control farmers nearly one time. There was not different in fungicide using pattern among farmer groups. Nearly all farmers used fungicide in rice disease management. Only 1% of FFS farmers did not apply fungicide. The average number of fungicide application was 3. It ranged from 0 to 7. However, the rates of farmers applied 1 time, 5 times, 6 times and 7 times were negligible. Nearly all farmers applied herbicide (99%), most of them applied 1 time/crop season (76%). The rest of 22% applied 2 times/crop season. The timing of application was either before or after sowing / transplanting. In the first case farmers applied herbicide from 1 to 5 days before sowing. This time, most of them used pre-germinated herbicide and applied on the blank soil surface. In the second case, first application was from 1-15 days after sowing (DAS). If using herbicide early (1-3 DAS), pre-germinated herbicide was used. If later, post-germinated herbicide was applied. Similarly, the 2nd application was applied at 9 DAS with post-germinated herbicide. In case of transplanting, farmers applied one time at 1 day after transplanting.

Almost farmers used molluscide (86%). Percentage of farmers did not use molluscide was 14%. If use, they used from 1 to 2 times depending on the availability of golden snail. Majority of farmers (80%) applied 1 time of molluscide per season; the rest (6%) applied 2 times/season.

Regarding to power use, almost farmers performed land preparation and rice threshing by machine. About harvesting in dry season 2008-2009, more FFS farmers (54%) than control farmers (39%) harvested their rice by machines (combine harvester or reaper). More than haft of farmers used manual harvesting. The model of "One Must and Five Reductions" recommends farmers to mechanize rice harvesting to reduce grain loss (Table 4).

Table 4. Mechanization in harvesting (% of farmers) (Winter-Spring 2008-2009, An Giang)

Item	Participated in model (n= 174)		Control within commune (n= 109)		Control outside commune (n=188)		All control group (n=297)		Total (n=471)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Harvesting										
Mini-combine harvester	42	24	20	18	41	22	61	21	103	22
Reaper	53	30	27	25	32	17	59	20	112	24
Hand cutting	79	45	62	57	115	61	177	60	256	54
Total	174	100	109	100	188	100	297	100	471	100

(Source: Analysis from data surveyed in 2009 in An Giang province)

In general, the total number of irrigation was not much different among farmers (FFS farmers had haft time of pumping lesser than control farmers). This happened because the irrigation in collectives was practiced in An Giang province and same rate of fee applied for all farmers. The focus group discussion showed that farmers who received pumping service had to pay the cost of 1 liter of diesel per 1000 m^2 for each time of pumping (1liter of diesel= 11,000 to 12,000 VN Dong) plus 20kg rice for dry season and 10kg rice for wet season to the pumping machine owner regardless how many times of pumping per season. The cost of diesel is paid directly to the owner of pumping machine. The amount of rice is converted into cash to pay to the owner for the pumping machine. The focus group discussion with farmers revealed that water saving or alternative wet and dry (AWD) was trained before "One Must and Five Reductions" model together with "Three reductions-Three gains (of which integrated pest management- IPM, balance fertilizer,

reducing seed rate were trained to farmers). Farmers recognized that AWD increases plant vigor, reduces lodging and insect and disease, increases rice yield and reduces cost of pumping though they were initially worried. They also believe AWD can reduce density of golden snail due to period of dry field alternatively. However, AWD is more effective in dry season than in wet season because farmers need to pump water out during wet season.

Farmers obtained more than 7 tons rice per hectare in dry season. Rice income per hectare of FFS farmers was higher than those of control farmers. They can sell rice at higher price than control farmers because they followed the "One Must and Five Reductions" to increase rice quality. FFS farmer applied lower seed rates, nitrogen fertilizer, and potassium than control farmer regardless similar pattern in fertilizer application. FFS farmer saved 952 thousands VND dong for pesticide cost per hectare. The labor investment of FFS farmers, thus, was lower than those of control farmers. Power cost of FFS farmers were higher than those of control farmers because they did well land preparation for drum seeding, and mechanization in harvesting. The net income from rice of FFS farmers was higher than control farmers. The focus group discussion also discovered that the rice yield and selling price of FFS- farmers was higher than other farmers outside the model. Thus, FFS-farmers obtained higher rice income than other farmers. Irrigation cost of FFS farmers was lower than control farmers though it was not significant because the irrigation practice was operated by collectives and farmers have to pay to the owner of pumping machine at same rate, exception of some farmers pumped water by their own and small pumping machine. The seed rates used by FFS farmers were low but they did not reduce much seed cost as compared with control farmers because they bought certified seeds with higher price than normal seeds bought by control farmers. According to focus group discussion, the cost of normal seed was from 4,000 to 5,000 VND per kg meanwhile the cost of certified seed was 7,500 VND per kg. Though the pattern of pesticide application was similar among different farmer categories, FFS farmers reduced pesticide cost as compared with control farmers (reducing 1,234 thousand VND /ha) though this reduction was not significant (table 5). Total labor days per hectare invested for a crop season was lower in FFS farmers (40 person days/ha) than control farmers (48 person days/ha). FFS farmers invested less labors than control farmers in irrigation for crop care from flowering to harvest, cleaning/repair of dikes, herbicide application, insecticide application, combine harvesting and gathering, and threshing operations. The overall labor investment in FFS farmers was lower than control farmers. This indicated that FFS farmers were already ware with labor saving technologies in adoption of individual technologies from previous programs called as "three reductions and three gains" and water saving technique before the training on "One Must and Five Reductions".

Input/output in rice production

Table 5. Rice production and input use in dry season (2008-2009 Winter-Spring), An Giang province

Item	Participated in model (n= 174)	Control within commune (n= 109)	Control outside commune (n=188)	All control groups (n=297)	Total (n=471)	T- Value compared model with all control groups
Rice area (ha)	1.57	1.67	1.68	1.68	1.64	-0.852
Rice production (kg/ha)	7414	7235	7074	7134	7236	1.422
Price rice (VND1000 /kg)	5	4	4	4	4	2.170*

Item	Participated in model (n= 174)	Control within commune (n= 109)	Control outside commune (n=188)	All control groups (n=297)	Total (n=471)	T- Value compared model with all control groups
Rice income (VND1000 /ha)	33041	31268	30827	30991	31744	2.435*
Rice yield (t/ha)	7.4	7.2	7.1	7.1	7.2	1.422
Seed rate (kg/ha)	125	145	163	156	145	-8.134**
Nitrogen fertilizer (N kg/ha)	118	123	127	126	123	-2.249*
Phosphorous fertilizer (P kg/ha)	31	33	31	32	32	-1.040
Potassium fertilizer (K kg/ha)	42	46	48	47	45	-1.973*
Hired labors (person days/ha)	26	28	35	32	30	-3.189**
Family labors (person days/ha)	13	16	14	15	15	-1.294
Total labors (person days/ha)	40	45	49	47	45	-3.804**
Power cost (VND1000 /ha)	1730	1545	1547	1546	1614	3.081**
Irrigation cost (VND1000 /ha)	1027	1215	1131	1162	1113	-1.382
Seed cost (VND1000 /ha)	868	765	961	889	881	-0.610
Granular fertilizer cost (VND1000 /ha)	4584	4653	4702	4684	4650	-0.639
Foliar fertilizer cost (VND1000 /ha)	192	307	201	240	222	-1.855
Total fertilizer cost (VND1000 /ha)	4776	4960	4902	4924	4872	-0.952
Insecticide cost (VND1000 /ha)	850	976	1168	1097	1005	-1.868
Fungicide cost (VND1000 /ha)	743	674	704	693	713	1.308
Herbicide cost (VND1000 /ha)	313	384	325	347	335	-0.944
Molluscide cost (VND1000 /ha)	229	174	202	192	206	1.109
Total pesticide cost (VND1000 /ha)	2135	2208	2400	2329	2258	-1.234
Hired labor cost (VND1000 /ha)	2524	2418	2859	2696	2629	-1.133
Imputed family labor (VND1000 /ha)	936	1140	1013	1060	1015	-1.294
Overall cost + Imputed family labor	13996	14251	14813	14605	14382	-1.845
Overall cost without imputed family labor	13059	13111	13800	13545	13367	-1.552
BCR with imputed family labor	2.47	2.39	2.23	2.29	2.36	2.101*
BCR without imputed family labor	2.66	2.62	2.40	2.48	2.54	1.895
Net Income with minus imputed family labor	19046	17017	16014	16386	17362	2.933**
Net Income without minus imputed family labor	19982	18157	17027	17445	18377	2.795**

(Source: Analysis from data surveyed in 2009 in An Giang province)

Farmers' perceptions on weed control

FFS farmers had better knowledge on weed management than control farmers. More FFS-farmers knew that "herbicides are toxic to people" and "there are other methods for controlling weeds aside from weeding and herbicides" than control farmers. Most of farmers (both FFS and control farmers) understood that "long duration of land preparation results in less weed infestation", "there are some herbicides that kill only grasses", "a well leveled field reduces weed problems", "there are some herbicides that kill weeds before they emerge" and "it is good to spray herbicides when rice plants are young". However, more FFS- farmers than control farmers knew that planting by broadcasting did not give more yield than planting by row seeding. In addition, weeds were easily managed in row seeding fields than seed broadcasting ones (Thelma and Truong Thi Ngoc Chi, 2005).

Farmers all knew that the best time to remove weeds was from 21-23 days after sowing (DAS) and to use herbicides were 3-4 DAS. The basis for choosing herbicide by majority of the farmers was its efficacy. Around half of the farmers said that using herbicide was a "Must" to increase rice yield. The average years of using herbicide by farmers was 14-15 years. Most of the farmers (91%) had their own sprayer. Source of information on herbicides mostly are from government extension, technician followed by dealers, friends, neighbors, other farmers and television. About one-fourth to one-fifth of the farmers said the important (problem) weeds kept changing over the years. The most common weeds were *Leptochloa chinensis* (L.) Nees, followed by *Echinochloa crus-galli* (L.) Beauv. The other weeds in the fields were *Oryza rufipogon* Griff, *Oryza sativa* L., *Fimbristylis miliacea,* white broad leaf weeds, *Cyperus* ssp, *Penníetum polystachyon* (L.) Schult., *Cynodon dactylon* (L.) Pers., *Brachiaria mutica, Hydrylia verticillata* Presl., *Cyperus clatus, Naias graminea* Delile., *Echinochloa colon*a (L.) Link. and *Chamaeraphis brunoniana.*

Impact of "One Must and Five Reductions" on knowledge and attitudes on irrigation

Regarding to irrigation, there was not much different about farmer's knowledge and attitudes between and control farmers because they had accessed the information related irrigation, especially wet and dry alternative information from the technical staffs in the studied site. About half of the farmers disagreed that "allowing the paddy field to get dry is always bad for the plants". Majority of the farmers agreed that "water is the food for the plants" because ancients of the farmers often said "first rank of the importance in rice production is water, the second rank is fertilizer, and the third rank is seeds". They also agreed "keeping low water level at tillering stage will result to more tillers and panicles". Almost farmers disagreed that "it is always better for the plants to have more water" and "water should always be maintained continuously from 7 days after sowing until to 2 weeks before harvesting". More than half of the farmers disagreed that "Keeping water at low level at flowering stage always gives more yield" (table 6).

Table 6. Farmer's Knowledge and Attitudes on Irrigation

Item	Participated in model (n=174)						Control farmers (n=297)						Total (n=471)					
	Agree		Disagree		No opinion		Agree		Disagree		No opinion		Agree		Disagree		No opinion	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Allowing the paddy field to get dry is always bad for the plants	92	53	75	43	7	4	135	45	151	51	11	4	227	48	226	48	18	4
Water is the food for the plants	161	93	13	7			245	82	41	14	11	4	406	86	54	11	11	2
Keeping low water level at tillering stage will result to more tillers and panicles	144	83	27	16	3	2	254	86	31	10	12	4	398	85	58	12	15	3
It is always better for the plants to have more water	15	9	157	90	2	1	18	6	265	89	14	5	33	7	422	90	16	3
Keeping water at low level at flowering stage always gives more yield	57	33	111	64	6	3	114	38	157	53	26	9	171	36	268	57	32	7
Water should always be maintained continuously from 7 days after sowing until to 2 weeks before harvesting	21	12	148	85	5	3	47	16	231	78	19	6	68	14	379	80	24	5

(Source: Analysis from data surveyed in 2009 in An Giang province)

Farmers' knowledge on harvesting, threshing, drying, storing, milling management, and post harvest loss

Regarding to harvesting, threshing and drying management, both FFS farmers and control farmers knew when paddy was ready for harvest by multiple methods as looking at the color of the grain, counting the days after flowering; rice duration and 85% to 90% of rice ripen. Some of them looked at fully filled grains and their moisture content. In general, in both dry and wet seasons, more FFS-farmers (40%) than control farmers (25%) applied mechanization in rice harvesting. However, this rate of mechanization in rice harvesting was low and the goal of the government is to increase the scale of mechanization in rice production in the Mekong Delta. Focus group discussion revealed that An Giang farmers mostly were familiar with combine harvester and reaper. However, the small field is difficult for rice harvesting by machine (Truong Thi Ngoc Chi, 2010).

More FFS- farmers (20.1%) than control farmers (4.7%) dried rice by machine (rice dryers). Farmers used nets to dry rice to avoid mixing rice with other substances on drying yard. More control farmers than FFS- farmers

dried rice by arranging in bundles in the field, spreading in mats along the roadway, and spreading in mats near the house. Drying in bundles in the field is not recommended because this practice reduced rice quality. Some of the farmers did not dry rice because they sold fresh rice after harvesting. With ideal sunlight conditions, it took about two and a half days for rice to get dry after threshing. This took about 4 and half days in the normal sunny conditions. Majority of the farmers tested for dried grains by biting between teeth, flowed by color. Few farmers also tested by their feeling and moisture meter. The grains are mostly cleaned after threshing by machines which are adopted by majority of the farmers. Farmers estimated the post harvest loss by traditional harvesting was 10.8% meanwhile it was only 7.1% by combine harvesting. The loss was lower in the later method due to mechanization of rice harvesting and rice drying. They also estimated their rice income increased around 7% if they could produce best quality rice (table 7).

Table 7. Estimation of post harvest loss by farmers (% loss)

Operation	Participated in model (n=174)		All control group (n=297)		Total (n=471)	
	Traditional harvesting	Combine harvesting	Traditional harvesting	Combine harvesting	Traditional harvesting	Combine harvesting
Before cutting (shattering)	1.0	1.0	1.0	1.0	1.0	1.0
Cutting	1.9		1.8		1.8	
Transport to threshing location	1.6		1.7		1.6	
Threshing	1.8		1.9		1.9	
Combine harvesting		1.6		1.6		1.6
Drying	1.0	1.0	1.0	1.0	1.0	1.0
Storage of paddy	1.2	1.2	1.3	1.3	1.2	1.2
Milling	1.3	1.3	0.9	0.9	1.1	1.1
Storage of milled rice	1.4	1.4	0.9	0.9	1.2	1.2
Total	11.1	7.5	10.4	6.7	10.8	7.1

(Source: Analysis from data surveyed in 2009 in An Giang province)

Farmers' knowledge on effects of "One Must and Five Reductions"

Most of the farmers heard about "One Must and Five Reductions" in rice production. However, more FFS-farmers knew the effects of "One Must and Five Reductions" in reducing rice input cost than control farmers due to reduce disease and insect on rice result in reduce pesticide use, fertilizer use, and reducing seed rate. The effects of "One Must and Five Reductions" mentioned by farmers were safe, benefit to health, no bad effect on human health, high effective, increasing benefit in rice production, benefit to farmers, family and society, reducing environmental pollution, protecting environment, reducing loss in post harvest, water saving, increasing rice variety quality and yield, less lodging and uniformity of field. Similarly, focus group discussion with the FFS- farmers indicated

that they learnt from “"One Must and Five Reductions" the following practices:

- Must use certified seeds
- Reduce seed rate
- Reduce pesticide
- Reduce fertilizer
- Reduce water
- Reduce post harvest loss

CONCLUSION

Rice has contributed the largest portion (about 90%) to the household income in An Giang province. Though the income from off-farm and non-farm, animal raising and aquaculture contributed the small portions to the household income, they picture the lively activities of farming society in rural area. In general, FFS farmers increase their knowledge and have change in cultural practices and increase their rice income. Therefore, there is the need to disseminate this model of “One Must and Five Reductions” to other farmers in the rice production area.

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TÁC ĐỘNG CỦA “MỘT PHẢI NĂM GIẢM” ĐẾN NĂNG SUẤT LÚA VÀ KIẾN THỨC NÔNG DÂN Ở AN GIANG

Nông dân tham dự lớp tập huấn và thực hiện mô hình “Một Phải Năm Giảm” sử dụng giống lúa xác nhận mua tại cơ sở sản xuất giống nhiều hơn nông dân không tham gia mô hình. Nông dân tham gia mô hình áp dụng sạ hàng nhiều hơn. Vấn đề tiết kiệm nước đã được tập huấn trước khi có mô hình “Một Phải Năm Giảm”. Trong khi tập huấn về “Ba Giảm Ba Tăng” trước đây, các nội dung liên quan quản lý dịch hại tổng hợp, bón phân cân đối va giảm giống được đề cập. Nông dân nhận thấy rằng phương pháp tiết kiệm nước giúp lúa cứng cây, ít đỗ ngã, ít sâu bệnh, tăng năng suất. Nông dân rất tự tin về vấn đề bón phân cân đối do tiếp cận với thông tin, tập huấn và kinh nghiệm. Nông dân tham gia mô hình “Một Phải Năm Giảm” đã giảm lượng phân, giảm chi phí phân bón và thuốc sâu bệnh. Họ cũng giảm được công lao động trong sản xuất lúa. Nông dân An Giang quen thuộc với máy gặt đập liên hợp và máy gặt xếp dãy. Tuy nhiên, tỷ lệ nông dân tham gia mô hình cơ giới hóa khâu thu hoạch và làm khô lúa nhiều hơn nông dân không tham gia mô hình. Nông dân tham gia mô hình có kiến thức và thực hành các kỹ thuật liên quan “Một Phải Năm Giảm” tốt hơn và đạt lợi nhuận từ sản xuất lúa cao hơn nông dân ngoài mô hình. Vì vậy chiến lược hữu hiệu trong phát tán mô hình này góp phần tăng sản lượng, chất lượng lúa gạo đồng thời nâng cao đời sống nông dân nông thôn.