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Model of linking four partners in production of organic rice certified internationally in Vietnam

Hay Van Duong, Thanh Cong Nguyen *, Manh Van Nguyen, Kha Quy Le, Anh Tuan Tran, Phuong Thao Thi Phan, An Van Nguyen, Tuyet Thi Hoang

Institute of Agricultural Sciences for Southern Vietnam (IAS), Ho Chi Minh City, Vietnam

Abstract

During 2014-2016, farmers in Chau Thanh district, Tra Vinh province, Vietnam under financial support from Tra Vinh Department of Science and Technology, applying technical package and supervision of IAS and economic contract with Ecotiger Ltd company has been, produced, processed and exported organic rice following standard of EU, USDA and JAS to EU and America. In 2015, mean yield of organic rice was 4.29 MT/ha, while inorganic rice being 5.40 MT/ha, net profit of organic rice was 3,431,000 VND/ha higher than inorganic rice. In total 50 ha, total profit was 1,201,150,000 VND. In 2016, profit of organic rice was 36,481,250 VND/ha, while inorganic rice being 23,950,000 VND/ha. MBCR of organic rice was 2.7 while inorganic rice being only 1.7 and net profit was 12,531,250 VND/ha. Besides, each hectare of black tiger shrimp or crabs rotated after organic rice farmers could harvested 70 million VND, and got net profit 40 million VND. In some farmer fields, models of raising green crayfish intercropped with organic rice along with taking other sources of sea fishes (goby, mullet, or land shrimp) had additional income of 20-30 million VND/ha. In 2015 about 200 MT and 2016 600 MT of organic paddy attained organic standards from EU, USDA and JAS. This quantity had exported to EU and America. Ecotiger conpany strives for 2000 MT under contract with importing partners.

Keywords: Organic Rice; Four Partners Linkage; Organic Standards; Rice-Shrimp Rotation System

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* Corresponding author. *E-mail address:* nguyencongthanhct@gmail.com

1. Introduction

According to the Research Institute of Organic Agriculture (FiBL), Switzerland, the total value of worldwide trade in organic food and beverages increased sharply, from 15.5 billion USD (1999), to 80 billion USD in 2014 (Reganold & Wachter, 2016). These authors also informed that, in Asia, in the year 2016, the Butane government announced a program of developing organic products for domestic consumption. Nepal promulgated a strategy to develop organic production since 2015. Indian Government granted 64 million USD for two organic agricultural projects; China increased the list of certificated organic products. FAO advised Mongolia to develop legislation on production and certification of organic products. Within the ASEAN countries, Lao DPR Ministry of Agriculture has established a strategy for organic production up to 2020. Malaysia has implemented the organic trademark. Organic agriculture was one of the five major programs of Thai Ministry of Agriculture (Willer & Lernoud, 2016) and so on. The attention of organic agriculture is increasing in many countries, especially in developed countries, where the hygiene and safety food, the quality of agricultural products and the sustainable environment are paid special attention. Nowadays, In Vietnam, many enterprises and scientific institution are coordinating with each other to organize the farmers into cooperative groups for building the model of organic production to meet the demands of many countries.

From 2014 to 2016, the model of "Four Partners" linkage in production and consumption of organic rice in Tra Vinh province actually came into operation effectively. The Four Partners consist of the first partner is the governmental organization, represented by Department of Science and Technology of Tra Vinh province, which was a funding organization, together with the local government authorities, supervising and supporting for the project model. The second partner is Scientists from the Institute of Agricultural Sciences for Southern Vietnam (IAS). IAS is a leading organization, which organized the farmers to build the organic production model, transferred technologies and trained technicians and farmers who directly carried out the works of organic production in Chau Thanh district, Tra Vinh province to apply the new production procedure. The third partner is the two Enterprises who invested the input materials and bought the output products, they were EcoTiger and Viorsa Ltd. companies. The fourth partner is all the Farmers who work directly in cooperative groups to produce 100% certified organic rice with international standards for export to Europe and America. This paper presents the results of the model “Four Partners” linkage in producing - exporting 100% certified organic rice successfully in Tra Vinh, Vietnam and the prospects for other crops in some southern provinces (Nguyen Cong Thanh, 2015a and Nguyen Cong Thanh 2015b).

2. Materials and Methodology

2.1. Materials

Rice seed applied in the model was ST5 (Cua, 2013), which is encouraged by Ministry of Agriculture and Rural Development (MARD) to mass-produce in many locations in the Mekong Delta, due to high quality which has been demanded by the markets.

Organic fertilizers used in organic rice production model were supplied by organic food production and trade company namely EcoTiger (Khoa hoc pho thong, 2016). These fertilizers including the following trade names: Organic powder (the root fertilizer); Eco Chi, Organo and DS80 (are foliar fertilizers), imported from Canada, certified by OMRI, Australia, Humic International Association (IHSS), Humic Products Trade Association (HPTA), National Organic American Program (NOP), Japanese Agricultural Organic Standard (JAS). In addition, Van Dien Phosphate fertilizer: This is natural phosphate, approved by ControlUnion (Independent Organic Inspection Agency). Plant protection materials substances included powdered lime, *Trichoderma*, Ometar green fungus to control rice blast disease and brown plant hoppers.

Figure 1 and 2. Organic rice models in Chau Thanh district, Tra Vinh province, 2015

The entire organic production process must be certified by the ControlUnion organization (third party, non-affiliated, and not affiliated with the IAS Institute or Department of Science and Technology), following USDA (US Department of Agriculture), EU (Europe) and JAS (Japan) standards. It also complies with the EU (European) and JAS (Japan) standards. Summary of the procedure shown in Table 1.

Construct a model of rice production and apply the organic farming procedure in shrimp-rice area, Chau Thanh district, Tra Vinh province. A total of 50 hectares in 2015 and 143 hectares in 2016 are organized into 14 units of cooperative farmer production groups.

All the participating farmers have been trained on organic production principles, in accordance with four principles of IFOAM (International Federation of Organic Agriculture Movements), adopted by IFOAM in 2005, and the US Agricultural Standard (USDA, 2012), and organic rice production procedure including methods of keeping record of field diary and management of production records.

Linking four partners are implemented with the first one was the Institute of Agricultural Science for Southern Vietnam (IAS), who transferred organic rice cultivation procedure (2016). The second partner was EcoTiger and Viorsa Companies. The third partner included Tra Vinh Department of Science and Technology (MOST) and Tra Vinh Department of Agriculture and Rural Development (DARD); Relating organizations and

local governments in Chau Thanh district, Tra Vinh province. In addition, the fourth partner is all the farmer groups in Chau Thanh district. The duration of organic rice project is last from 2015 to 2017.

Table 1. Procedure of organic rice production compared to conventional production

Inorganic rice production normally	Organic rice production certified 100% organic by international organizations
Normal land and water	Land and water are analyzed and certified
May be near the industrial processing plant	Away from the industrial processing industry as prescribed
Application of chemical fertilizers	Use of safe organic compost, bio-fertilizers, or natural fertilizers accepted by professional bodies or with international certification.
Spray chemical drugs to prevent rice pests	Use natural enemies and birds, resistant varieties, or bio-traps to reduce pests and diseases
Use herbicides to manage weeds	Apply crop rotation, tillage, mechanization or hand weeding or land cover to manage weeds
It is possible to use GMO varieties	No use of GMO varieties
Apply common farming procedure	Apply organic farming procedure control by ICS
Harvesting, drying, processing and packaging by conventional activities	Harvesting, drying, processing and packaging are controlled by ICS to avoid contamination with inorganic products
Trademark of ordinary rice bag	Trademark with organic certified logos following international organic standards

Table 2. Apply four levels of organic produce according to US Department of Agriculture regulations (USDA)

100% organic product	Get all the ingredients from organic ingredients
Organic products	At least 95% of the material is organic, with the remainder approved by the USDA
Products are made from the organic	At least 70% organic ingredients and can display 3 organic ingredients on the label. Cannot use organic seal/logo
Organic material	Less than 70% organic ingredients, cannot be labeled organic or use USDA organic seal

3. Results and discussion

3.1. Soil and water quality in shrimp-rice area of Chau Thanh - Tra Vinh

The result of soil analysis at the Division of Soil Science, (2016) belongs to the Institute of Agricultural Science for Southern Vietnam (IAS) has shown that the soil is alluvial in the Mekong Delta. The quality of soil is rich in organic matter (6.80 and 6.18%); Humic acid is quite high (1.37 and 1.10%); But limitation in the potential of acidic alum infection (pH H2O = 4.51 and 4.37); High nutrient content (N total = 0.23% (high), P2O5 available = 72.7 and 62.8 mg/kg and especially K2O available = 530 and 367 mg/kg. The test result for soil and water in representative areas in Long Hoa and Hoa minh villages, Chau Thanh district, Tra vinh province for building the organic rice production model do not have heavy metals and toxic microorganisms in excess as per regulation (Table 3 and Table 4).

3.2. Analysis results of organic rice samples - the determinant of international organic standards by EU, USDA and JAS

Thanks to the application of organic rice production procedure, the organic rice product of the model has reached almost absolute quality with a total of 255 chemical pesticide residues in general tested by an independent inspection agency (TUV). The test result does not detect contain persistence any harmful chemical residual in organic rice samples. Especially compared to conventional rice for export from Vietnam, pesticide active ingredients in rice are detected when imported into the US market through inspection of the US Food and Drug Administration (FDA) the exporting rice samples were detected with 12 active ingredients. Of these, eight (8) active ingredients often exceed permissible limits (MRLs) such as *Hexaconazole, Isoprothiolane, Tebuconazole, Pirimiphos-methyl, Fenitrothion, Flusicolazole, Chlorpyripos, Acetamiprid*. With this useful information, we need to call for attention that these active ingredients should be removed in the list of pesticides and not allowed to be used in agricultural production in Vietnam or foreign countries.

Explanation:

- ppm (parts per million) is equal to mg/kg
- MDL: Method Detection Limit
- N.D.: Not detected (<MDL)
- Reference to AOAC 2007.01, determination by GC- MS/MS and LC-MS/MS:
    - I: Insecticide;
    - H: Herbicide,
    - F: Fungicide;
    - R: Rodenticide;
    - N: Nematicide;
    - A: Acaricide: PGR: plant growth regulator,
    - O: others.

Table 3. Analysis results of land in project areas, Long Hoa and Hoa minh villages

Test parameters	Unit	Test results (2015)	
		Long Hoa village	Hoa Minh village
pH_ KCl		3.96	3.85
pH_{H2O}		4.51	4.37
Organic matter	%	6.80	6.18
Acid humic	%	1.37	1.10
N_total	%	0.23	0.23
P_ total	NA	NA	NA

K_ total	NA	NA	NA
P_ available	mg/kg	72.7	62.8
K_available	mg/kg	530	367
Cu_available	mg/kg	22.5	20.9
Zn_available	mg/kg	102	93.5
Cd	mg/kg	N.D.	N.D.
Pb	mg/kg	20.2	21.2
Hg	mg/kg	0.073	0.066
As	mg/kg	6.16	5.72

- *N.D.: Not detected (<MDL)*

Table 4. Results of water analysis with the same site, indicators such as Cd, Pb, Hg and As

Test parameters	Unit	Test results	Testing method
Cd	mg/L	N.D. MLOD=1	TCVN 6193-1996
Pb	mg/L	N.D. MLOD=5	TCVN 6193-1996
Hg	mg/L	N.D. MLD=0,0001	EAP-Method2008
As	mg/L	0,0026	EAP-Method2008

N.D.: Not detected

According to the Food and Drug Administration (FDA) in the period from 2013 to April 2016), having 15 rice exporting companies from Vietnam exported rice to the US markets which were returned rice with the amount of 4,212 tons (234 containers), as some of the pesticide residues in rice export samples is exceeded the MRLs imposed by the importing country. With this bad result, has been caused tens of billions of Dong (Vietnamese currency) in damages (Vinafood2, 2016). Meanwhile, these 12 substances were analyzed with result of non-detectable (ND) from the organic rice models of the IAS in the year 2015 and 2016. Not only these 12 substances, but also total 255 chemical substances in the organic rice samples were same results with non-detectable (Table 5 and Table 6).

Table 5. Analysis results of organic rice samples from the research models

No.	Groups of test parameters	No. of test parameters	Unit	MDL	Results
1	Insecticides (I)	87	mg/kg	0.01	N.D.

2	Herbicides (H)	55	mg/kg	0.01	N.D.
3	Fungicides (F)	37	mg/kg	0.01	N.D.
4	Rodenticides (R)	02	mg/kg	0.01	N.D.
5	Nematicides (N)	02	mg/kg	0.01	N.D.
6	Acaricides (A)	05	mg/kg	0.01	N.D.
7	Plant growth regulators (PGR)	08	mg/kg	0.01	N.D.
8	Others (O)	20	mg/kg	0.01	N.D.
9	IA	25	mg/kg	0.01	N.D.
10	IR	04	mg/kg	0.01	N.D.
11	PGR,H	03	mg/kg	0.01	N.D.
12	IN	03	mg/kg	0.01	N.D.
13	FN	01	mg/kg	0.01	N.D.
14	FA	01	mg/kg	0.01	N.D.
15	IO	01	mg/kg	0.01	N.D.
16	INA	01	mg/kg	0.01	N.D.
	Total of test parameters	255			

Figure 3 and 4. Rice sampling for inspection in the year 2015

3.3. Results of the project model applied the organic production procedure in shrimp-rice area of Tra Vinh province

3.3.1. Production cost

In 2015, the results showed that the cost of inorganic rice production was high as the cost of spraying insecticide, herbicide and fungicide. These costs are so less in organic rice production. The cost of organic fertilizer was maintained at actual investment, which is equivalent to the current inorganic production cost of 5.5 million VND/ha. Total cost of organic rice production was 13.3 million VND/ha; While inorganic rice production was 14.4 million VND/ha, the difference was 1.1 million VND/ha (Table 7).

Table 6. Generally produced rice products are contaminated with 12 banned substances

No.	Name of the contaminated pesticides were detected in rice exports	Number of pesticide trade names	Toxic grouping according to WHO	Subjects (insects, diseases) to control in rice
1	*Hexaconazole*	133	IV	Bacterial Panicle Blight; Leaf Blight; Rice Blast; Sheath Blight; Yellow leaf (*Xanthomonas oryzicola*)
2	*Isoprothiolane*	64	III	Rice Blast…
3	*Tebuconazole*	64	III	Bacterial Panicle Blight; Leaf Blight; Rice Blast; Sheath Blight; Yellow leaf (*Gonatophragmium sp*)
4	*Tricyclazole*	128	II	Bacterial Panicle Blight; Leaf Blight; Rice Blast; Sheath Blight; Yellow leaf (*Xanthomonas oryzicola*)
5	*Azoxystrobin*	72	IV	Bacterial Panicle Blight; Leaf Blight; Rice Blast; Sheath Blight; Yellow leaf (*Xanthomonas oryzicola*); Rice Thrips; Brown plant hoppers; Seed treatments.
6	*Propiconzole*	111	II	Bacterial Panicle Blight; Leaf Blight; Rice Blast; Sheath Blight; Yellow leaf (*Xanthomonas oryzicola*)
7	*Pirimiphos-methyl*	01	III	Weevils in the warehouses
8	*Flusicolazol*	NA	III	Rice Blast; Bacterial Panicle Blight
9	*Fenitrothion*	NA	III	Insects; Brown Plant hopper…
10	*Chlorpyrifos*	NA	II	Stem Borer; Leaf folders…
11	*Acetamiprid*	NA	II	Brown Plant hopper…
12	*Difenoconazole*	NA	III	Bacterial Panicle Blight; Leaf Blight…

(Source: VFA, 2016)

3.3.2. Income of organic rice versus conventional inorganic rice production

The company EcoTiger purchased all rice of farmers who participating in the organic rice production model with the higher prices as compared to the inorganic rice as follow: in the first year (2015-2016), 25% increased; in the second year (2016 – 2017), 35% increased; and in the third year (2017 – 2018) will be 55% increased. Since, each hectare of 100% certified organic rice, the income of farmers was increased 3,333,000 VND (2015); 4,819,000 VND (2016); 9,795,600 VND (Estimated for 2017).

Table 7. Cost of organic rice versus inorganic rice production in Chau Thanh, Tra Vinh, 2015

Types of farming	Production cost for 1 ha (million VND)				Total cost (million VND)
	Cost of labor	Fertilizer + pesticide	Seeds	Harvest	
Organic	4,0	5,5	1,6	2,2	13,3
Inorganic	4,2	6,3	1,7	2,2	14,4
Difference	*0,2*	*0,8*	*0,1*	*0*	*1,1*

Table 8. Income per ha of organic rice versus inorganic rice production in 2015 - 2016, and planned 2017 in Chau Thanh, Tra Vinh

Types of rice models	Year	Total cost/ha (million VND)	Yield (ton)	Current fresh rice price (VND/kg)	Increased value (VND/kg)	Converting value from fresh to dry (VND/kg)	Real selling price (đ/kg)	Total income (VND/ha)
Organic	2015	13,3	4,29	5.800	1.450	1.450	8.700	37.323.000
	2016	13,3	4,29	5.800	2.030	1.450	9.280	39.811.200
	2017	13,3	4,29	5.800	3.190	1.450	10.440	44.787.600
Inorganic		14,4	5,4	5.400	0	1.080	6.480	34.992.000

** Values in 2017 are estimated*

Because organic production is less cost, the profit of each hectare of organic rice in 2015 was higher than the inorganic one for the year 2015 was 3.431.000 VND and 2016 was 12.531.250. With the total of 50 hectares in 2015, the total profit was 1,201,150,000 VND (Table 9). The organic rice model in Tra Vinh in 2016 reached 143 hectares with an average yield of 4.5 tons/ha and the inorganic production outside the model was 5.2 tons / ha (Table 9).

In 2016, the purchased price of fresh inorganic rice in the same field was 5,900 VND. The price of fresh organic rice was 8,850 VND (the difference in the second year increased by 50% after being certified organic while in the proposal it was only 35%). From there, the value of organic dried rice was 11,062.5 VND/kg. Thus, the income of one hectare of organic rice was 49,781,250 VND. While inorganic production in 2016, the income was only 38.35 million VND. The profit/ha of organic rice (2016) was 36,481,250 VND, while inorganic rice only reached 23,950,000 VND. The Marginal benefit cost ratio (MBCR) of profit/cost of organic rice was high (2.7); While inorganic rice was lower (1.7). The increased profit/ha of organic rice production

was higher than that in inorganic production 12,531,250 VND/ha, surpassing that of the original plan (Table 9). The plan of total expanding area to 2019 will be 250 hectares.


Figure 5 and 6. Organic rice intercropping with shrimps (green crayfish) and other fishes

Table 9. Income and profit of organic rice versus inorganic rice models in Chau Thanh, Tra Vinh

No.	Category	Organic rice		Inorganic rice	
		2015	2016	2015	2016
1	Yield (ton/ha)	4,29	4,50	5,20	5,20
2	Total cost (VND/kg)	13.300.000	13.300.000	14.400.000	14.400.000
3	Rice price (VND/kg)	8.700	11.062,5	6.480	7.375
4	Total income (VND/kg)	37.323.000	49.781.250	34992.000	38.350.000
5	Profit (đ/kg)	24.023.000	36.481.250	20.592.000	23.950.000
6	Ratio of profit/cost	1,8	2,7	1,4	1,7
7	Increased profit (VND/kg)	+ 3,431,000	+ 12.531.250	0	0


Figure 7 and 8. ICS member and certifiers inspected the organic rice farmers' diary, 2015

3.3.3. Income from shrimp farming

Each hectare of shrimp or rotated crab after cultivation of organic rice gave the income of 70 million VND, profits was 40 million VND (after deducting total costs). In some locations, the model of green crayfish farming intercropping with rice and taking aquatic species from the river such as Mudskippers, mullets, silver shrimps, greasy bock shrimps ... gave an additional income from 20-30 million VND/ha. In addition, the reason for that income was that the fields were not contaminated with toxic chemicals.

The important thing is that the above efficiency was mentioned only on economic, while the effect in long run such as the environmental safety for humans, plants and animals was very valuable and cannot measure by money value (Hai, 2012; Tuan, 2009).

3.4. Training and monitoring process

The result for training by the organic project was another contribution as it has trained a dozens of extension workers, technicians and hundreds of farmers. By training, they knew the principles of organic production (IFOAM, 2005), applying the organic rice production procedure, and organic fertilizers according to the organic practice requirements and knew techniques for diseases, pest and weeds management in organic rice production. In addition, farmers were also acquired new knowledge compared to the conventional production. Those are the knowledge and skill in organic rice production and implementation of field diary, input and output recording, which helped to trace the origin of products. Through the training, farmers also came to know the techniques of pollution management to avoid the contaminants might come from the neighboring inorganic farms, through the drifts, or through the waste treatment systems. In addition, the farmers knew to manage the post-harvest products, to ensure them not to mix with contaminants and non-organic matters. In case of technical staffs, they understood the diagram of system traceability in organic rice products through different stages.

By training, and practice, farmers had changed remarkably their thinking and perception, contributing to success of building the new model in community that created organic products, which internationally certified for export. From result of training farmers, all steps of rice production and related activities were documented to meet annual internal monitoring by field officers, Internal Control System member (ICS), and the inspection by ControlUnion - an independent organization - the competent professional body that inspecting and certifying follow USDA, EU and JAS standards.

3.5. Results of certification of organic rice and processing factories in accordance with USDA, EU and JAS standards

As reported in the Table 5, the sample of rice in the organic rice model in Chau Thanh, Tra Vinh has tested with 255 test parameters of residual chemicals which required by ControlUnion following European, American and Japanese standards. The test result with no contamination of toxic chemical residues. The output was achieved 200 tons of 100% organic rice in 2015 and 600 tons in 2016. This organic rice product

quantity was met the international standards of EU, USDA and JAS. Then, the product of organic project is labeled with 3 logos of EU, USDA and JAS. (USDA, 2012).

Each kilogram of EU, USDA and JAS certified rice is sold in Europe at double price as compared to the normal inorganic rice price.

Figure 9. Project's organic rice products labelled and with 3 logos of EU, USDA JAS

3.6. Orientation for linking organic agriculture development in southern provinces

Prospects for organic production in the Mekong Delta in the future are rice, and with the valuable crops like pepper, cashew, green grapefruit and organic shrimp…, as the market is in great demand. In the immediate future, concentrate organic rice in Tra Vinh, Bac Lieu, Kien Giang and An Giang provinces because of the large area of shrimp-rice cultivation systems. In case of Binh Phuoc province and Phu Quoc district, Kien Giang province, black peppers are high quality and brand, it is very suitable to build the brand name of Phu Quoc with clean pepper certification, orienting and proceed to produce certified organic black pepper there. Cashew nut in Binh Thuan province, green-skin grapefruit in Binh Phuoc province is also potentially for organic growing crops because more demand from the markets and the provincial governments there has suitable promoting policies

In order to develop organic agriculture, it is necessary to promote research on weed control by bio-products, and apply the method of combining weed control and cultivation.

In addition, fertilizers with high level of nitrogen are very necessary. Produce organic fertilizer with high levels of nitrogen to stabilize and increase the productivity of organic crops from plant sources, especially as Azolla is necessary, because it has the potential to increase protein yields in rice production. Rice paddies are typically covered with Azolla "blooms" that fix up to 600 Kg N/ha/year during the growing season (Stephen, 2012; Postgate 1982; Fattah 2005).

There are also many bean plants. One major benefit of growing legumes is that they not only use atmospheric nitrogen for their own growth but also leave residual nitrogen in the soil for subsequent crops. (Will, 2016).

Alternatively, from animal sources such as chicken manure, pig, and cow manure etc. Animal manures provide essential nutrients required to grow healthy plants. In addition, animal manure adds organic matter to soil, improving microbial activity, water drainage and overall soil structure (Delp, 2017).

Planning organic growing areas, in the beginning time focus on the high-value crops and promulgation of policies to promote organic farming, investment and financial support for farmers and businesses.

4. Conclusion and suggestion

4.1. Conclusion

For each hectare of organic rice, farmers had an additional income as compared to inorganic production in the first, second and third year with 2,331,000; 4,819,200 and 9,795,600 VND per ha. The profit per hectare of organic rice production in year 1 is 24,023,000 VND; The second year is 26,511,200 VND and estimating for the third year is 31,487,600 VND, while inorganic rice production is 20,592,000 VND per ha.

Cultivating rice-shrimp/crab rotation can get income reached 70 million VND per ha, except the cost of production, the profit is 40 million VND per ha. In the case of intercropping with rice because of non-application of chemical pesticides, farmers can take many fishery species from large rivers such as: shrimps, goby, mullet, crayfish, crab etc.... and at the end of harvesting rice, farmers can catch fish such as snakehead, catfish, perch ... to increase income from 15-20 million VND per season per hectare. There are also effected in environmental safety, ensuring human and animal health.

Rice products from the project models have been certified organic standard from EU (European Union), USDA (USA) and JAS (Japan).

4.2. Suggestion

It is necessary to study and application of transplanting rice in some areas possible instead of traditional direct sowing rice, in order to shorten the time of salinization at the end of the crop, reduce the cost of seeds, help the plant to resist salt water, avoiding salinity damage in seedling stage and many other benefits. There should be reduced the cost of production, and certification by many possible solution to give more additional profit for the participating parties in organic agricultural production in Vietnam.

Planning organic growing areas focus on the high-value crops and promulgation of policies to promote organic farming. Research and production on organic materials like high nitrogen fertilizers; methods and materials for weeds control and increase the productivity of organic crops by fertilizers/compost from plant and animal sources, and study the application of Azolla in rice.

References

Fattah, Q.A. (2005), “Plant Resources for Human Development” Third International Botanical Conference 2005. Bangladesh Botanical Society, Dhaka, Bangladesh, 2005 (accessed 21 October 2017).

Ferguson, W. (2016), “Soybean nitrogen breakthrough could help feed the world”, College of Arts & Sciences, Published on October 10, 2016, pp. 24-26.

Ho, Q.C. (2013), "Summary of rice varieties", available at: http://www.omard.gov.vn/lib/ckfinder/userfiles/files/Phu/Bao cao/Tong hop.doc/ (accessed 22 October 2017).

Hoang, Q.T. (2009), "The special subject of Rotational production of shrimp - rice in the Mekong Delta" in Dong Thap province on 2 October 2009. Proceeding of dien đan Khuyen nong @ cong nghe lan thu 7 - 2009. Dong Thap province, Vietnam, pp. 45-50.

Khoa học phổ thông. (2016), "4 loại phân hữu cơ cần biết trên thị trường", available at: http://kythuatphanbon.blogspot.com/2016/02/4-loai-phan-huu-co-can-biet-tren-thi.html/ (accessed 19 October 2017).

Le, H.H. (2012), "Shrimp-rice model on the challenge of climate change", available at: http://tepbac.com/tin-tuc/full/Mo-hinh-san-xuat-tom-lua-truoc-thach-thuc-cua-bien-doi-khi-hau-1426.html/ (accessed 29 October 2017).

Nguyen, C.T. (2015a), "How is organic rice produced?", *Journal of National Agricultural Extension, belongs to MARD*, Vol. 10 No. 12, 13, pp. 20-22.

Nguyen, C.T. (2015b), "Organic agricultural production trends and the situation of organic rice production", *Journal of Science and Technology of Soc Trang province*, Vol. 8 No. 10, pp. 30-31.

Postgate, J.R. (1982), *The Fundamentals of Nitrogen Fixation*, Cambridge University Press, 1982, p.7.

Rachel, D. (1992), "The Best Animal Manure Fertilizers" available at: http://homeguides.sfgate.com/animal-manure-fertilizers-73720.html/ (Online accessed date August 25, 2017) .

Reganold, J.P. and Wachter, J.M. (2016), "Organic agriculture in the twenty-first century", *Journal of Nature Plants,* Vol. 2 (February), p.152.

Soil Science Department. (2016), "The results on soil analysis" Institute of Agricultural Sciences for Southern Vietnam, available at: http://iasvn.org/menutop/Phong-NC-Khoa-hoc-Dat-001710032008pbd.html/ (accessed 26 September 2017).

USDA. (2012), "Organic Standards", available at: http://www.ams.usda.gov/AMSv1.0/NOPOrganicStandards/Last Modified Date: 04/23/2015.

Vinafood2. (2016), Report on ''Effects of pesticide residues in rice when exported to developed markets", *Southern Food Corporation (Vinafood2),* July 6, 2017, pp. 1-5.

Wagner, S.C. (2012), "Biological Nitrogen Fixation", *Nature Education Knowledge,* Vol. 3 No. 10, p.15.

Willer, H. and Lernoud, J.E. (2016), "The World of Organic Agriculture 2016: Statistics and Emerging Trends", available at: http://www.systems comparison.fibl.org/fileadmin/ documents/shop/1546-organic-world-2011/ (accessed 30 September 2017).