

Model of public–private partnership in organic rice production in rice–shrimp cultivation system in Cuu long delta, 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 of Ecotiger Ltd, Company 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, 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. Profit ratio of organic rice was 2.7; inorganic rice being 1.7, net profit was 12,531,250 VND/ha. Besides, each hectare of tiger prawns or crabs rotated after organic rice harvested 70 million VND, net profit of 40 million VND. In some areas, models of raising green lobster intercropped with rice + raising 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 about 600 MT of organic rice attained organic standard of EU, USDA and JAS exported to EU and America. Ecotiger¹ strives for 2000 MT under contract of exporting to foreign partners.

Keywords: organic rice, linking four partners, certification of organic standards, rice–shrimp system

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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 (1999), to \$ 80 billion USD in 2014.² In Asia, many countries have launched organic agricultural programs to improve the life condition and benefit of farmers and to sustain the agricultural production. In the year 2016,² the Bhutan 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, 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.³ 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 private companies and scientific institutions are coordinating with each other to organize the farmers for building the model of organic production to meet the demands of many countries. From 2014 to 2016, the model of Public–private Partnership in Tra Vinh province represented by “Four Partners” linkage in production and consumption of organic rice that actually came into operation effectively. The Four Partners includes the governmental organizations, research institutes/universities, companies and the farmers. In the case of Tra Vinh province, first partner is the 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 model (Figure 1). The second 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 Companies who invested the input materials and bought the output products, they were EcoTiger Co., Ltd, and Viorsa Co., Ltd. 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 of Public–private Partnership in producing – exporting 100% certified organic rice successfully in Tra Vinh, Vietnam and the prospects for other crops in some southern provinces^{4,5} (Figure 2).



Figure 1 Associated companies in the organic rice production project to survey the growing area and work with the local government and farmers to carry out the project in Chau Thanh district, Tra Vinh province (2015).



Figure 2 Organic rice model in Chau Thanh district, Tra Vinh province, 2015.

Materials and methodology

Materials

Rice seed applied in the model was ST5,⁶ which is encouraged by Ministry of Agriculture and Rural Development (MARD) to mass-produce in many locations in the Mekong Delta, which has been ordered by the business. Organic fertilizers used in organic rice production model (supplied by Organic Food Trade Company EcoTiger¹ included the following trade names: Organic powder (Root fertilizer); Eco Chi, Organo, DS80 (foliar fertilizers). These fertilizers were imported from Canada and certified by OMRI (The Organic Materials Review Institute (OMRI) is an international nonprofit organization that determines which input products are allowed for use in organic production and processing), Humic International Association (IHSS), Humic Products Trade Association (HPTA), National Organic Program (the National Organic Program (NOP) is the federal regulatory framework governing organic food in the United States of America), Japan Organic Certification Agency (JAS). Van Dien Phosphate: Natural phosphate from ortho of Vietnam, approved by Control Union (Independent Organic Inspection Agency). Plant protection materials substances included powdered lime, *Trichoderma*, *Ometar* green fungus.

Methodology

The entire organic production process must be certified by the Control Union organization (third party, non-affiliated, not affiliated with the IAS Institute or Department of Science and Technology), following USDA (US Department of Agriculture), EU (Europe) and JAS (Japan) standards. The summary of the procedure shown in Table 1. It also complies with the EU (European) and JAS (Japan) standards. 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, organic standards and organic rice production procedure and methods of keeping record of organic origin, in accordance with four principles of IFOAM (International Federation of Organic Agriculture Movements), adopted by IFOAM in 2005, and the US Agricultural Standard.⁷ Linking Four Partners be consistent throughout the document: The Institute of Agricultural

Science for Southern Vietnam (IAS) with organic rice cultivation procedure (2016); EcoTiger Company and Viorsa Company; Tra Vinh Department of Science and Technology, Tra Vinh Department of Agriculture and Rural Development; Relating organizations and local governments in Chau Thanh district, Tra Vinh province. The duration of organic rice project is last from 2015 to 2017 (Table 2).

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	Use of no 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

Results and discussion

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 limiting the potential 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 Chau Thanh district for building the organic rice production model do not have heavy metals and toxic microorganisms in excess as per regulation (Table 3) (Table 4) (Figure 3).



Figure 3 Organic rice model with intercropped prawn farming in organic rice production project in Chau Thanh district, Tra Vinh (Winter–Autumn season).

Table 3 Analysis results of land in Long Hoa and Hoa Minh (Chau Thanh–Tra Vinh) project areas

Test parameters	Unit	Test results (2015)	
		Long Hoa Village	Hoa Minh Village
pH_KCl		3.96	3.85
pHH ₂ O		4.51	4.37
Organic matter	%	6.8	6.18
Acid humic	%	1.37	1.1
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 – Method Detection Limit)

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.

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 pesticides 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 these active ingredients in the list of pesticides are not allowed to be used in agricultural production in Vietnam or foreign countries (Table 5). According to the Food and Drug Administration (FDA) in the period from 2013 to April 2016), having 15 rice exporter 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.⁸ Meanwhile, these 12 substances in organic rice samples were analyzed with non–detectable (ND) from the organic rice models of the IAS in the year 2015 and 2016. Not only these 12 substances, but total 255 chemical substances in the organic rice samples were same results with non–detectable (Table 5) (Table 6) (Figure 4).

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)	2	mg/kg	0.01	N.D
5	Nematicides (N)	2	mg/kg	0.01	N.D
6	Acaricides (A)	5	mg/kg	0.01	N.D
7	Plant growth regulators (PGR)	8	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	4	mg/kg	0.01	N.D
11	PGR,H	3	mg/kg	0.01	N.D
12	IN	3	mg/kg	0.01	N.D
13	FN	1	mg/kg	0.01	N.D
14	FA	1	mg/kg	0.01	N.D

Table Continued

No.	Groups of test parameters	No. of Test Parameters	Unit	MDL	Results
15	IO	I	mg/kg	0.01	N.D
16	INA	I	mg/kg	0.01	N.D
Total of test parameters		255			

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 6 Generally produced rice products are contaminated with 12 banned substances

No. trade names	Name of the Contaminated Pesticides were Detected in Rice Exports	Number of Pesticide	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 (<i>Xanthomonas oryzae</i>)
2	Isoprothiolane	64	III	Rice Blast...
3	Tebuconazole	64	III	Bacterial Panicle Blight; Leaf Blight; Rice Blast; Sheath Blight; Yellow leaf (<i>Gonatophragmium</i> sp)
4	Tricyclazole	128	II	Bacterial Panicle Blight; Leaf Blight; Rice Blast; Sheath Blight; Yellow leaf (<i>Xanthomonas oryzae</i>)
5	Azoxystrobin	72	IV	Bacterial Panicle Blight; Leaf Blight; Rice Blast; Sheath Blight; Yellow leaf (<i>Xanthomonas oryzae</i>); Rice Thrips; Brown plant hoppers; Seed treatments.
6	Propiconazole	111	II	Bacterial Panicle Blight; Leaf Blight; Rice Blast; Sheath Blight; Yellow leaf (<i>Xanthomonas oryzae</i>)
7	Pirimiphos-methyl	I	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.



Figure 4 The ICS Leader of the Organic Rice Production Project is presenting to the CU's independent verification team during farmer and farmer group inspections (2015).

Results of the rice model produced by the organic farming procedure in shrimp-rice area in Tra Vinh province

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) (Figure 5).



Figure 5 Harvesting of shrimp and organic rice in the organic rice project model in Chau Thanh district, Tra Vinh province (2016).

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

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 8). 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, while inorganic rice only reached 23,950,000. The ratio 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.

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	Yield (ton/ha)	Current fresh rice price (VND/kg)	Increased value (VND/kg)	Gap value between fresh rice to dry rice (VND/kg)	Real selling price (đ/kg)	Total income (VND/ha)
Organic	2015	13,3	4,29	5.8	1.45	1450	8.7	37.323.000
	2016	13,3	2,29	5.8	1.45	1450	9.28	39.811.200
	2017	13,3	2,29	5.8	1.45	1450	10.44	44.787.600
Inorganic		14,4	5,40	5.4	0	1080	6.48	34.992.000

Note: Values in 2017 are estimated.

Table 9 Income and real 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)	8.7	11.062,5	6.48	7.375
4	Total income (VND/kg)	37.323.000	49.781.250	34992	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

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 crayfish farming intercropping with rice and keeping aquatic species from the river such as Mudskippers, mullets, silver shrimps, greasy bock shrimps gave an additional income from 20–30 million VND/ha. And the reason for that income was because the fields were not contaminated with toxic chemicals. 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.^{9,10}

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 the completely new knowledge compared to the conventional production, which was the knowledge and implementation of field diary, input and output recording which helped to trace the source and the products later. 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. Farmers knew to handle the post–harvest products and knew to manage the post–harvest products, to ensure them not to mix with contaminants and non–organic matters. Technical staffs understood

the diagram of system traceability of organic rice products through different stages. Farmers had changed remarkably their thinking and perception, contributing to success of building the latest model in local that created organic products that are internationally certified for export. From result of training farmers, all steps of rice production and related documentation procedures were met through annual internal monitoring by field managers, company, technicians and the inspection by Control Union an independent organization – the competent professional body that inspecting and certifying follow USDA, EU and JAS standards.

Results of certification of organic rice and organic rice 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 Control Union following European, American and Japanese standards in which no contamination of toxic chemicals. The output results by organic rice project were achieved 200 tons of 100% organic rice in 2015 and 600 tons in 2016. The standards of 100% organic were met the international standards EU, USDA and JAS (USDA, 2012). So, the product of organic project is labeled with 3 logos of EU, USDA and JAS.

Orientation for linking organic agriculture development in southern provinces

Prospects for organic production in the Mekong Delta are rice, 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. Binh Phuoc and Phu Quoc 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. Cashew nut in Binh Thuan, blue–skin grapefruit in Binh Phuoc are also potentially for organic growing crops because the provincial governments have the appropriate policies as the market demands. On the other hand, in order to develop organic agriculture, it is necessary to promote research on weed control by bio–products, the method of combining weed control and cultivation. In organic agricultural production, fertilizers with high level of nitrogen are very necessary. Production of organic fertilizer with high levels of nitrogen (because of organic fertilizers currently in Vietnam are very low nitrogen (N)), to stabilize and increase the productivity of organic crops. The sources to produce organic fertilizers come from waste plant and animal sources, especially as Azolla in case of paddy rice, because it has the potential to increase protein yields for rice production. Rice paddies are typically covered with Azolla “blooms” that fix up to 600 Kg N ha⁻¹ yr⁻¹ during the growing season.^{11–13} Plant sources for making organic fertilizer are also many legume/bean plants. The benefit of growing legume plants are they not only can use atmospheric nitrogen for their own growth but also leave residual nitrogen in the soil for subsequent crops.¹⁴ Alternatively, from animal sources such as chicken manure, pig 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.¹⁵ 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.¹⁶

Conclusion and suggestion

Conclusion

For each hectare of organic rice, farmers had an additional income as compared to inorganic income 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 for income can 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 drugs, farmers may have fishery species from large rivers and catch such as: shrimps, goby, mullet, crayfish, crab ... and at the end of harvesting rice, farmers can catch fish such as snakehead, catfish, roach ... to increase income from 15–20 million VND per crop per hectare. There are also environmental safety effects, ensuring human and animal health. Rice products from the project models have been certified organic EU (European Union), USDA (USA) and JAS (Japan).

Suggestion

It is necessary to study the application of transplanting rice instead of traditional direct sowing rice in the project areas 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, seedling stage and many other benefits. There should be an international monitoring and certification organization in Vietnam to reduce the cost of certification, 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 sources, especially Azolla in rice.

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None.

Conflict of interest

The author’s declines there are no conflict of interest.

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