

The Concept of Organic Cultivation as a Sustainable Agricultural Education Effort

Hening Widowati^{1*}, Agus Sutanto¹, Achyani¹, Fenny Thresia², Nedi Hendri³ and Mia Cholvistaria¹

¹Postgraduate of Biology Education

²English Education Study Program, FKIP

³Accounting Economics Study Program, FE

Universitas Muhammadiyah Metro

Ki Hajar Dewantara Street No. 116 Kota Metro, 34111, Lampung, Indonesia

Abstract

*Farmers generally prefer non-organic farming. This study examines the residue of active ingredients due to the use of synthetic chemical pesticides. It conducted with organic farming methods that are environmentally friendly by utilizing fermented fertilizers and refugia biopesticides. It was randomly sampled the water, soil, and products of 9 types of vegetables with four replications in the vegetable field of Karangrejo Sub-District, North of Metro Lampung, Indonesia in April-September 2019. The non-organic farmed expose facto data was used as a control. Data were analyzed by means of the different *t* test, and descriptive by examining laboratory test documents for increasing land productivity and agricultural yields. The results showed that the levels of active residues of chlorfenapyr, diphenconazole, and low fipronil below the permitted threshold were found in soil, water, and all types of non-organic vegetables, with significantly different residue levels of $p \leq 0.05$. While organic management is only found in the soil where vegetables grow, those were not detected. The findings of organic farming are very significantly different for all parameters of active residues, as well as increased productivity of land and agricultural products can be socialized for healthy living and environmentally friendly farming and sustainable agricultural education effort.*

Keywords: organic cultivation, land productivity and agricultural yields, sustainable agricultural education

1. Introduction

Efforts to increase agricultural yields for the purpose of producing abundant, superior, high-quality crop products, the government and farmers in Indonesia are looking for breakthroughs in the hope of obtaining optimal crop yields. Among the efforts made is to create an agricultural system through intensification, diversification, and agricultural extensification techniques [1]. Intensification and extensification in general are an effort to optimize agricultural business by optimizing crop cultivation on land in terms of superior seeds, *Panca Usaha Tani* (Five Farming Optimizations) and so on, then expanding agricultural land in order to provide more productivity. Implementation of Agricultural Intensification is packaged as the *Panca Usaha Tani* (Five Farming Optimizations), namely: 1) Good land management; 2) Irrigation; 3) Selection of superior seeds; 4) Fertilization; 5) Eradication of pests and plant diseases. Along with the development, *Panca Usaha Tani* then developed into *Sapta Usaha Tani* (Seven Farming Optimizations): with the addition of 6) Post Harvest, and 7) Product Marketing.

The agricultural intensification program which prioritizes the target of high productivity of agricultural products, encourages farmers to implement this program wrongly. According to [2], the agricultural system to be able to meet the needs of food and other human needs, demanding the use of large amount of chemicals. It has been known to cause a decline in the carrying capacity of land very quickly in a relatively short time. In addition, land and

water pollution as a consequence of the use of chemicals, such as fertilizers and pesticides, cannot be avoided anymore. This condition is carried out because to meet expectations in a short time with the maximum results are obtained without considering the negative effects.

In [3] states global environmental changes triggered by climate change, deforestation, water scarcity, species extinction, and drastic human population increases, encourage farmer expectations to maximize instant crop production by over-fertilizing and eradicating synthetic chemical pests, in hopes of providing maximum results quickly. In [4] revealed the implementation of the agricultural intensification program over time turned out to be not as expected. Many uses of farming inputs do not pay attention to the balance of the ecosystem, although in fact the main purpose of the use of these inputs is intended to provide increased production in farming and will later strengthen the agricultural sector as one of the development sectors. Some researches on horticultural products show that the content of pesticide residues in these products is still below the maximum residue limits (MRL). However, if consumed for a long period, it will accumulate in the body and causes various health problems. The findings of [5] South Sumatra Province in 2013 on Ranti tomatoes (*Solanum nigrum*) and cabbages still contained organochlorine, organophosphate and pyrethroid pesticide residues from 5 regencies/cities in South Sumatra. This reinforces [6] which states that vegetables and fruit are horticultural commodities containing higher pesticide residues compared to other foodstuffs. Pesticides are very dangerous to plants because of the impact of residues that are caused afterwards.

Application of pesticides in non-organic farming from many studies shows that it tends to continue to increase in the number, frequency, dosage, and composition used [7]. In fact, this is compounded by incorrect application techniques such as spraying more than one type of pesticide in one application without considering the compatibility of the pesticide. This certainly has a negative impact on the environment, health, social and economy as well as the products produced. In [8] found organochlorine, organophosphate, and carbamate pesticide residues in red chili, lettuce, and onions at the seller farmers, as well as supermarkets in Bandung and Brebes, Central Java and Cianjur, West Java.

Residue is residual substance that is still left behind in a product or environment. The chemical content of existing residues can pose a danger not only to plant commodities, but also to other beneficial organisms and consumers as users of these products. The use of pesticides that are not in accordance with the recommended recommendations and tend to exceed the recommended dose is the cause of the increase in pesticide residues in horticultural products. The classic problem is the desire of horticultural product manufacturers to reduce yield losses due to pests and diseases. However, it was not realized this was more focused on the use of chemical pesticides. Some problems arise related to the presence of residues in horticultural products such as the increasing number of disease events in consumers and the rejection of products that will be exported, added by the selling value of products is relatively lower compared to organic products. Several studies have shown that pesticide residues can result in the emergence of various diseases in humans. Even residues also contaminate the surrounding environment, and are distributed through the food chain. Traceability of chemical pesticides, insecticides and fungicides used is known to contain active ingredients intended to kill pests, but can cause residues of active ingredients to enter agricultural products that can harm vegetable consumers, because of them are known to contain chlorfenapyr, difenoconazole, and Fipronil has been found in soil, water, and vegetable tissue that is planted non-organically in the Karangrejo Metro Lampung vegetable plantation [9], which relies on synthetic chemical pesticides, insecticides, and fungicides. Chlorfenapyr is a contact, stomach and respiration poisonous insecticide. It is tawny concentration that can be emulsified to control caterpillar pests, aphids of various types of vegetables, and flies on chili peppers [10]. Difenconazole is an active ingredient in fungicides, to eradicate various types of fungi and protect the leaves and seeds of agricultural plants. Although specifically designed to treat fungal attacks, several studies have shown that fungicides have neurotoxic effects on tested animals. This gives the potential harm to non-target animals that benefit the farming system, such as pollinator insects [11]. Fipronil is one of the residues of

insecticide active ingredient for sting bugs. It has very high effectiveness of poison power, so it is effective for pest mortality, and it can stop the sustainability of the lives of other biota [12], but actually it is very detrimental to agricultural products, because the chance of residue into agricultural products is higher than chlorfenapyr and diphenconazole as stated in the field observation data at the research site. The failure to vegetables harvest caused by stink bugs is mostly overcome by spraying an insecticide made from fipronil.

The bad effects of agricultural intensification provide lessons to change the orientation towards the sustainable agricultural development [13]. One form of sustainable agriculture implemented in Indonesia is organic agriculture. According to [14], organic farming is a farming system that is designed and managed in such a way as to be able to create sustainable productivity.

In [15] states that almost 100% of vegetable farmers, even organic ones still use pesticides. When talking about healthy food, health experts recommend consuming a lot of vegetables and fruits. In the composition of a balanced dinner plate it is mentioned, the percentage of vegetables is 30 to 40 percent of the entire contents of the plate. Vegetables are even called cheap food but full of benefits for the body, contain a variety of vitamins and fiber. But, behind all the goodness of vegetables, there is a harmful threat. In the modern world it is claimed that almost 100% of vegetables are inseparable from pesticides, even for organic vegetables. Pesticides are indeed needed by farmers to protect crops from pests and damaging insects. In the organic list of the United States Department of Agriculture it is mentioned, if conventional farmers can use 900 synthetic pesticides, then organic farmers can only be 25. One means, even organic vegetables cannot be separated from pesticides. An article in one of the national mass media mentioned, Brebes is the highest pesticide user area in ASEAN. This is really irony. When we think the food we consume is healthy and good for the body, without realizing it has bad effects for human. Several studies have shown, exposure to pesticides can be associated with an increase in chronic diseases such as cancer, Alzheimer's, diabetes to neurodegenerative diseases. Even children with high and continuous exposure to pesticides can influence behavior and cause problems in learning. Furthermore, exposure to pesticides can double a child's risk of developing ADHD / Attention Deficit Hyperactivity Disorder.

Because of these negative impacts, a new concept emerges with efforts to reduce the supply of chemicals as small as possible to agriculture in an effort to produce sufficient food and continue to maintain land productivity and prevent environmental pollution for unlimited use, as a sustainable agricultural concept/ the concept of regenerative agriculture, a pattern of sustainable agriculture that maintains environmental carrying capacity for production over time. Based on understanding this concept, a study was conducted to examine the increase in land productivity and agricultural yields, by looking at the reduction in residues of the active ingredients chlorfenapyr, diphenconazole, and fipronil; soil fertility by observing the increase in NPK levels, as well as the nutritional quality of vegetables by observing levels of protein, vitamins A and C from organic, environmentally friendly farming methods that utilize microbial fermented fertilizers from Pineapple Liquid Waste and refugia biopesticides.

2. Methodology

This research substances includes: 9 types of vegetables namely green spinach and red amaranth, mustard greens, cassava leaves, water spinach, basil, leek, bok choy, and lettuce, then water and soil with 4 replications taken in the environment where those were planted namely *Kebun Sayuran Kelurahan Karangrejo* (The Vegetable Garden of Karangrejo Sub-district) of Metro Lampung in April-September 2019, which was managed by group one non-organically, and in the group two organically. Non-organic management is routinely managed to control pests using insecticides and synthetic chemical fungicides Scors exterminator fungi, Regent stink bugs and grasshoppers exterminator, Plainum plant hopper exterminator, Amistartop fungus exterminator, Gordon worm exterminator, Kempo leafhopper exterminator. The vegetables are intensively watered with river water, while organically maintained with compost produced by

fermentation by indigenous bacteria from Pineapple Liquid Waste processing of GGP Company in Bandarjaya Lampung, refugia flowering plants, vegetal biopesticides, and Great Crested Canopy Lizzard (*Bronchocela jubata*), as an insect controller, and the vegetables were watered from the artesian well water. The samples of each biomass vegetable, water, and 100 grams of soil which were put into a plastic bag and given sodium benzoate, then analyzed at the Chemical Analysis Laboratory of the University of Muhammadiyah Malang with the method of High Performance Liquid Chromatography/ HPLC by Shimadzu brand; to detect residual levels of active ingredients including chlorfenapyr, difenoconazole, and fipronil, vitamins A and C, and the Kjeldal method for detecting whether the proteins contained still live in the vegetable samples.

Quantitative data of chlorfenapyr, difenoconazole, and fipronil active residues were analyzed by t-test using the SPSS 21 application, to determine whether there were differences in levels of organically active organic farming in plant tissues, water, and soil in their plantations and their relationship to land productivity by observing NPK levels and agricultural productivity by observing the levels of protein, vitamin A, vitamin C of the produced vegetables.

3. Results and Discussion

Preliminary research observational data shows that not all active ingredients are found in all types of vegetables on agricultural land. From the 9 agricultural products, green spinach and red amaranth, mustard greens, cassava leaves, water spinach, basil, leek, bok choy, and lettuce were not detected in the presence of difenoconazole. Difenoconazole was only found in mustard greens, bok choy, lettuce, and leek. The average of active residue was in the sample of vegetables, water used for watering, and soil of the planting environment is set out in the following Table 1.

Table 1. The Average of Residual of Active substances in Vegetables, Water, Environment and Soil

Sample	Chlorfenapyr (ng/g)		Difenoconazol (ng/g)		Fipronill (ng/g)	
	Non-Organic	Organic	Non-Organic	Organic	Non-Organic	Organic
Soil averages	70,2911638	4,47962125	2,2924775	0,09905812	213,372392	27,7880844
Water averages	10,35838	0 (undetected)	0,12032	0 (undetected)	18,36873	0(undetected)
Vegetables averages	0,45860212	0 (undetected)	0,04362688	0 (undetected)	2,37272062	0 (undetected)

Note: The maximum limit for all active substances residues ranges from 0.01 to 0.5 mg / kg (ppm)

It is known from Table 1 descriptively, the active ingredients in non-organic farming are found in all types of samples; soil, water, and vegetables; whereas in organic farming, active residues were only found in the soil. Meanwhile, there was no active residues was detected in the water and vegetables. In non-organic and organic farming, the level of active residue in the soil is much higher than water and vegetables. The highest active residue found was fipronil, chlorfenapyr, and the lowest was difenoconazole.

The presence of chlorfenapyr in non-organic soil is 6,786 times higher than in the water, while in the vegetables was only 0.652% from the soil. Whereas, in organic farming, chlorfenapyr found 0.064 times lower than the level of active substances in non-organic soil, even in the water or organic vegetables there was no chlorfenapyr detected.

The presence of difphenconazole in non-organic soils is 19,053 times higher than that found in the water. While, the presence of difphenconazole in the vegetables was only 1.903% of that in the soil. In the soil of organic farming is still rarely found, 23,143 which is lower than non-organic farming. While, difphenconazole was not detected in the water and the vegetables

The presence of fipronil in non-organic soils is 11,615 times higher than that found in the water. While, the presence of fipronil in the vegetables was only 1,112% of what was in the soil. In organic soil farming, it was still rarely found, which was 7.679, lower than non-organic farming.

The visualization of the difference between non-organic and organic active farming residues can be seen in Figure 1(a)-(c).

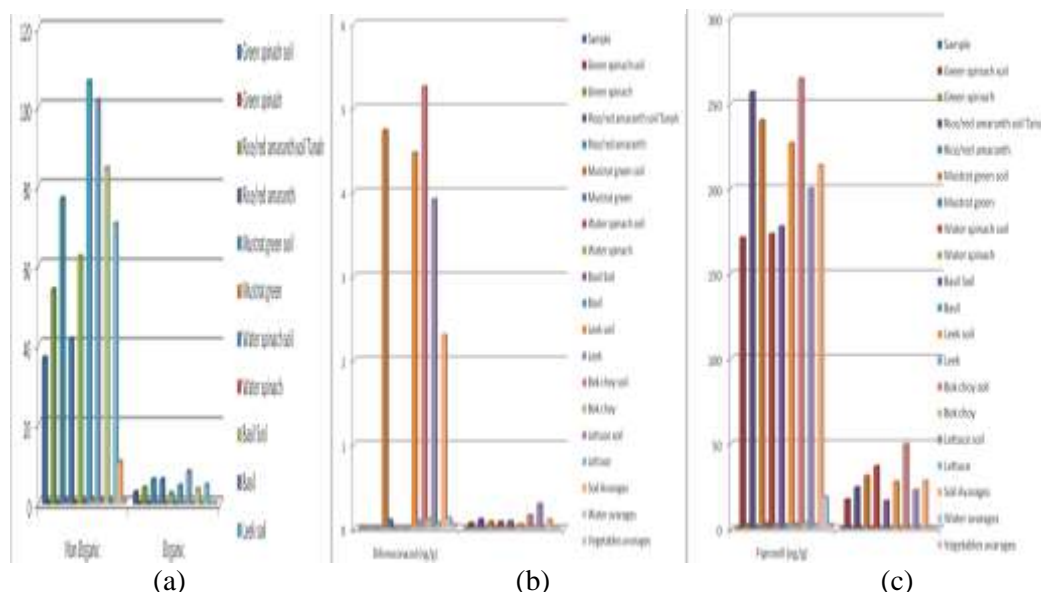


Figure 1(a)-(c). The Comparison of Chlorfenapyr, Difenoconazole and Fipronil Residues Between Non-Organic and Organic Farming

The results of the t test analysis are as follows.

Table 2. Test Results of Non-Organic and Organic Agricultural Soil to Chorfenapyr Levels

One-Sample Test						
Sample	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Chlorfenapyr of Non-Organic Soil	15.756	31	.000	70.2911631	61.192653	79.389674
Chlorfenapyr of Organic Soil	14.405	31	.000	4.3648394	3.746839	4.982840

The analysis shows that there was a very significant difference of chorfenapyr between non-organically and organically managed soils with $p \leq 0.05$. The chorfenapyr content in non-organically managed soils was very high compared to organically managed soils.

Table 3. Test Results of Non-Organic and Organic Agricultural Soil to Difenoconazole Levels

One-Sample Test						
Sample	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Difenoconazole of Non-organic soil	5.502	31	.000	2.2924775	1.442623	3.142332
Difenoconazole of Organic Soil	8.309	31	.000	.1097487	.082811	.136687

The analysis showed that there was a very significant difference between difenoconazole between non-organically and organically managed soils with $p \leq 0.05$. The level of difenoconazole in non-organically managed soils was very high compared to organically managed soils.

Table 4. Test Results of Non-Organic and Organic Agricultural Soil to Fipronil Levels

One-Sample Test						
Sample	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Fipronil of Non-Organic Soil	32.632	31	.000	213.3723625	200.036485	226.708240
Fipronil of Organic Soil	15.020	31	.000	27.7880844	24.014775	31.561393

The analysis shows that there was a very significant difference between fipronil between non-organically and organically managed soils with $p \leq 0.05$. Fipronil levels in non-organically managed soils were very high compared to organically managed soils.

Table 5. Test Results of Non-Organic and Organic Agricultural Water Differences in Chlorfenapyr Levels

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Chlorfenapyr of Non-Organic Water	32	1.035838E1	.9441799	.1669090
Chlorfenapyr of Organic Water	32	.000000	.0000000 ^a	.0000000
a. t cannot be computed because the standard deviation is 0.				
One-Sample Test				
Water Sample	Test Value = 0			
	t	df	Sig. (2-tailed)	95% Confidence Interval of the Difference

					Lower	Upper
Chlorfenapyrof Non-Organic Water	62.06 0	31	.000	10.3583800	10.017967	10.698793

The analysis shows that there was a very significant difference between chorfenapyr between water that was managed non-organically and organically with $p \leq 0.05$. The levels of chorfenapyr in water that were managed non-organically are very high compared to water that was managed organically. While the average difference in water organically cannot be calculated because all water samples in organic farming were not detected by chlorfenapyr (standard deviation is 0).

Likewise, for diphenconazole and fipronil of the water showed the same results, where the non-organically farming is very different from organically, that was for all water samples in organic farming were not detected the presence of diphenconazole and fipronil, on the contrary in non-organic farming were found those substances in the water even though the levels were low.

Table 6. Results of Non-Organic and Organic Vegetable Difference Test on Chorfenapyr Levels

One-Sample Statistics						
Vegetables Sample	N	Mean	Std. Deviation	Std. Error Mean		
Chlorfenapyr of Non-Organic Vegetables	32	.458602	.2389360	.0422383		
Chlorfenapyr of Organic Vegetables	32	.000000	.0000000 ^a	.0000000		
a. t cannot be computed because the standard deviation is 0.						
One-Sample Test						
Sample	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Chlorfenapyr of Non-Organic Vegetables	10.857	31	.000	.4586021	.372457	.544748

The analysis showed that there was a very significant difference in chorfenapyr between non-organically and organically managed vegetables with $p \leq 0.05$. Chorfenapyr levels in non-organically managed vegetables were very high compared to organically managed vegetables. Whereas the average difference in vegetables organically could not be calculated because all vegetable samples in organic farming did not detect chlorfenapyr (standard deviation is 0).

Likewise, for diphenconazole and fipronil vegetables showed the same results, where in the organic farming was very different from organically, for all vegetable samples that were organically farmed were not detected in the presence of diphenconazole and fipronil, on the contrary those were found in non-organic vegetables, although the levels were low; below the permitted threshold.

The visualization of decreasing levels of active substances in non-organic to organic farming, can be seen in Figure 2-4.

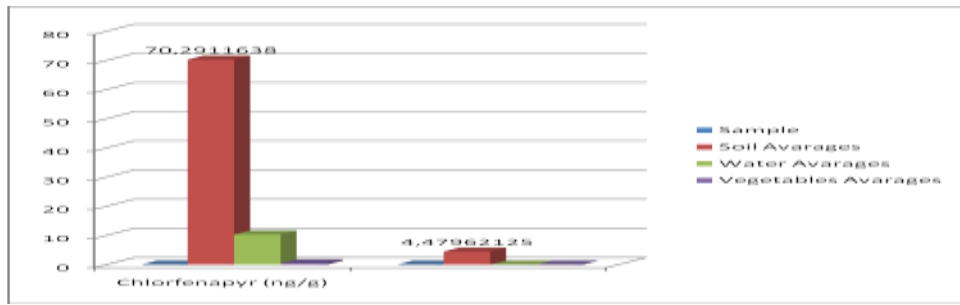


Figure 2. The Decrease in Active Substances of Chlorfenapyr in Non-organic to Organic Farming

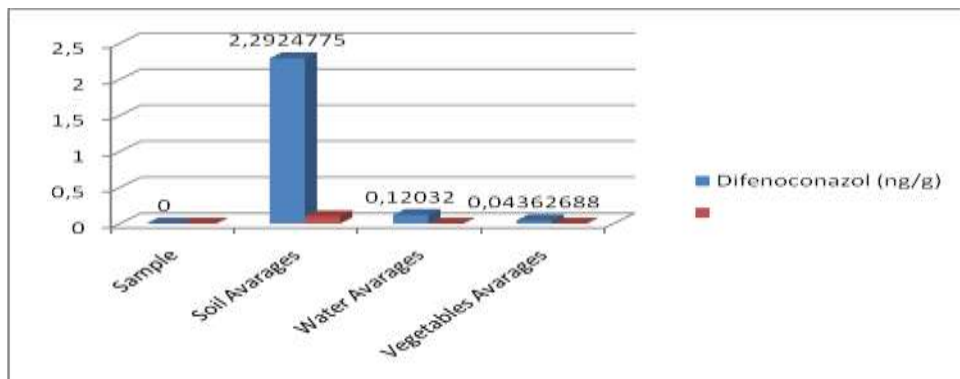


Figure 3. The Level Decrease of Active Difenoconazole in Non-organic to Organic Farming

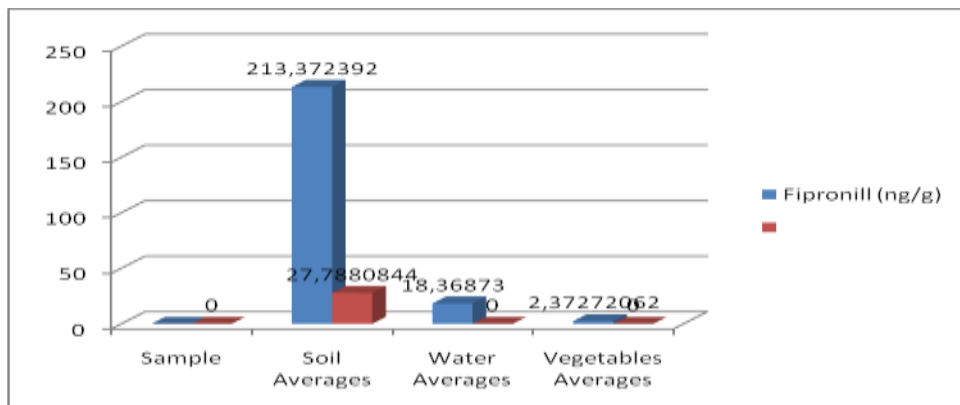


Figure 4. The Decreased Level of Active Fipronil Substances in Non-Organic to Organic Farming

If noted on the Figure 2-4, the content in vegetable tissue is still very low, far from the permitted threshold by the Indonesian National Standard (SNI); 7313: 2008 formulating the maximum limit of pesticide residues in strawberries, for the type of organophosphate diazinon amounting to 0.1 mg / kg [16]. Whereas in soil in particular, it was found to be much higher than in the water, especially vegetable tissue which was found to be very low. Even though it was much higher, it was still far below the permitted threshold. Moreover, it was found in the units of ng / g in the range of hundreds, while in the provisions of SNI, the units were using ppm or mg / kg.

The results of the average difference test with the t test showed very significantly between the three active residues of chlorfenapyr, difenoconazole and fipronyl significantly different with p value ≤ 0.05 . It was proven that the organic processing of vegetable farming has a very

significant effect in reducing the three active residual substances of chlorfenapyr, diphenconazole, and fipronyl in soil, water, and in vegetable products. Of all the residues of active ingredients, it was still far from the allowable threshold, which was 0.1 ppm or 0.1 mg / kg. So that vegetables on farmland that were managed in non-organic way are still safe for consumption. However, no matter how small and as low as the level of active residues that are difficult to degrade and are accumulative, it becomes important and absolutely to consider [3]. As [15] states, with all the harmful effects of pesticides that threaten "healthy food", we must be wise in managing it. Because vegetables are proven as healthy food, it is easy to accumulate active residues.

In modern agriculture, the use of pesticides is very important. However, pesticides in large quantities are quite toxic and dangerous to humans, the environment, and can affect the taxonomy of biota, including non-targeted creatures to some extent depending on physiological and ecological factors [17]. Organophosphate pesticides are widely used because of their low price and favorable properties. Organophosphate group works by inhibiting the activity of the enzyme cholinesterase in sucking insects and leaf eaters, so that acetylcholine is not hydrolyzed. Organophosphate pesticide poisoning is caused by excessive acetylcholine, resulting in the continuous stimulation of muscarinic and nicotinic nerves. Diazinon pesticide residues in food cause cholinergic signal modification due to inhibition of acetylcholinesterase. Due to its toxic nature and risk to human health, the government has set a maximum limit of pesticide residues to minimize its impact on health [18]-[19]. Indonesian National Standard (SNI) 7313: 2008 formulates the maximum limit of pesticide residues in strawberries, for the type of diazinon organophosphate group of 0.1 mg / kg [16].

At the world level, the use of pesticides is dominated by herbicides, followed by insecticides and fungicides. Whereas in Indonesia, insecticides still rank first. An insecticide is a chemical or biological that can control insects by killing or preventing damage to plants by insects. Insecticides contain toxic chemical compounds that can kill all types of insects. To kill insects, insecticides enter the insect's body through the stomach, direct contact and breathing (Sembiring, 2011 in [3]).

The results of analysis [20] of the pesticide residues in four samples of broccoli obtained residues in the four samples tested with a percentage of 10%, 20%, 60% and 82% of the maximum residue limit. The impact of the use of pesticides on the health of farmers is in the form of nausea, vomiting, dizziness and itching on the skin. The results of the calculation of the assumption of health risk intake through analysis of exposure obtained results 1.505 g / day with the highest value of 4.014 g / day and the number of the lowest risk intake is 423 g/ day. From the results of these calculations it can be seen that the average amount of vegetable and horticultural consumption at risk by farmers is 1,505 g / day.

Climatic conditions, selling prices, and attacks of Plant-Disturbing Organisms (PDO) also encourage farmers to use insecticides and herbicides in their land management. PDO attacks that occur almost every planting season encourage farmers to use pesticides in control measures. In the world of agriculture, pesticides are an inseparable part of agricultural cultivation, all types of plants as part of plant maintenance activities. Pesticide residues in the environment are a bad result of direct use or application. Pesticides aimed at specific targets such as plants and soil can be carried by water, wind or air movements. Pesticide residues can also be carried in the food chain. In horticultural commodities, pesticide residues are reported to have health hazards [21]. Furthermore, in [22] found that pesticide residues in vegetables and fruit can reduce sperm quality, although that does not mean reduced fertility. To anticipate this effect, in [22] suggests that it is better to consume organic foods or avoid vegetables and fruits that have high levels of pesticide residues.

Found 13 types of pesticides that are often found in fruits and vegetables [23]. In Indonesia, pesticide residues contained in horticultural products such as carrots, potatoes, mustard greens, onions, tomatoes and cabbage in several vegetable production centers have been reported to have

residues that exceed the maximum limit of 2 ppm [24]. In [25] further stated, there are four types of pesticide treatments that pose a risk of endangering the user, namely carrying, storing and removing insecticide concentrates (pesticide products that have not been diluted), farmers generally store for a moment in the house; mix pesticides before they are applied or sprayed in the upwind direction, insecticides easily enter through the skin when mixing; applying or spraying pesticides, by not using a mask to cover the mouth and nose, the insecticide will be sucked into the respiratory tract also poses a high risk of contamination through the skin; and washing application tools that are at risk of polluting the environment.

On the other hand, farming organically in addition to reduce residual levels of active ingredients of synthetic chemical insecticides, in fact it can increase land productivity and vegetable products. The visualization of increasing land and vegetable productivity can be seen in Figure 5-6.

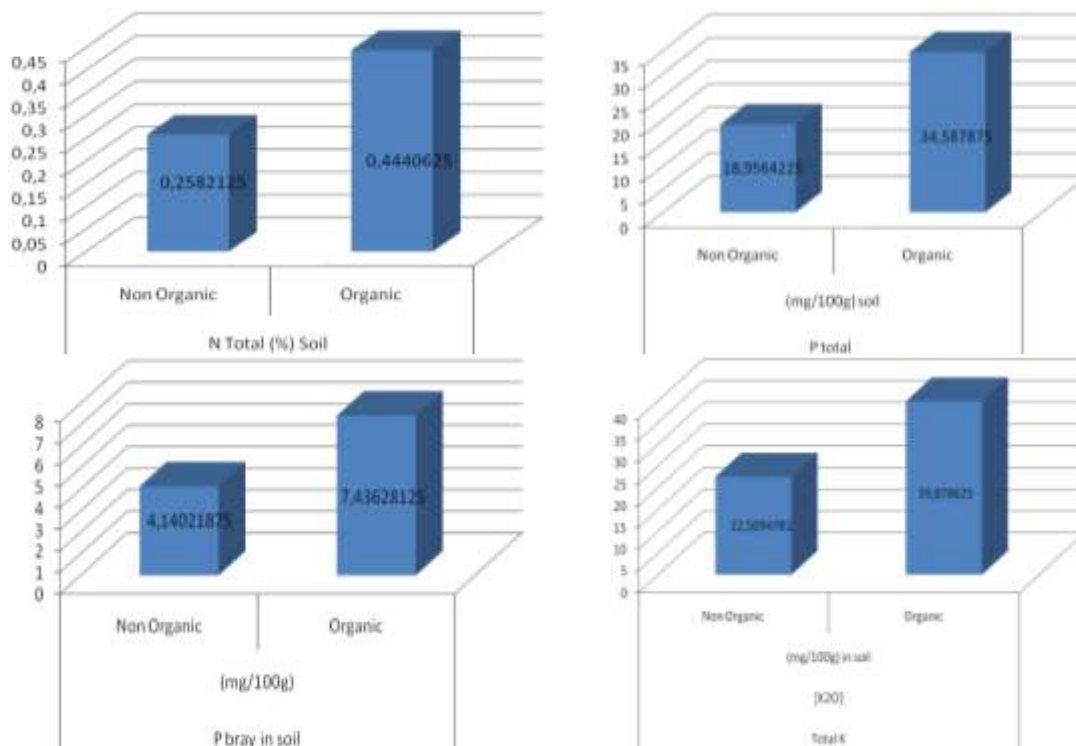


Figure 5. The Average Increase of Land Productivity/Soil Fertility (N, P total, P available, K levels)

Attention to Figure 5, there is an increase in land productivity, namely N levels increased to 71.976%, 82.460% of total P levels, 79.611% of Available P, and 77.164% of K. Increased levels of NPK give a clue, that without chemical insecticides has effect on the availability of soil NPK. This makes better condition. It is known that the use of vegetable or animal bioinsecticides instead of chemical insecticides have a positive influence on the availability of NPK. Because with bioinsecticides, in this case the use of refugia flowers, tobacco solutions in the urine of cows and goats, and the use of Great Crested Canopy Lizzard (*Bronchocela jubata*) as natural enemies of insects, does not add to the burden of the presence of active residues, so as it did not to kill the life of soil microbes; as worms as soil decomposers and fertilizers have a positive effect as the media grows into crumbs and smudges and provides a healthy rhizosphere environment. Therefore, it can maintain the NPK content of the soil, even in its available form, in the sense of being readily absorbed and utilized by plants for its nutritional needs [26].

The positive effect on land productivity is evidenced by the increase in nutrient levels of vegetables, which can be visualized in Figure 6.

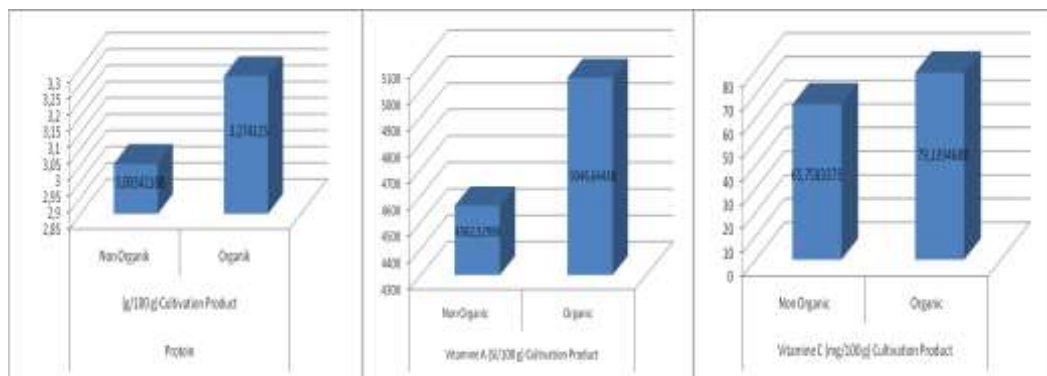


Figure 6. The Average Increased Quality of Vegetables (Levels of Protein, Vitamin A, Vitamin C)

Figure 6 shows an increase in 9,013% of protein levels, 10,611% of vitamin A, and 20,349% of vitamin C, after planting organically. Growing media that become fertile and nutritious because of organic techniques that provide high nutrients, allows soil nutrients to be optimal to provide mutations for plants so that the absorption of nutrients becomes more efficient. Organically farming more guarantees better plant growth, so as to produce better and excellent quality crop products, which are characterized by increased nutritional levels of agricultural products, beside the lack of pollutants from active residues, will minimize vitamins A and C in their role as antioxidants against free radicals. On the other hand, the minimal free radicals will allow protein synthesis to work optimally, which is characterized by increased levels of vegetable protein. As [27] mentioned to eliminate the negative effects of free radicals, plants develop a self-defense mechanism by applying an antioxidant system so the levels of vitamins A and C will decrease.

The results of the average difference test with the t test showed very significantly between land productivity and agricultural yields that were very significantly different with a p value ≤ 0.05 . The results of the analysis proved, the processing of organic vegetable farming has a very significant influence in increasing land productivity and agricultural productivity.

Based on the data and analysis in the discussion it is known, that organic farming, without using synthetic pesticides, has 2 advantages/ advantages; 1) Increasing land productivity; increasing nutrient (NPK), even nutrients in available forms that can be directly utilized by plants; 2) Increase the productivity of agricultural products, which is indicated by increased levels of nutritional vegetables (protein, vitamin A, vitamin C).

From collecting data through interviews and observations of vegetable farmers at the research place, the lack of interest in switching to organic farming methods is that farmers were less confident not to use pesticides because they were worried about crop failure, because they were accustomed to use synthetic chemical pesticides, which were effective in eradicating pests as their experiences, so they believe that it always increases the productivity of agricultural products.

In [28] stated the knowledge, attitudes, and actions of vegetable farmers in Pandeglang Regency, Banten about synthetic pesticides generally differ according to the characteristics of each respondent farmer. Only a small proportion of farmers understood the use of pesticides properly and in accordance with the recommended use. From her findings, farmers in Pulosari Subdistrict generally had a low rationality in using pesticides compared to farmers in Jiput and Menes Subdistricts. The results of the analysis with the chi-square test method showed that the age factor and income of farmers showed a non-significant relationship compared to the factors of education and participation of farmers in the farmer groups.

The importance of vegetables to health triggers an increase in the quality of vegetable production. To produce fresh and high quality vegetables, good handling is needed from the location and seeds selection phase to harvest way. The problem of pests and plant diseases in Pandeglang Regency is an inseparable part of vegetable cultivation. One obstacle in increasing the productivity of vegetables in the area is the presence of Plant-Disturbing Organisms (PDO) as a limiting factor that can reduce agricultural production and the use of pesticides that can cause pesticide residues in the environment. Plant protection is a complex process that requires an understanding of the role of each component of the environment, farming systems and cropping systems implemented [29]. The emergence of various pest problems such as resistance, resurgence, emergence of secondary pests, and residues of active ingredients of pesticides are some evidence of failure of conventional control methods that rely heavily on synthetic pesticides. Unwise use of pesticides can cause new problems, such as environmental pollution, detrimental to human and animal health, target insect populations become resistant to insecticides that are used continuously, the occurrence of resurgence after insecticide treatment, as well as the number of non-target organisms dying like predators, parasitoids, antagonistic agents, and pollinators [21]. Strategic opportunities for the horticultural commodity business, especially vegetables, are in an increasingly competitive market condition that requires the support of product quality regulation policies such as regulations that guarantee the safety of these products from pesticide residues [30]. In addition, a control effort that is more environmentally friendly and safer to human health and other non-target organisms is needed. The emergence of new problems in agricultural development has inspired experts to come up with the concept of Integrated Pest Management (IPM). The principle of IPM is to minimize the use of pesticides by integrating various control methods that are compatible while still improving environmental sustainability. This can take place by prioritizing biological control, how to cultivate healthy plants including the use of resistant plants, and the use of pesticides by always considering environmental sustainability. The latest information on alternative control techniques or environmentally friendly agricultural systems has not yet been fully received by farmers compared to conventional pest control using synthetic pesticides. Therefore, research needs to be done to obtain this information so that it can be used in the development of IPM of horticultural crops.

Based on the facts of research results, as well as information and concepts of IPM, it can provide a basis for understanding to farmers, should switch to organic farming methods that will provide long-term benefits, not for a short-term as well as non-organic farming that provides short-term benefits, limited to farmers, but very detrimental to consumers. With this effort, it will ensure farmers to be educated to manage their land in a sustainably, while maintaining agricultural productivity and products at the same time.

4. Conclusion

4.1. Conclusion

Based on the research, it can be concluded that 1) there is a very significant difference in residual levels of the active substances of chlorfenapyr, diphenconazole, and fipronil between non-organic and organic farming; 2) Organic farming can eliminate the residue of active substances in vegetables; 3) Decreased levels of residual active substances of chlorfenapyr, diphenconazole, and fipronil, resulting in improved land quality as indicated by increasing soil NPK levels; 4) Decreased levels of residual active substances chlorfenapyr, diphenconazole, and fipronil, resulting in improved nutritional quality of vegetables as indicated by increased levels of protein, vitamin A, vitamin C of vegetables; 5) Increasing land productivity and the quality of vegetable yields on organic farming can be a sustainable agricultural education effort.

4.2. Suggestions

Although very small/ low levels of residual active substances were detected, all residual active substances were still far (ng/ g) from the permitted threshold; 0.1 ppm or 1 mg/ kg. While,

because it is difficult to degrade and it is bioaccumulative, one is still important and absolutely monitored in farming using chemical synthetic insecticides and fungicides. Beside affecting the food quality, disrupting the consumers' health, the death of biota that can affect the balance of the ecosystem which ultimately damages the environment, even though at first the effect provides short-term financial benefits.

Acknowledgments

Thanks to the Director of Research and Community Service, General Directorate of Strengthening Research and Development, Ministry of Research and Technology, and Higher Education, who have provided funding to the Campus Intellectual Product Development Program (PPUPIK) Schematics Service Team.

References

- [1] Jeffry, E. S., & Bambang S. S., The Effect of Rice Farming Intensification on Increasing Production and Farmer Income in Manokwari Regency. *Journal of Informatika Pertanian*, 22(2), (2013), 73-79.
- [2] Parlindungan Lumbanraja, Sustainable Agriculture. Agroecotechnology Study Program. Medan: Faculty of Agriculture, University of HKBP Nommensen Medan, (2018).
- [3] Asep, N. A., The Pesticide Residues and its Identification and Handling Techniques Using Materials Around Us. *Agro Inovasi. Science Innovation Networks. Agricultural Environment Research Institute. Agricultural Research and Development Agency. Indonesian Ministry of Agriculture*, (2018).
- [4] Julita, H., Muhammad, R., & Triana, D. H., Risk Analysis of Organic Rice Production in Rowosari Village, Sumberjambe District, Jember Regency. *Jurnal Agribisnis Indonesia*, 6(1), (2018), 23-34.
- [5] South Sumatra Province Food Security Agency. BKP Activity Report of South Sumatra Province 2009-2013. BKP of South Sumatra, Palembang, (2013).
- [6] Claeys, W. L., Schmit, J. F., Bragard, C., Maghuin-Rogister, G., Pussemier, L., & Schiffers, B. Exposure of Several Belgian Consumer Groups to Pesticides Residues through Fresh Fruit and Vegetable Consumption. *Food Control*, 22(3-4), (2011), 508-516.
- [7] Food Crops and Horticultural Protection Agency of South Sumatra Province. Activities Report, Palembang, (2013).
- [8] Miskiyah, & Munarso, S. J., Pesticide Residue Contamination in Red Chili, Lettuce and Onion (Case Study in Bandung and Brebes, Central Java and Cianjur, West Java). *J. Hort.*, 19(1), (2009), 101-111.
- [9] Agus, S., Achyani, Hening, W., Feny, T., & Nedi, H., Campus Intellectual Product Development Program (PPUPIK) Service Report. Institute of Research and Community Service. LPPM of Muhammadiyah Metro University, (2019).
- [10] Madi, S., Insecticide Made from Chlorphenapir. *Teknologi Informasi*, (2015).
- [11] Ida, K., Rusdy, S. N., Ramadhani, E. P., Agus, D. P., & Mia, R., Toxicity of Several Types of Commercial Fungicides in Pollinating Insects, *Trigona (Tetragonula) laeviceps* Smith. *Indonesian Journal of Entomology*, 14(1), (2017), 29–36.
- [12] Indah, N., Abdul, B., Indiyah, M., & Heri, P., Evaluation of the Effects of Fipronil and Diafenthiuron Mixtures in Controlling Tobacco Leaf Caterpillars (*Spodoptera litura* Fabricius) in Tobacco Plants (*Nicotiana tabacum* L.). *Folium Journal*, 1(2), (2018), 79-87.
- [13] Saptana, & Ashari, Sustainable Agriculture Development Through Business Partnerships. *Jurnal Litbang Pertanian*, 26(4), (2007), 123-124.

- [14] Maryati, H., Idham, A., & Dwi, The Comparison of Productivity Levels and Income of Farmers Using Organic Fertilizers in Different Land Agroecosystems in South Sumatra. National Seminar on Suboptimal Land, (2014).
- [15] Gita, A., Pesticides in Our Vegetables. Republika. Co. id. Wednesday, (2018).
- [16] Badan Standardisasi Nasional (National Standardization Agency), Maximum Limits of Pesticide Residues in Agricultural Products. SNI 7313, (2008).
- [17] Connell, D. W., & Miller, G. J., Chemical and Ecotoxicology of Pollution (Y. Koestoeer (trans.)). Jakarta: University of Indonesia Press, (2006).
- [18] Sartono, Poison and Poisoned. Jakarta: Widya Medika, (2002).
- [19] Zhang, Z. Y., X. Liu, X. Yu, C. Zhang, & X. Hong, Pesticides Residue in Spring Cabbage (*Brassica oleracea* L. var. *capitata*) Grown in Open Field. J. Foodcont., 18(6), (2007), 723-730.
- [20] Euis, A., Benny, J., & Sunardi, S., Pesticide Residues in Horticultural Plants (Case Study in Cihanjuang Rahayu Village, Parongpong District, West Bandung Regency). Journal of Agriculture, 27(1), (2016), 23-29.
- [21] Untung, K., Basics of Integrated Pest Management. Yogyakarta: Gadjah Mada University Press, (2001).
- [22] Jorge, C., Pesticide Residues in Vegetables and Fruits Can Reduce Sperm Quality. Reuters: Detikhealt, (2015).
- [23] Cox, C., Insecticide Factsheet Permethin. Journal of Pesticide Reform, 18(2), (1998), 14-19.
- [24] Tjahjadi, & Gayatri, Remember the Dangers of Pesticides: Collection of Pesticide Residues and Alternatives. Jakarta: PAN Indonesia, (1994).
- [25] Djojosumarto, Pesticides and The Applications. Jakarta: PT. Agromedia Pustaka, (2008).
- [26] Fahrurnisa, Y., Orryani, L., & Suwastika, I. N., The Abundance of Soil Microorganisms in Semi-Intensive and Non-Intensive Cocoa Plantation Systems (*Theobroma cacao* L.). Journal of Science and Technology, 6(3), (2107), 194-205.
- [27] Munzuroglu, O., Obek, E., Karatas, F., & Tatar, S. Y. Effects of Simulated Acid Rain on Vitamin A, E, and C in Strawberry (*Fragaria vesca*). Pakistan Journal of Nutrition, 4(6), (2005), 402-406.
- [28] Lilis Zakiyatunnufus, Knowledge, Attitudes, and Actions of Vegetable Farmers in the Use of Pesticides in Pandeglang District, Banten. Thesis. Department of Plant Protection. Faculty of Agriculture. Bogor: Bogor Agricultural University, (2015).
- [29] Sutanto, The Application of Correctional Organic Agriculture and Its Development. Yogyakarta: Kanisius, (2002).
- [30] Walangadi, The Pesticide Residue Regulation Policy: Implementation on Horticultural Commodities. Thesis, Indonesia: Bogor Agricultural University, (2000).



ELSEVIER



1 - 2 of 2 items



[Make a Submission](#)



The Effectiveness of Pumakkal Organic Waste Bioremediator

Agus Sutanto, Hening Widowati,
Achyani, Fenny Thresia, Nedi
Hendri, M. Rustam Rifai, Elza
Yulistiana

132 - 143

2020-04-14

The Concept of Organic Cultivation as a Sustainable Agricultural Education Effort

Hening Widowati, Agus Sutanto,
Achyani, Fenny Thresia, Nedi
Hendri, Mia Cholvistaria

144 - 157

2020-04-14





sersc.org/journals/inde



Register

Login

International Journal of Advanced Science and Technology

Home

Editorial Board

Journal Topics

Archives

About the Journal

Submissions

Privacy Statement

Contact

Search





Dear Author,

Paper ID: IJAST_Submission_15

Paper Title: The Concept of Organic Cultivation as a Sustainable Agricultural Education Effort

Congratulations! On behalf of Editorial Team of the “**International Journal of Advanced Science and Technology**”, we are pleased to inform you that your Paper has been accepted publication in IJAST Current Issue of 2020 as per the recommendations given by the peer review group of experts.

Please treat this email as an Official communication reference email for all the publication related activities & quote the Paper No. & Name for future correspondence.

We would like to further extend our congratulations to you that your paper is accepted for publication in upcoming issue of IJAST Journal. Kindly email us your final paper and scanned copy of copyright form. The blind peer review process results are given below

----- **REVIEW 1** -----

----- Overall evaluation -----

Review Decision 1: Accepted

----- TEXT:

1. Originality: 84%
2. SCOPE: 83%
3. Results: Satisfactory
4. References are Cited Properly

----- **REVIEW 2** -----

Review Decision 2: Accepted

1. Originality: 83%
2. SCOPE: 84%
3. Results: Satisfactory
4. References are Cited Properly

Final Decision: Accepted

For any further query feel free to contact us.

Regards
Editorial Team, IJAST
SERSC Journals



International Conference on Science, Technology, Engineering, Economics, Education, and Mathematics

Sekretariat: Kampus II Universitas Ahmad Dahlan

Jl. Pramuka No.42, Pandeyan, Umbulharjo, Daerah Istimewa Yogyakarta 55164, Telp. 0274-563515 ext. 2128

Website: <http://steem.mpmat.uad.ac.id/en/fp/>

Payment Confirmation Receipt

The organizing committee of The 1st International Conference on Science, Technology, Engineering, Economics, Education, and Mathematics (1st ICSTEEEM), has received the payment:

From : Hening Widowati
Country : Indonesia
Amount : 5,300,750 IDR
For : Publication fee of 1st ICSTEEEM
Paper title: The Concept of Organic Cultivation as a
Sustainable Agricultural Education Effort
Date of Payment : March 30, 2020

Cordially yours,
General Chair



Dr. Suparman, M.Si., DEA.