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The Promotion of Organic Agricultural Volunteer Youth and Planting from Waste Materials to Environmental Conservation for Primary School Students, Maha Sarakham Province, Thailand

Wutthisak Bunnaen[1], Ongart Yartniyom[2], Phanomphong Suwannasingha[3], Aphinya Phatthrathammarak[4], Phanat Photibat[5], Kuantean Wongchantra[6], Prayoon Wongchantra[7*]

[1,2,3,4] Mahasarakham University Demonstration School (Secondary), Maha Sarakham, Thailand
[5] Faculty of Fine-Applied Arts and Cultural Science, Mahasarakham University, Maha Sarakham, Thailand
[6] Srimahasarakham Nursing College, Praboromarajhanok Institute, Maha Sarakham, Thailand
[7] Faculty of Environment and Resource Studies, Mahasarakham University, Maha Sarakham, Thailand
* Corresponding Author : prayoon_nam@yahoo.co.th

ABSTRACT

This research aims to compare awareness of native organic vegetable growing by using waste materials as planting materials for environmental conservation, the volunteer spirit, and expansion before and after participating in activities. The sample group consisted of 100 youth volunteers. The research instruments included a volunteer spiritual test, an awareness questionnaire, and an expansion questionnaire. This study revealed three key findings. First, by using t-test, the students' average awareness of planting local vegetables using waste materials as planting materials for environmental conservation after participating in the activities was higher than before with a statistical significance level of .05. Regarding the volunteer spirit, the volunteer spirit after participating in the activities was higher than before with a statistical significance level of .05. Lastly, regarding the expansion of the promotion of native organic vegetable farming using waste materials as planting material, the participants after 1 month of participating in the activities, they gained the knowledge and expanded it to their parents and school mates and the level of expansion was found to be high.

Keywords
Volunteer spirit; Awareness; Native organic vegetable; waste materials; organic agriculture; environmental conservation

Introduction

Recycling is a key part of decreasing present-day waste. The reduction, reuse, and recycling of waste maintains an ecological economy by substituting crude material contributions to, and diverting waste yields out of, the monetary framework. Due to the growing amount of residual waste, it is encouraged to apply a waste hierarchy to provide viable alternatives in managing waste and efficiently using resources to move towards a low-carbon economy. This includes the development of sustainable alternatives that can reuse different kinds of waste by formulating them into secondary materials. Human activities, such as construction, impact the environment. Recycling waste reduces disposal costs and carbon emissions. It also helps to comply with environmental legislation and landfill restrictions. The use of waste materials as soil amendments has received increased attention in recent years for agronomic applications as well as soil reclamation projects. Adding these materials to soils can be viewed as serving a dual purpose: (1) for disposal of solid waste from municipalities and agricultural operations and (2) as a means to improve chemical and physical soil properties which in turn promotes improved crop performance. A variety of materials have been investigated for their suitability as soil amendments. For example, applications of composted municipal solid waste and composted crop residues were shown to increase soil fertility and improve structural stability in agricultural. Currently, taking care of the health of the people, consumers pay more attention to safe food consumption, especially food that comes from the process of organic farming. therefore a guideline for sustainable development and the promotion of environmental quality. The survey on issues of organic farming learning management in educational institutions for youth in primary schools near of Mahasarakham University, it was found that in basic education management at the elementary level there is not direct agricultural course but is inserted in the subject matter of learning in the subject Career and Science learning group and there is no teacher who graduated directly from teaching agriculture. The some schools do not have experienced learning activities there is not organic farm in the school. From the importance of organic agriculture and being fundamental to life therefore absolutely necessary that requires a process to develop learning on organic farming for youth and students at both primary

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school levels and secondary to give knowledge and skills in organic farming in order to be adapted of learning and future career.

An obstacle to research primary schools near Mahasarakham University located in Kantharawichai District, Mahasarakham Province, Thailand, is that most of them are small schools with a small number of students. Most of the richer families send their children to schools in the downtown. As a result, students in urban schools are children of poorer families, most of whom are farmers. Small schools do not have much space for vegetation or agricultural learning area. According to a study, 74 percent of urban schools require a space of 30-50 square meters to develop an organic farming learning center and the most appropriate ratio between student and farming space is 1: 3 square meters [1].

For this reason, the researchers are motivated to promote native plants grown by using recycled materials as an attempt to safeguard the environment, recycle used materials, and save the cost. Not only does this require a smaller area, but the agricultural products can also be used as food for school students. More importantly, it will promote children's learning and awareness of organic agricultural promotion.

Research objectives

1. To promote youth volunteer spirit in organic agriculture and native plants grown by using waste materials as the planting materials for primary school students in schools near Mahasarakham University.
2. To compare the awareness of growing native vegetables using waste materials as the planting materials for environmental conservation of primary school students in schools near Mahasarakham University before and after the promotion activities.
3. To promote youth volunteer spirit and expansion of native vegetable growing using waste materials as the planting materials of primary school students in schools near Mahasarakham University after the promotion activities.

Methodology

1. Hypothesis

After participating in the activities to promote youth volunteer spirit in organic agriculture for environmental conservation and growing native vegetables using waste materials, the participants will have more awareness and volunteer spirit.

2. Population and sample group

The population in this promotion activity included 600 students who were in grade 4-6 at Ban Kham Riang School, Ban Don Wiang Chan School, Ban Makok School, Ban Tha Khon Yang School, and Ban Don Nong School located near Mahasarakham University, Kantharawichai District, Maha Sarakham.

The sample in this promotion activity included 100 students who were in grade 4-6 at the 5 abovementioned schools located near Mahasarakham University who volunteered to join this project (voluntary sampling).

3. Research design

The Action Research and One Group Pretest – Posttest Designs were used.

4. Instruments

4.1 Instruction instruments

1) The activities for promoting volunteer spirit in organic agriculture and growing native vegetables by using waste materials as the planting materials.
2) A lecture by a guest speaker aiming to educate the students in organic agriculture, environmental conservation, and growing native vegetables by using waste materials as the planting materials.

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4.2 Assessment and evaluation instruments

1) The volunteer spirit test on organic agriculture and growing native vegetables by using waste materials as the planting materials with 20 questions and 5 rating scale ranging from highest, high, medium, low, and lowest.
2) The awareness questionnaire about growing native vegetables using waste materials as the planting materials for environmental conservation with 5 rating scale ranging from highest, high, medium, low, and lowest.
3) The expansion evaluation questionnaire about growing native vegetables using waste materials as the planting materials for environmental conservation with 5 rating scale ranging from highest, high, medium, low, and lowest.
The interpretation of the average score of the research instrument is weighted as below [2].

4.51 – 5.0	means	highest
3.51 – 4.50	means	high
2.51 – 3.50	means	medium
1.51 – 2.50	means	low
1.00 – 1.50	means	lowest

4.3 The research tools and quality of tools

The promotion organic agricultural volunteer youth and planting from waste materials for primary school students, researchers have built and searched for quality tools as follows:
1) Study and research preliminary information related to the development questionnaire by studying concepts, theories, documents and related research in order to plan for the preparation of the questionnaire for efficiency.
2) Study knowledge about organic agricultural by studying the document books, texts and various media to guide the activities in the development of questionnaire. It will focus on the content to be consistent with the objectives of the activity.
3) Bring an questionnaire created for 5 experts and used for try out it was found that:
3.1) Awareness of growing local vegetables by using waste material as planting material for environmental conservation test found that all questionnaires had an the consistency value (IOC) than 0.50 and assessed the suitability of the questionnaire by experts, found that the average suitability was 4.49, which at the highest level, indicating that the questionnaire was the most appropriate can be used. The discrimination every item was greater than the critical value 0.361 and the α - Cronbach Coefficient method was found that there is a confidence factor of 0.98, indicating that the questionnaire can be used to collect information.
3.2 Volunteer spirit of organic agriculture and local vegetable growing by using waste material as planting material test. By examining the correctness of the content by experts (IOC), it was found that all of the volunteers test had the consistency value (IOC) than 0.50 for all items. And assessing the suitability of the volunteers test form by experts, it was found that the average suitability was 4.80, which was the highest level, indicating that the volunteer spirit measurement model could be used. The discrimination every item is greater than the critical value of 0.361 and the α - Cronbach Coefficient method was found that there is a confidence factor of 0.95, which indicates that the volunteers test can collect data.
3.3 Evaluation form for expanding local vegetable cultivation by using waste material as planting material by examining the accuracy of content by experts (IOC), it was found that all of the assessments had the consistency value (IOC) than 0.50 for all items. And assessing the appropriateness of the assessment form by experts found that the mean of appropriateness was 4.72, which is the highest level, indicating that the assessment can be used.

5. Data collection procedure

In this research, the researchers promoted the growing of native vegetables by using waste materials as the planting materials for students at Ban Kham Riang School, Ban Don Wiang Chan School, Ban Makok School, Ban Tha Khon Yang School, and Ban Don Nong School, Kantharawichai District, Maha Sarakham. The data collection procedure was divided into three stages.

Stage: 1

1. The researchers collected data from secondary sources i.e. textbooks, concepts, theories, and relevant studies.

2. The researchers drafted the outline of the research, consulted with the head of the Foundation of Environmental Education and held a meeting to make the action plan among the research participants and lecturers who would educate volunteer students at Mahasarakham University Demonstration School (Secondary) and primary school students interested.
3. The researchers constructed the data collection instruments and validate the reliability and quality of the instruments by seeking assistance from lecturers at the Department of Environmental Studies, Faculty of Environment and Resource Studies, Mahasarakham University, environmental experts or scholars.

Stage: 2

1. The researchers recruited volunteer students at Mahasarakham University Demonstration School (Secondary) and primary school students near Mahasarakham University to join the activities.
2. The researchers prepared the space and floating planting materials. The planting containers were used lockers, used tires, used plastic bottles. The planting materials included organic matters and soil. The seeds of vegetables were prepared and geminated.
3. The awareness and volunteer spirit of organic agriculture and growing vegetables by using waste materials were tested with primary school students in the vicinity of Mahasarakham University. The pre-treatment awareness test and volunteer spirit questionnaire were distributed to the students before introducing them to the activities.

Stage: 3

1. The training was organized to educate the students in the theory and practice of growing organic native vegetables by using waste materials. The activity aiming to promote awareness of environmental conservation was also held for primary school students in the vicinity of Mahasarakham University.
2. The participants were asked to grow organic native vegetables using waste materials. They also studied the species of native vegetables, organic agriculture, and ecosystem in the vegetation plot.
3. The awareness and volunteer spirit of organic agriculture and growing vegetables by using waste materials were tested with primary school students in the vicinity of Mahasarakham University. The post-treatment awareness test and volunteer spirit questionnaire were distributed to the students before introducing them to the activities.
4. The researchers collected the data and monitored the expansion of the concept to their families and friends. The expansion questionnaire was used with primary school students in the vicinity of Mahasarakham University.

6. Data analysis

The procedure of data analysis was as follows:
1. The quality of tools used to determine the effectiveness of the research instruments.
2. The researchers analyzed the outcome of growing the vegetables and the effectiveness of growing the vegetables by using waste materials as the planting materials in different growing methods.
3. The researchers analyzed the volunteer spirit of organic agriculture and growing vegetables by using waste materials were tested with primary school students in the vicinity of Mahasarakham University after the training and the activities.
4. The researchers used paired t-test to compare the awareness of organic agriculture and growing vegetables by using waste materials tested with primary school students in the vicinity of Mahasarakham University between before and after the activities.
5. The researchers used paired t-test to analyze the degree of expansion of promoting native vegetables by using waste materials as the planting materials by primary school students in the vicinity of Mahasarakham University between before and after the activities.

7. Statistical tools used for data analysis

The researcher used the computer software package to analyze the data. The statistical tools used were as below.
1. Descriptive statistics i.e. frequency, percentage, average ($\bar{x}$) and standard deviation (S.D.).
2. Statistics used to analyze the quality of the instruments included:
2.1 The Index of Item-Objective Congruence (IOC) of the questionnaire was performed by experts.

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2.2 The fitness value of the questionnaire was evaluated by experts.
2.3 The discrimination power of the questionnaire was calculated by using the item-total correlation.
2.4 The reliability of the questionnaire was validated by the α – Cronbach Coefficient).
3. The hypothesis testing statistics was paired t-test with the statistical significance level of .05.

Results

The results of growing native vegetables by using waste materials and the agricultural produce from waste materials are as below.

1) The floating vegetable plots (1 x 2 x 0.3 m) made of 2 kg of organic matter in the area of 2 m2 were used to test growing 8 types of vegetables, 5 each. The fastest growing and sprouting vegetable was *Kaempferia rotunda L.,* followed by *Limnocharis flava (L.) Buch, Nasturtium officinale, Diplazium esculentum (Retz.) W.,* and *Oenanth javanica (Blume) DC.,* respectively. The slowest growing and sprouting vegetable was *Lasia spinosa (L.) Thwaites.*

2) The organic vegetable plots made of used lockers (0.32 X 0.42 X 0.45 m) consisted of 18 plots in one locker. The ratio of planting materials was 10 kg of organic matter (1 part), 4 kg of decayed leaves (1 part), and 20 kg of soil (1 part). The planting material in the controlled plot contained only 50 kg of soil.

Table 1. The results of growing organic vegetables from waste material in used lockers (45 days).

Type of vegetables	Testing materials	weight of vegetables in plot 1 (grams)	weight of vegetables in plot 2 (grams)	weight of vegetables in plot 3 (grams)	Avg. vegetable weight (grams)
Chinese chive	Controlled	105	95	85	86.00
Allium tuberosum Rottler ex Spreng.	Treatment	140	165	170	158.34
Collards	Controlled	90	130	120	113.34
Brassica alboglabra	Treatment	490	320	310	373.33
Dill	Controlled	80	120	110	103.34
Anethum graveolens L.	Treatment	180	200	190	190.00
Morning glory	Controlled	430	360	460	416.67
Ipomoea reptans L.	Treatment	450	380	550	460.00

Table 1. demonstrates the experiment of growing organic vegetables in used lockers by using waste materials as the planting material. The controlled plots used soil (100%) as the planting material while the treatment plot used a mixture of materials, including organic matters, decayed leaves, and soil at the ratio of 1:1:1. Each type of vegetables in the treatment plot grew significantly better and had higher dry weight than in the controlled plots.

3) Organic vegetables in plastic bottles. To grow organic vegetables in 1.5-liter plastic bottles, the appropriate ratio of planting material was organic matter, decayed leaves, and soil (1:1:1), with a total weight of 11 kg. This method could be used either vertically or horizontally. According to the analysis, the awareness of growing native vegetables using waste materials as the planting material for environmental conservation, most items of awareness rating before joining the activities were at a high level. Some of the items were found to be medium and the overall awareness was at a high level.

Table 2. Analysis results of awareness of growing native vegetables using waste materials as the planting material for environmental conservation after joining the activities.

Item	Awareness	$\bar{X}$	S.D.	Interpretation
	Attribute 1: Acceptance			
1	Organic native vegetables are important for good health.	4.66	0.58	Highest
2	Waste reduction and recycling should be the responsibility of everyone.	4.57	0.63	Highest

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Item	Awareness	$\bar{X}$	S.D.	Interpretation
3	Waste and leftover materials are problems for the environment and ecosystem.	4.37	0.81	High
4	Understanding organic agriculture for household consumption is important for life and can reduce household expenses.	4.55	0.76	Highest
5	Using chemicals in farming results in the destruction of other organisms in the ecosystem	4.51	0.75	Highest
	Attribute 2: Response			
6	Growing vegetables for consumption from waste helps reduce the use of chemicals and minimize the impact of global warming.	4.76	0.57	Highest
7	Growing vegetables in the household area and on the fence keeps a healthy environment.	4.40	0.65	High
8	You understand the importance of growing vegetables from waste materials and can do so.	4.48	0.73	High
9	Encouraging friends and families to grow native vegetables from waste materials is important and everyone should do it.	4.45	0.65	High
10	Using plant debris as compost for growing plants helps reduce was and the household expense.	4.58	0.78	Highest
	Attribute 3: Appreciation			
11	Using native vegetables can reduce or prevent pest outbreaks.	4.45	0.73	High
12	There should be training in waste sorting and recycling to save the environment.	4.46	0.65	High
13	Schools should promote waste sorting and recycling to save the environment.	4.64	0.61	Highest
14	In your house, there are waste materials that you can use as the planting materials.	4.48	0.73	High
15	The training on growing native vegetables from waste materials gives you more knowledge and you can expand the knowledge to your school and family.	4.75	0.47	Highest
	Total	**4.54**	**0.67**	**Highest**

According to Table 2. students' awareness of growing native vegetables using waste materials as the planting material for environmental conservation after joining the activities had most item average scores at the highest level, some of the items were at the high level, and the overall average was at the highest level. The highest average was in the attribute of response (6. Growing vegetables for consumption from waste helps reduce the use of chemicals and minimize the impact of global warming), followed by the attribute of appreciation (15. The training on growing native vegetables from waste materials gives you more knowledge and you can expand the knowledge to your school and family).

Table 3. The comparison results between the awareness of growing native vegetables using waste materials as the planting material for environmental conservation between before and after joining the activities using the paired t-test.

Awareness	Before (N=5)		After (N=5)		df	*t*	P
	$\bar{X}$	S.D.	$\bar{X}$	S.D.			
Sample (100 persons)	3.61	1.34	4.54	0.67	14	-19.866	.000*

* Statistically significance level of .05.

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According to Table 3. the students' awareness after joining the activities was higher than before joining the activities with the statistical significance level of .05.

Table 4. The comparison results between students' volunteer spirit of growing native vegetables using waste materials as the planting material for environmental conservation between before and after the activities using the paired t-test.

Volunteer spirit	Before (N=10)		After (N=10)		df	*t*	P
	$\overline{X}$	S.D.	$\overline{X}$	S.D.			
Sample (100 persons)	2.93	1.22	4.79	1.23	99	-11.262	.000*

* Statistically significant level of .05.

According to Table 4. the students' volunteer spirit after joining the activities was higher than before joining the activities with the statistically significance level of .05.

Table 5. Analysis results of the expansion of the promotion of growing native vegetables using waste materials as the planting materials.

Item	Expansion of the promotion	(n = 100), (N=5)		
		$\overline{X}$	S.D.	Interpretation
1	You warn your friends about the danger of chemicals in vegetables and fruits.	4.31	0.81	High
2	You share the knowledge of agricultural chemicals with your parents.	4.46	0.61	High
3	You tell your parents or people in your community to reduce the use of agricultural chemicals.	4.38	0.74	High
4	You tell your friends or parents to reduce the use of plastic.	4.44	0.71	High
5	You tell your friends or parents to make the maximum use of products.	4.48	0.62	High
6	You persuade your school mates to grow organic vegetables at school.	4.49	0.7	High
7	You advise your friends to make compost from plant debris.	4.44	0.72	High
8	You propose to your teacher about having an organic farm and using waste materials on the school farm.	4.33	0.69	High
9	You recommend your friend to use plastic bottles and other waste to grow vegetables at school.	4.54	0.64	Highest
10	You can lead other people to reduce waste and recycle waste at home or at school.	4.53	0.59	Highest
	Total	**4.44**	**0.68**	**High**

Primary school students near Mahasarakham University participated in the activities to promote volunteer spirit in organic agriculture to conserve the environment and grow vegetables by using waste materials. The organizers monitored them 1 month after the activities regarding the use of waste materials to grow vegetables and expanding their knowledge to their parents and school mates. According to Table 5, most items and the overall average of expansion were at a high level. For Item 9 and Item 10, the expansion levels were at the highest degree.

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Discussions

1. This study investigated the promotion of organic agriculture volunteer spirit and growing vegetables from waste materials among primary school students in the vicinity of Mahasarakham University. According to the results of using waste materials as the planting materials, it can be concluded that the floating organic agriculture plot sized 1 x 2 x 0.3 m requires the total organic matter of 70 kg as the planting materials. This ratio is suitable for the planting area of 2 m^2 to float on the water surface. By experimenting with the growth of 5 plants of 8 vegetable species, the fastest growing and sprouting vegetable was *Kaempferia rotunda L.*, followed by *Limnocharis flava (L.) Buch* because these two species grow and sprout well in the area with a high quantity of water. Other plant species sprout lower, depending on their nature.

The organic vegetable plots in the used lockers had a size of 0.32 x 0.42 x 0.45 m, with 18 plots in each locker. Samples were collected from 3 plots of the treatment group and 3 other plots from the controlled group. The controlled plots used soil (100%) as the planting material while the treatment plot used a mixture of materials, including organic matters, decayed leaves, and soil at the ratio of 1:1:1. It was found that each type of vegetables in the treatment plots grew significantly better and had higher dry weight than in the controlled plots. This is because the mixture of organic matter, plant debris, and soil at the ratio of 1:1:1 increases the number of organic matter and natural fertilizer into the soil, resulting in better growth of plants in the treatment plot. Planting vegetables in used lockers is a way to make use of and reduce waste. In addition to this activity, the participants were also encouraged to use plastic bags, foam boxes, and old tires to use as the plant containers, especially plastic bags which are plenty in the community and school. Likewise, using organic matters and plant debris from mowing and trimming in the school premises is reuse of these materials for growing native vegetables for household consumption and promotion of organic agriculture for environmental conservation. Which is consistent with the findings by Md Zahangir Hossain [3]. Using different organic matters also benefits the soil qualities and growth of plants. Organic waste used for agriculture plays a critical role in recycling nutrients from plants required for soil stability and safeguarding the environment from undesirable threats. These findings agree with those of Lourdes Hernández-Apaolaza, Antonio M.Gascó, José M.Gascó, and Francisca Guerrero [4]. These scholars experimented using different types of waste (bark of pine trees, coconut fiber, and wastewater sediment) as the surface materials for growing decorative plants. The tested species included *Pinus pinea*, *Cupressus arizonica*, and *C. sempervirens.* From their study, the reactant made from (1) bark of pine trees, (2) bark of pine trees with 15% of wastewater sediment, (3) bark of pine trees with 30% of wastewater sediment, (4) coconut fiber, (5) coconut fiber with 15% of fermented sewage, and (6) coconut fiber with 30% of compost from wastewater sediment resulted in good physical and chemical characteristics of soil surface that can grow the plants 75 cm for one year. Which is consistent with the findings of Ying Li, Hongyi Cen, Yung-ho Chiu & Tai-Yu Lin [5]. Waste landfill plant and waste disposal plant efficiencies in China. This study used dynamic DDF DEA to analyze the waste disposal efficiencies in 23 provinces in China, the main conclusions from which are as follows: Nine of the 23 provinces had average overall efficiencies and some index efficiencies of 1, indicating that no improvements were necessary in the existing input and output waste disposal activities. Six of the 23 provinces had efficiencies below 0.8, ten had fluctuating declining efficiencies, and three had volatile fluctuating efficiencies. Which is consistent with the findings of Christie Oby Onyia, Amarachi Mariam Okoh & Okoh Irene [6]. Production of Plant Growth-Promoting Bacteria Biofertilizer from Organic Waste Material and Evaluation of Its Performance on the Growth of Corn (Zea mays). The results showed significant improvement in growth and yield of maize on which biofertilizer was applied as against those treated with NPK and the Control. The plants treated with the biofertilizer did not show signs of insects attack, which were easily observed on the blades of those treated with NPK and the control. Therefor, based on the findings and the observations made, it was concluded that the biofertilizer has a higher crop performance efficiency than the chemical fertilizer. The Plant Growth Promoting Bacteria isolated and used as biofertilizer in this research work also demonstrated the ability to protect the corn plants from pathogen/insect attack and therefore can serve as both biofertilizer and biopesticide or biocontrol agent. And Weena Nilawonk [7] have studied influence of organic and bio-extractson the growth and yield of okra, Chinese radish, and Kale. The results showed that the application of organic fertilizers and fermented bio-extracts significantly influenced the growth ($P<0.05$) and yield ($P<0.05$) of Okra, Chinese radish, and Kale. The combination of chicken dung and earthworm-vermicompost tea showed the highest yield of Okra (2,202.6 kg/rai). Whereas, the combination of guano and earthworm-vermicompost tea showed the highest head length and root yield of Chinese radish (17.8 cm. and 1,386.7 kg/rai, respectively), and the combination of earthworm-vermicompost tea showed the highest yield of Kale (799.9 kg/rai). And Pitchya Tangsombatvichit and Utharn Buranasaksee [8] have studied

vermicomposting: biological technology for soil conservation and organic wastes management in Thailand. The results showed that vermicomposting is an innovative sustainable technology for organic and agricultural waste treatment which is a natural process of quick recycling of organic material into nutrient-rich compost using earthworms such as Eudrilus eugeniae under aerobic condition. Vermicompost is an eco-friendly non-toxic product, low cost, less mechanized, easy operation and uses low energy input during processing etc. This process is adopted for the improvement of soil damage. And Karistsapol Nooprom [9] have studied organic vegetable production, found that the organic vegetable yields must not be contaminated by any synthetic chemical after collection and the yields have to be clearly separated from any other vegetables. Based on the manufacturing standard requirements of the organic vegetable growing system, the farmers would surely be allowed to gain the higher quality yields with the acceptance of quality standard by vegetable consumers. And Apichart Jai-aree [10] have studied guidelines to promote organic agriculture to food security and safety for community: reflection from the operating sector, found that the they are interest and alert to agricultural products and consumption greatly but lack accurate information about organic agriculture in compliance with standard certification, including technology adaptation and modern methods in production process, they also deprive of knowledge about farming management system and marketing mechanism to support products.

2. The participants' awareness of growing native vegetables by using waste materials as the planting materials for environmental conservation before joining activities had the average item at a high level. Some of the items were at a medium level and the overall average was at a high level. After joining the activities, the participants' awareness was raised. Most items were rated at the highest level while some of them were high, and the overall average was at the highest level. Using paired t-test to compare the awareness before and after joining activities revealed that the post-activity awareness was higher than pre-activity awareness with the statistical significance level of .05. The findings are consistent with those of other scholars [1]. The research was conducted by organizing learning activities for the youths through training, field study, and hands-on practice. By comparing the students' attitudes toward and awareness of organic agriculture and environmental conservation before and after the activity, their attitude improved with a statistical significance level of .05 and the awareness improved with a statistical significance level of .05. These also agree with Detyothin [11] found that the problem-solving projects resulted in the effectiveness index of 0.7133 and that students in the treatment group demonstrated higher environmental knowledge, environmental awareness, and environmental problem-solving skills than before the instruction. These also agree with Keqiang Wang, Jianglin Lu & Hongmei Liu [12] had studied residents' waste source separation behaviours in Shanghai, China. This paper aims to investigate the driving forces behind waste source separation behaviour (WSSB), and behaviour anticipation was first introduced under the theory of planned behaviour (TPB). The specific research hypotheses (RHs) regarding WSSB are supported by relevant literature and the TPB, seven conceptual factors are established to investigate the key forces behind the rarely discussed WSSB of household solid waste (HSW), and the RHs are empirically tested through the structural equation modelling method with the 433 surveys conducted in Shanghai, China. Some interesting findings are observed in this study: both behaviour anticipation and environmental awareness and knowledge have an influence on attitudes. Attitudes, subjective norms (SNs), cost of separation, and convenience are all confirmed to play a role in influencing the separation intention towards WSSB. It was observed that separation intention and convenience have a significant effect on positive WSSB behaviour, which is supported by the TPB. In addition, several implications are proposed to strengthen WSSB. And Setthapong Apmaye [13] had studied a study of awareness of impacts on global warming relevant to home economics knowledge base of home economics students Suan Dusit Rajabhat university. The results showed that the study revealed that the majority of the sample had been aware of impacts on the global warming relevant to home economics knowledge. And Salakchit Phukcharoon and Polkrit Khumklum [14] had studied realization of environmental ethics of Rajamangala University of Technology Phra Nakhon students towards the refuse disposal problem. The results showed that the research was found that 49.47% of the students had a high level of the realization of environmental ethics 30.37% had a medium level and 19.30%. And Suwitcha Raksasri [15] had studied the development of environmental awareness through recreational activities for fifth grade students. The results were shown with eight school students environmental awareness was positive level. After participating in recreational activities, development of environmental awareness through activities were higher than before which significantly different of statistic at .05 level. And Chuleewan Praneetham [16] had studied awareness and air travel behavior of Thai Passengers for global warming alleviation in the Airline Industry. The results revealed that impact of global warming causes more hot weather, climate variability, season change, disaster and natural disasters. For the global

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warming alleviation which passengers had a positive opinion that they can help reduce global warming and the impact on environment from air travel. Awareness on global warming of Thai passengers was at good level.

3. The participants' volunteer spirit before and after joining the activities was found that their level of volunteer spirit after joining the activities with a statistical significance level of .05. This is consistent with Wongchanthra, P. [17] who investigated the pedagogy of environmental studies that attached morality for undergraduate students found that students in the treatment group had the environment knowledge of 69.00 percent of the total score while those in the controlled group had 60.75 percent. Also, students in the treatment group had environmental morality at level 4 in terms of integrity while those in the controlled group had environmental morality at level 3 in terms of morality for society. Students in the treatment group had overall environmental knowledge, environmental morality, and the four specific attributes i.e. forest, water resource, waste, and global warming, higher than the controlled group ($p < .05$). Female students in the treatment group had overall environmental knowledge and environmental morality lower than males ($p < .05$). Students in the treatment group with high and medium academic achievement had overall environmental knowledge and environmental morality higher than those with low academic achievement. Lastly, students in the treatment group had higher environmental morality than those with low and medium academic achievement ($p < .05$). Also, the findings of the current study also agree with those of Sabaichit, C. [18] had developed the learning activities to promote public spirit among grade 6 students. By asking the teachers about students' expression of public spirit, grade 6 students' behavior was still troublesome and required improvement on public spirit both inside and outside of school, namely helping others and participating activities beneficial to schools and society. The effectiveness assessment of the learning activities to promote public spirit revealed that students followed the activities at a high level and expressed obvious and consistent the public-spirited behavior through self-reflection. The assessment of students' public spirit by the teacher after using the lesson plan revealed that students had a high public spirit. By comparing students' public spirit before and after using the lesson plan, found that the average level of public spirit in terms of helping others and participating in the activities beneficial to school and society increased with a statistical significance level of .05. Also, the findings of the current study also agree with those of Prayoon Wongchantra, et.al. [19] had studied the development of environmental volunteer spirit for high school students, found that the study and comparison of environmental volunteer spirit score at the grade level before and after the development, before the development, overall was at high level and after development at the high level. When classified the grade found that before development grade 4 students were at the high score level and after development at the high level, grade 5 students had average volunteer spirit at the high level and after development at the high level, before development, grade 6 students had at the high level and after development at high levels, students in grades 4-6 had scores for environmental volunteer spirit after development higher than before development as statistical significance value of .05. And Kannika Sookngam, Prayoon Wongchantra, Wutthisak Bunnaen [20] had studied the effect of environmental education training course in soil, water and forest conservation on the concept of The King Rama IX of Thailand. The results showed that the students' average score of environmental volunteers in the posttest was higher than the pretest statistical significance. And Uraiwan Praimee and Wannasakphijit Boonserm [21] had studied the effect of learning activities on waste and sewage management by using question and problems-based learning, found that the students had an average score of environmental volunteers towards promoting the reduction, acceptance, giving and use of plastic waste after promotion is higher than before promotion. And Ariya Wongphimsorn and Prayoon Wongchantra [22] had studied the effect of training course development of green university management in campus, energy, waste, water, transportation and education, found that there was difference of mean score of environmental volunteers before and after the training statistically significant level. 05. And Likhit Junkaew, Prayoon Wongchantra & Wutthisak Bunnaen [23] had studied the effects of environmental education learning activities using Area-Based Learning in Khok Hin Lad Community Forest in Maha Sarakham, Thailand, found that the student's environmental volunteers after learning activities were higher than before the learning activities' statistical significance ($p< .05$). And Suparat Ongon, Prayoon Wongchantra & Wutthisak Bunnaen [24] had studied the effect of integrated instructional activities of Environmental Education by using community - based learning and Active Learning, the students had average score of the environmental volunteers in the posttest higher than pretest statistical significance ($p<.05$). And Jackrit Thinkhamchoet, Prayoon Wongchantra & Wutthisak Bunnaen [25] had studied the effects of environmental conservation school activities development using Team Work Based Learning (TWBL) for students of Mueng Roi-Et Municipality Schools, Thailand, found that the students had an average score of environmental volunteers higher than the pre-test statistically significance ($p<.05$). And Worawat Chanwirat, Prayoon Wongchantra & Wutthisak Bunnaen [26] had studied the effect of environmental education activities for the developing environment and occupational health in

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School, found that average scores on environmental volunteers at posttest were significantly improved when compared to those at pretest ($p<0.05$).

The analysis of the expansion of growing native vegetables by using waste materials as the planting materials revealed that most participants after joining the activities expanded their knowledge to their parents and school mates. Most items and the overall average of expansion were at a high level. For Item 9 (You recommend your friend to use plastic bottles and other waste to grow vegetables at school) and Item 10 (You can lead other people in reducing waste and recycle the waste at home or school), the expansion levels were at the highest degree. The expansion of knowledge, awareness, and practice after joining activities is part of the environmental process that aims at knowledge and experience sharing with others and changing their behavior. Therefore, after joining the activities, the participants could expand their knowledge, awareness, and practice to their family and school mates and made attempts to change their behavior that is to reuse used items or waste to grow plants. This will in turn, reduce the quantity of waste, elevate awareness and volunteer spirit among the youths, and encourage them to become adults with social and environmental responsibility.

Conclusion

1. This study investigated the promotion of organic agriculture volunteer spirit and growing vegetables from waste materials among primary school students in the vicinity of Mahasarakham University. According to the results of using waste materials as the planting materials, it can be concluded that the floating organic agriculture plot sized 1 x 2 x 0.3 m requires the total organic matter of 70 kg as the planting materials for the area of 2 m2. By experimenting with the growth of 5 plants of 8 vegetable species, the fastest growing and sprouting vegetable was *Kaempferia rotunda L.*, followed by *Limnocharis flava (L.) Buch, Nasturtium officinale, Diplazium esculentum (Retz.) W.,* and *Oenanth javanica (Blume) DC.,* respectively. The slowest growing and sprouting vegetable was *Lasia spinosa (L.) Thwaites.* The organic vegetable plots in the used lockers had a size of 0.32 x 0.42 x 0.45 m, with 18 plots in each locker. The sample were collected from 3 plots of the treatment group and 3 other plots from the controlled group. The controlled plots used soil (100%) as the planting material while the treatment plot used a mixture of materials, including organic matters, decayed leaves, and soil at the ratio of 1:1:1. It was found that each type of vegetables in the treatment plots grew significantly better and had higher dry weight than in the controlled plots.

2. The participants' awareness of growing native vegetables using waste materials as the planting materials for environmental conservation before joining the activities was at the high level for the average item and medium level for some items, and the overall average was at a high level. The participants' awareness of growing native vegetables using waste materials as the planting materials for environmental conservation after joining the activities was at the highest level for most items and a higher level for some items, and the overall average was at the highest level. The highest average was in the attribute of response. Growing vegetables for consumption from waste helps reduce the use of chemicals and minimize the impact of global warming), followed by the attribute of appreciation (15. The training on growing native vegetables from waste materials gives you more knowledge and you can expand the knowledge to your school and family).

The comparison results between participants' awareness of growing native vegetables using waste materials as the planting materials for environmental conservation between before and after the activities using paired t-test showed the statistically significant level of .05.

3. The comparison results between participants' volunteer spirit of growing native vegetables using waste materials as the planting materials for environmental conservation between before and after joining the activities using paired t-test showed the statistically significant level of .05.

Regarding expansion, primary school students near Mahasarakham University participated in the activities to promote volunteer spirit in organic agriculture to conserve the environment and grow vegetables by using waste materials. The organizers monitored them 1 month after the activities regarding the use of waste materials to grow vegetables and expanding their knowledge to their parents and school mates. Most items and the overall average of expansion were at a high level. For Item 9 (You recommend your friend to use plastic bottles and other waste to

grow vegetables at school) and Item 10 (You can lead other people in reducing waste and recycle the waste at home or school), the expansion levels were at the highest degree.

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