



Tropentag 2006  
Prosperity and Poverty in a Globalized World Challenges  
for Agricultural Research

October 11-13, 2006, University of Born, Born, Germany

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## **Valuable added the agricultural waste for farmers using in organic farming groups in Phitsanulok, Thailand**

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### **Abstract**

The royal government of Thailand is very active in efforts to educate farmers in good agricultural practices, organic farming, and sustainable agriculture. This includes an active policy on improved livelihood, education of the rural population, and also reduced pressure environment caused by agricultural production. Group of farmers in Phitsanulok province, Thailand, have grown bananas and produced several products from bananas for widely food used, medicinal used, animal feed and other used etc. Banana peels are become serious environmental problem caused by the bananas production. Utilization of bananas peel for organic fertilizer was studied by Naresuan University, Thailand. Potential of bananas peels to make organic fertilizer and development to commercial were done. Laboratories are in place to test efficiency of the fertilizer was investigated. This project organized several training course for the groups of farmers on “the development of compost manure fertilizer from banana peels”. During these courses the farmers learn to make organic fertilizer from the banana peels. Additional, the farmers learn organic farming is a whole-system approach to optimizing the natural fertility resources of a farm. It works through traditional practices of recycling farm-produced livestock manures, composting, and crop residue management. The training helps the farmers to understand major nutrient content of fertilizer, organic material in their community, soil organisms to break them down to release nutrients, understand how to use technology equipment for commercially and include marketing. The outcome of the project not only reduced cost of using chemical fertilizer but also increased income and strengthening farmers of the organic farming group.

Key word: agricultural waste, banana peels, organic fertilizer, organic farming

### **1. Introduction**

The Thai government supports the development of organic agriculture because of the increasing demands for organic products in the export market. However, shifts in government agricultural policy and in consumer demands in Thailand are needed if farmers across the country are to reap the full benefits possible from converting to non-chemical farming. According to in organic

farming systems do not use toxic chemical pesticides or fertilizers. However, chemical fertilizer is necessary and widely used by the Thai farmer. But rates of chemical fertilizers applied by the farmer is still low than the rate of recommendation due to the high cost of fertilizers that farmer can not afford. Naresuan University concern with demand for organic fertilizer, and have stimulated the driving force in the development of organic agriculture, particularly local farmers in Phitsanulok province, Thailand. The organic fertilizer plays vital role for better production and becomes the alternative source of essential plant nutrients. Therefore, the need for increase crops yield by using organic fertilizer were recommended. Also, the need materials for compost fertilizer were increase used by the farmers. Moreover, the organic wastes were increased and become environmental problem caused by banana peels in the processed food products from the bananas.

## **2. Background and Aim of the study**

Bananas are cultivated widely by smallholders in many parts of Thailand. The total planted area in 2002 is approximately 619,612 hectares (Bansiddhi, K. 2003). There are more than 50 varieties of bananas in Thailand. Kluai Numwa is one of the bananas variety has cultivated by farmers in Phitsanulok particularly variety of “Malee Ong”. Phitsanulok is located in the lower northern region of Thailand. The agriculture sector, especially bananas planting is the major occupation of the people here. They have grown banana and produced several products from bananas for widely food used such as dried banana in commercial. As a result 200 tones of waste from banana peels were generated each day and its trend is increasing. This waste is transported and disposed in municipal landfill. Phitsanulok municipality has tried to increase efficiency of waste management while reducing the amount of waste disposed in the landfill. Thailand government by Provincial Chief Executive Officer in Phitsanulok (CEO) has promoted organic farming and become pilot project in Phitsanulok. The CEO project has responded by Naresuan University where is located in Phitsanulok. Naresuan University has studied by investigating potential of bananas peels to make organic fertilizer and development to commercial. The organic waste from the banana peels is fermented by effective microorganism and molasses and used as Fermented Organic Liquid. The municipality has utilized this liquid as a deodorizer and cleaning liquid. Furthermore this organic liquid can be used as fermented organic liquid fertilizer. It works through traditional practices of recycling farm-produced livestock manures, composting, and crop residue management. Moreover, training courses were setting for the valuable added of agricultural waste from banana peels to the local farmers. To increase the income of the farmers, the project “Organic Farming for Good Health” was launched. The project aimed at reducing the use of chemical substances in agriculture. The outcome of the project not only reduced cost of using chemical fertilizer but also increased income and strengthening farmers of the organic farming group.

## **3. Method**

### **3.1 Farmer Field School**

Farmer Field School is a season-long training activity that takes place in the field. It consists of a group of 20 to 30 farmers in Phitsanulok who have regular (weekly or monthly) meetings during the cropping season. Each meeting includes with a discussion of crop management decisions based on local field problems. One of the problems was agricultural waste from banana peels. The training process is always learner-centered, participatory and relying on an experiential learning approach. It works through traditional practices of recycling farm-produced livestock manures, composting, and crop residue management. The training helps the farmers to understand major nutrient content of fertilizer, organic material in their community, soil

organisms to break them down to release nutrients, understand how to use technology equipment for commercially and include marketing.

### 3.2 Compost Fertilizer

The farmers group were trained the traditional method of fermentation compost fertilization. All of agricultural wastes such as banana peels and livestock manures were collected. Make four layers of compost materials, each layer about 2-3 m width 30-40 cm height and 25 cm thick. A layer of compost material consists of three parts banana peels, one part livestock manure, soils, and molasses, urea spread on top of each other. Stack the layers until the compost heap reaches 1.5 m high. Insert several perforated bamboo poles into compost bed to serve as breathers. The compost piles were fermented under the Sun in 40 to 60 days and were turned every 4 days (Anonymous 2004). The composting process depends on many factors. These factors include temperature, moisture, oxygen, particle size, carbon-to-nitrogen ratio and the frequency and degree of turning (Anonymous 2004). The mature composts were mixed up with clay and molasses before make to granule and become final products of granule fertilizer for using and selling by the farmers group.

### 4. Result and Discussion

The compost fertilizer in granule were analyzed the nutrient content with parameter are shown in table 1 and table 2.

Table 1 Method of parameters analysis in compost fertilizer from banana peels

Parameter	Compost Analysis
1. pH	Compost: Water = 1 : 1 measure with pH Meter
2. Nitrogen (N)	Micro-Kjedahl Method
3. Phospholus (P)	Wet digestion/ Vanadate/ measure with Spectrophotometer
4. Potassium (K)	Wet digestion measure with Atomic Absorption Spectrophotometer
5. Organic matter	Walkley and Black method
6. Organic Carbon	-
7. Electrical Conductivity (EC)	Conductivity meter

Table 2 Analysis of values of nutrient content of compost fertilizer from banana peel composting

Treatments	Nutrient Content of banana peel composting (%)							
	N	P	K	pH	Organic Matter	Organic Carbon	EC (mS/cm)	Moisture
Agricultural wastes and animal manure (ratio)								
banana peels : cattle manure = 100 : 20	1.89	2.92	0.84	7.91	28.43	6.36	9.97	33.51
banana peels : cattle manure : urea = 100 : 20 : 0.2	1.82	2.13	2	8.30	36.81	21.35	9.73	32.87
banana peels : cattle manure : molasses = 100 : 20 : 0.2	2.90	1.51	3.00	8.10	18.43	2.53	6.67	37.79
banana peels	1.69	2.92	0.84	9.91	24.79	10.96	7.91	15.55

All of treatments shown that pH of banana peel composting have trended to be alkalinity but not over than standard level in which of the range 5.5- 8.5 except only the pH of banana peels (9.91) (table 2). Therefore, using these compost fertilizers in the soil with the degree of pH more than 7 are not recommend. Because it may be cause the soil are in less efficiency nutrient of iron and manganese (Anonymous, 2004). However, it can be used in rice paddy field in Phitsanulok because the pH of soils in that area is less than 7 but not recommend for high rate of using. The major nutrients of N, P and K in the treatment of banana peels higher than standard level were 1.69, 2.92 and 0.84 respectively. Mean time the nutrients of N, P and K in all of banana peel composting treatments were high when compare with standard level. The standard of major nutrient content in compost fertilizer have recommended by Ministry of Agriculture and Co-operative, Thailand is N-P-K in range of 1.0-0.5-0.5 respectively (Anonymous, 1993). Also the banana peel composting showed that organic matter, C/N ratio, and moisture were appropriated in range of the standard level. But the electrical conductivity occurred higher than standard. Thus, it can not recommend to be used in young plant directly but should be mixed up with soil in ratio of 1:10 (Anonymous, 1993). Although compost fertilizer is way to achieve fast results in a more natural and environmentally friendly way. Compost fertilizer doesn't have to be used forever, but it can really help a soil badly in need of renewal (Christian *et al.*, 1997). However this project was launched increase the income of the farmers and reduced cost of using chemical fertilizer under the project "Organic Farming for Good Health".

### **Acknowledgement**

The author wish to thank Provincial Chief Executive Officer (CEO) in Phitsanulok, Department of Provincial Administration for providing R&D fund; also I would like to thank the farmers group in Phitsanulok for responding and were training in this project.

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