International Journal of Agricultural Technology 2018 Vol. 14(7): 989-996
Available online http://www.ijat-aatsea.com
ISSN: 2630-0613 (Print) 2630-0192 (Online)

# KMITL organic agriculture model: a review article

**Soytong, K.[1], Poeaim, S.[2*], Pongnak, W.[1], Luenam, L.[3], Poeaim, A.[2], Kuhaswonvetch, S.[3], Poungsuk, P.[4] and Laipasu, P.[5]**

[1]Department of Plant Production Technology, Faculty of Agricultural Technology, [2]Department of Biology, Faculty of Science; [3]Department of Agricultural Development and Resource management, Faculty of Agricultural Technology; [4]Department of Agricultural Education, Faculty of Industrial Education and Technology; [5]Department of Statistics, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand.

Soytong, K., Poeaim, S., Pongnak, W., Luenam, L., Poeaim, A., Kuhaswonvetch, S., Poungsuk, P., and Laipasu, P. (2018). KMITL organic agriculture model:- a review article. International Journal of Agricultural Technology 14(7): 989-996.

**Abstract** KMITL organic agriculture model is established by supporting from King Mongkut's Institute of Technology Ladkrabang (KMITL), Bangkok, Thailand to contribute the research findings of biological products as agricultural inputs to be used for organic agricultutre in practice. It is located at Dan Chang district, Suphanburi province, Thailand. It is to promote the farmers to gain the based knowledge of organic agriculture. KMITL organic model are divided into six parts as follows:- production, agricultural inputs, organic certification, marketing, extension and training as well as research and development. The model is a processes from production to marketing including research findings which necessary to serve the model.

**Keywords:** Agricultural inputs, Organic agriculture, Organic certified, Organic model

## Introduction

Crop production to serve as food for human being has been continued without agrochemicals from generation to generation for thousands of years. The chemical fertilizers are released to the farmers in the mid-19$^{th}$ century that was cheap and rapid response to plants, and chemical pesticides expected to occur for pest eradication as agricultural input in the 1940s. Modern agriculture has been used all agrochemicals both for crop and animal production targeted to increase yield in a short period of time, thereafter the side effects of unbalanced agroecosystem and environmental pollutions as well as cultivated soil become compact, low acidity, low organic matter and almost extinct the beneficial living organism, finally effects to human health. Organic agriculture have come out with many definitions and explanations that still unclear. Some defines as to realize agroecosystem rather than external agricultural inputs, practical

[*]**Corresponding Author:** Poeaim, S.; **Email:** poeaim@hotmail.com

management to maintain soil fertility and prevent diseases and insect pests without synthetic agrochemical application. Other defines as the management system to enhance and stimulate the agroecosystem including biological diversity. This may be accomplished by using agronomic, biological, and mechanical methods, as opposed to using synthetic agrochemicals (FAO/WHO Codex Alimentarius Commission, 1999, Sibounnavong *et al*., 2006).

The definition of our experienced in organic agriculture would be defined as strictly non-agrochemical application for crop and animal production in the farms. The agricultural inputs which certified from research works as biological products for organic agriculture are acceptable applied in organic farms eg. biofertilizers and biopesticides. Other cultural practice in agriculture are combined for organic production like crop rotation, compost production, medicinal plants or herbs for diseases and insect pests protection. The natural inorganic substances products without synthetic chemical in process to be finished products, non-genetically modified organism etc. It concerns in environmental reservation, ecological balance and sustainable development in agro-ecosystem. Agrochemicals have released for agricultural production over 100 years ago. The farmers have been used for crop cultivation year by year. The toxic chemicals residue in agricultural products leading to cause human diseases like heart, high blood pressure and cancer etc.

Organic farming realied for practical cultivation without toxic agrochemical applications that originated in early $20^{th}$ century. It is interested and developed by farmers, scientists and organization which concerns on green manure, composted manure, bone meal, crop rotation, mixed cropping system, biological pest control, insect predators, natural substances (USDA Blog, Organic 101: Allowed and Prohibited Substances. blogs.usda.gov. Retrieved 6 april 2016). Organic agriculture that do not use synthesized chemical fertilizers, chemical pesticide, genetically modified organism that aims to minimize the burden of agricultural production on the environmental protection. International Federation of Organic Agriculture (IFOAM) is established in 1972 and organic methods become internationally recognized and regulated ny many countries and certified organics (Stinner, 2007; Horne *et al*., 2008; Paull, 2010; Gold, 2014).

**KMITL organic model**

KMITL organic agriculture model has just a sample of our experienced full organic agriculture including crop and animal production. It is supported by King Mongkut's Institute Of technology Ladkrabang (KMITL), Bangkok, Thailand to contribute the research findings of biological products as

agricultural inputs to be used for organic agriculture in practice. It located at Dan Chang district, Suphanburi province, Thailand. A model is started from production, agricultural inputs, organic certified, marketing and processing, extension and training, research and development (Figure 1).

## Organic crop production

KMITL organic farm is established in 2018 by commercial scale production. It is a pilot model for organic crop and animal production for delivering to the markets. One of the most important steps in farming is soil improvement in order to crop production. As well as chicken farming in order to organic eggs production.

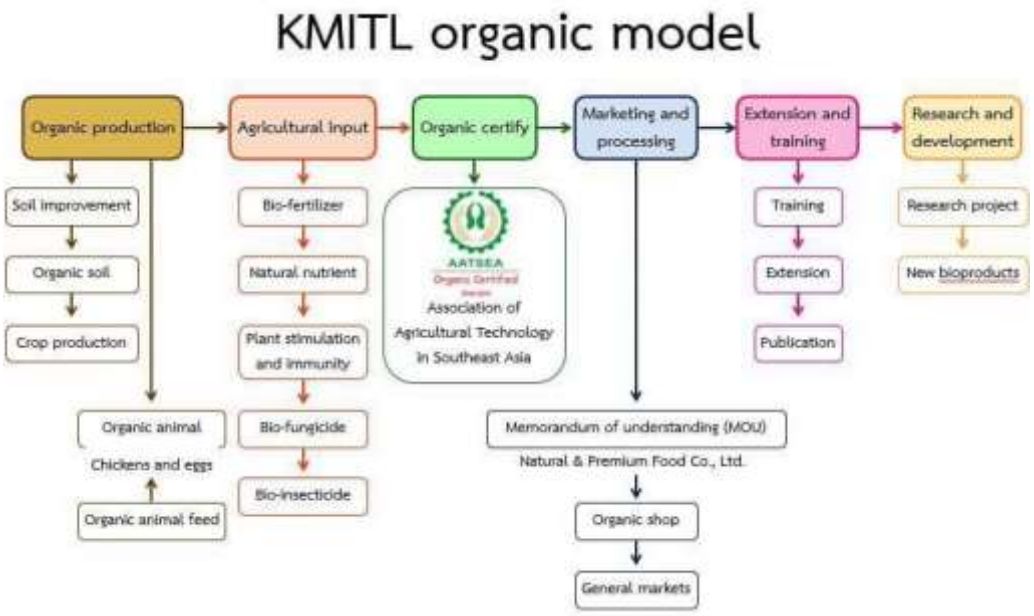


**Figure 1.** KMITL organic model

## Agricultural inputs

Research on development of biological products have been started since 1996 where Soytong and Quimio (1989) reported to found *Chaetomium* sp. effectively antagonized *Pyricularia oryzae* causing rice blast disease. *Chaetomium* spp. have developed as a broad spectrum mycofungicides (Soytong *et al.*, 2001, Natcha *et al.,* 2013). Ketomium is patented and registered as biofungicide and biofertilizer in Thailand, China, Cambodia, Vietnam and

Laos (Song and Soytong, 2017). It consisted of 22 active strains of Chaetomium spp. in combination into one formulation either powder or liquid forms. Ketomium mycofungicide become an unique biofungicide that can be used to control several kinds of plant diseases and tested in many countries (Kanokmedhakul *et al.,* 2006). The other biological products have been gradually released from research finding at Biocontrol Research Unit, Department of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang (KMITL) eg. biodecomposer to produce compost (Soytong and Quyet, 2013; Song and Soytong, 2018), bio-fertilizer, high phosphorus biofertilizer, high potassium biofertilizer (Kaewchai *et al.,* 2009; Phuwiwat and Soytong, 2001, Tann *et al.,* 2012; Sibounnavong *et al.,* 2012; Chulida *et al*., 2016, Boonyanoot *et al.,* 2016), biological nutrients for plant growth, biological insecticide (Aung *et al.,* 2008; Ohnmar *et al*., 2006a,b) and microbial metabolites from *Chaetomium* and *Trichoderma* to control plant disease and induced plant immunity **(**Soytong *et al.,* 2013, Pheaktra *et al*., 2017). The neem seeds extracts for insect protection (Sambo and Okutu, 2010). The insects can be protected by using medicinal or herb repellent plants, plant extracts, used light trap, yellow trap, pheromone without toxic chemicals, and natural sulfur etc. The other techniques are cultural practices, maintained soil pH, mulching, organic amendment, mixed cropping system, crop rotation (Olabiyi *et al.,* 2010). All discovery biological products have been evaluated and used by farmers over 20 years in all over the country and other countries.

**Organic certification**

AATSEA was performed in 9 march 2011 and officially approval on 17 april 2012. We are in a group of scientists in Southeast Asia which leading by Associate Professor Dr. Kasem Soytong who works at Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang (KMITL), Ladkrabang, Bangkok, Thailand.

- ATTSEA organizes internationally recognized research journal in all aspects of agricultural technology and related fields.
- ATTSEA is active in a variety of training programs for agricultural technology, especially organic agriculture and bio-energy.
- AATSEA has also done organic certification in Thailand, Vietnam, Cambodia, Myanmar and Laos. KMITL organic farm has certified by AATSEA for organic agricultural production and processing to the markets since 6 august 2018 (Figure 2).

AATSEA

ORGANIC CERTIFICATION

Association of Agricultural Technology in Southeast Asia (AATSEA)
Country Offices: Thailand, Laos, Cambodia, Vietnam, Myanmar
E-mail: (at.aatsea@gmail.com

Declaration No. 06/2018
Control Code: AATSEA_Organic reg. 004/06

This is to certify on the basis of the controls agricultural inputs without agrochemicals and surrounding environment during organic agricultural production and processing after harvesting for marketing as follows:-Yard Long Bean, Peanuts, Asparagus , Zucchini, Kales, Chinese cabbage, Okra (lady's finger), Morning glory, Papaya, Corn, Rice, Banana, Coconut, Pineapple, Lemon, Acacia, Glazed, Lemon grass, Basil, Chilli, Ginger, Galangal Bergamot, including chickens and eggs.

To KMITL ORGANIC FARM

Farm location's address :-

Moo3 Tambon Ong Phra, Dan Chang District
Supanburi province 72180
Thailand

Certified area is covered for 16 hectares

Observation of organic inspectors have been periodically investigated. The authorization and registration are capable on these organic products in the country of production. The distribution of the organic products is not covered by the present certificate of other company for marketing and this is completely understandable by the requested responsible personality only.

The validity of this declaration is respected of the rules of AATSEA Organic requirements for one year and issued in originally for exclusive use of the person mentioned above.

Issued date: 6 August 2018 Expired date: 5 August 2019

AATSEA
Organic Certified
2018-2019

**Figure 2.** KMITL organic farm has certified by AATSEA

## Marketing

Marketing is very important factor for cultivation thereafter production. KMITL organic model has committed to produce organic vegetables eg. asparagus, bitter cucumber (bitter gourd, bitter melon), luffa or angled gourd, long bean, morning glory, peanut, spinach, sweet potato, sweet corn, okra and some Thai herbs and delivery to the company. It is known which kinds of vegetable would be cultivated and speculation of each plants including the quality, quantity and price. Organic production planning would depend on production order. Our logo of KMITL organic brand design by Thanarak Chantaraprasit, Division of Industrial Design, Faculty of Architecture, KMITL (Figure 3). Moreover, organic shop and home delivery would also be started for marketing promotion.

## Extension and training program

Training program for organic agriculture has organized at KMITL organic farm. A pilot project of transfer technology for KMITL organic agriculture model to expand learning network in the area of KMITL, Dan

Chang campus, Suphanburi province, Thailand has trained the farmers and interesting peoples to gain knowledge based commercial scale of organic agriculture.


**Figure 3.** KMITL organic brand and organic products

## Research develoment

### *Bio-product development*

Application of bioproducts for organic agriculture is evaluated by Kasem Soytong. Phosphorus bio-fertilizer and Potassium bio-fertilizer for organic crop production is investigated by Wattanachai Pongnak and Kasem Soytong. As result, the selected fungi namely: *Aspergillus niger*, *Penicillium* sp., *Chaetomium lucknowense*, Actinomycetes were mixed to sterilize ground rock phosphate and potassium feldspar to produce high phosphorus bio-fertilizer and high potassium bio-fertilizer. Biological control of anthracnose disease on 'Mali-Ong' banana, leaf spot disease on kale cause *Alternaria brassicicola*, stem blight on asparagus, *Colletotrichum capsici* of chilli by *Neosartorya* and *Talaromyces* have conducted by Supattra Poeaim. The development of an insect repellent wood vinegar kiln is investigated by Luepong Luenam.

### *Research on crop improvement*

Effect of plant growth regulator on micropropagation shoot of (*Musa* sp.) cv. Kluai Namwa Mali-Ong is conducted by Anurug Poeaim.

### *Research on transfer technology and extension*

transfer technology for KMITL organic agriculture model to expand learning network in the area of KMITL, Dan Chang campus, Suphanburi

province, Thailand has responsible by Somsak Kuhaswonvetch. Behaviour and consumer demand for organic products in King Mongkut's Institute of Technology Ladkrabang (KMITL) and Ladkrabang district, Bangkok and the development of organic agriculture in school and community have conducted by Pakkapong Poungsuk and Piyanard Junkek. A study of consumer perception and demand for organic products in Thailand is done by Pornchai Laipasu.

Moreover, the organic eggs are demonstrated to poduce by treated organic feed to chickens. The preliminary research on finding the appropriate organic animal feed for chickens are during investigated by Suphalucksana and Soytong (2006), Suphalucksana and Soytong (2017). The research findings are still investigated the potent microorganism for disease control and stimulate plant growth, enzymatic microorganism for ruminant animal and for poutry.

## Acknowledgement

This work was financially supported by King Mongkut's Institute of Technology Ladkrabang (KMITL) (grant number A118-0261-010).

## References

Aung, O. M., Kang, J. C., Liang, Z. Q., Soytong, K. and Hyde, K. D. (2006a). *Cordyceps nrciensis* sp. Nov from a spider in Thailand. Mycotaxon. 97:235-240.

Aung, O. M., Kang, J. C., Liang, Z. Q., Soytong, K. and Hyde, K. D. (2006b). A new entomopathogenic species, *Hymenostilbe furcata*, parasitic on a hemiptera nymph in northern Thailand. Mycotaxon. 97:235-240.

Aung, O. M., Soytong, K. and Hyde, K. D. (2008). Diversity of entomopathogenic fungi in rainforests of Chiang Mai Province, Thailand. Fungal Diversity. 30:15-22.

Chaiyosang, B., Kanokmedhakul, K., Boonmak, J., Youngme, S., Kukongviriyapan, V., Soytong, K. and Kanokmedhakul, S. (2016). A new lumazine peptide penilumamide E from the fungus *Aspergillus terreus.* Natural Product Research. 30:1017-1024.

Gold, M. (2014). What is organic production. National Agricultural Library. USDA. Retrieved 1 March 2014.

Hemtasin, C., Kanokmedhakul, S., Moosophon, P., Soytong, K. and Kanokmedhakul, K. (2016). Bioactive azaphilones from the fungus *Penicillium multicolor* CM01. Phytochemistry Letters. 16:56-60.

Horne, P. A. (2008). Integrated pest management for crops and pastures. CSIRO Publishing. p. 2.

Kaewchai, S., Soytong, K. and Hyde, K. D. (2009). Mycofungicides and fungal biofertilizers. Fungal Diversity. 38:25-50.

Kanokmedhakul, S., Kanokmedhakul, K., Nasomjai, P., Loungsysouphanh, S., Soytong, K., Isobe, M., Kongsaeree, P., Prabpai, S. and Suksamrarn, A. (2006). Antifungal azaphilones from the fungus, *Chaetomium cupreum* CC3003. Journal of Natural Products. 69:891-895.

Olabiyi, T. I., Harris, P. J. C., Atungwu, J. J. and Rosenfeld, A. (2010). Assessment of crop rotation and soil fertility building schemes in selected organic farms in England. International Journal of Organic Agriculture Research and Development. 1:38-51.

Panthama, N., Kanokmedhakul, S., Kanokmedhakul, K. and Soytong, K. (2015). Chemical constituents from the fungus *Chaetomium cupreum* RY202. Archives of Pharmacal Research. 38:585-90.

Paull, J. (2010). From France to the world: The International Federation of Organic Agriculture Movements (IFOAM). Journal of Social Research and Policy. 1:93-102.

Phal, P., Waingsamut, B. and Soytong, K. (2017). Evaluation of agricultural inputs for cultivation organic asparagus in the field. International Journal of Agricultural Technology. 13:893-906.

Phuwiwat, W. and Soytong, K. (2001). The effect of *Penicillium notatum* on plant growth. Fungal Diversity. 8:143-148.

Sambo, B. E. and Okutu, P. C. (2010). Effects of neem extract on insect pest complex of grapevine (*Vitis vinifera* L.) International Journal of Organic Agriculture Research and Development. 1:53-65.

Sibounnavong, P., Sysouphanthong, P., Xay Ly, Phoutasay, P., Promrin, K., Pongnak, W. and Soytong, K. (2006). Application of biological products for organic crop production of kangkong (*Ipomoea aquatica*). International Journal of Agricultural Technology. 2:177-189.

Sibounnavong, P. S., Utthajadee, A., Makhonpas, C. and Soytong, K. (2012). Efficacy test for good agricultural practice, pesticide-free production and organic agriculture in tomato. Journal of Agricultural Technology. 8:363-376.

Song, J. J and Soytong, K. (2017). *Chaetomium* spp. as biological fertilizer for plant growth. International Journal of Agricultural Technology. 13:941-951.

Song, J. J. and Soytong, K. (2018). Research and development on bio-products in China. International Journal of Agricultural Technology. 14:131-141.

Soytong, K., Kanokmedhakul, S., Kukongviriyapa, V. and Isobe, M. (2001). Application of *Chaetomium* species (Ketomium) as a new broad spectrum biological fungicide for plant disease control: A review article. Fugal Diversity. 7:1-15.

Soytong, K. and Quyet, N. T. (2013). Production of organic compost from mushroom producing substances waste and tested for Kangkong organic cultivation. Journal of Agricultural Technology. 9:115-123.

Soytong, K., Charoenporn, C. and Kanokmedhakul, S. (2013). Evaluation of microbial elicitors to induce plant immunity for tomato wilt. African Journal of Microbiology Research. 7:1993-2000.

Stinner, D. H. (2007). The science of organic farming. In: William Lockeretz. Organic farming: An International History. Oxfordshire, UK & Cambridge, Massachusetts: CAB International (CABI). ISBN 978-1-84593-289-3. Retrieved 30 April 2013.

Suphalucksana, W. and Soytong, K. (2006). Significance of *Chaetomium cupreum* for ruminant nutrition improvement through biodegradation. International Journal of Agricultural Technology. 2:155-163.

Suphalucksana, W. and Soytong, K. (2017). Lactic acid bacteria and enzyme production in silage of guinea grass (*Panicum maximum*). Bulgarian Journal of Agricultural Science. 23:86-91.

Tann, H., Makhonpas, C., Utthajadee, A. and Soytong, K. (2012). Effect of good agricultural practice and organic methods on rice cultivation under the system of rice intensification in Cambodia. Journal of Agricultural Technology. 8: 289-303.

(Received: 25 August 2018, accepted: 31 October 2018)