

Status of Food Safety and Food Security in Thailand: “Thai’s Kitchen to the World”

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The world population is expected to reach anywhere between 6.8 and 9.1 billion by 2050, creating a growing demand for food. Thus, Thailand exports food products throughout the world and we are just as concern as many other people are around the world about “Food Quality and Safety”. By investigating agricultural products, Thai’s government has requested that farmers and exporters understand the procedures of Good Agricultural Practices (GAP), the processes for food in Hazard Analysis and Critical Control Point (HACCP) and Good Manufacturing Practices (GMP) to minimize contaminated food products. Thailand is a world leader in growing safe food products and this gives Thailand the best opportunity to become the “Kitchen to the World” and support the Thai’s National Strategy for food production “From Farm to Table” principles. Kasetsart University and other associated universities throughout Asia have implemented programs for dissemination of technological information and exchange of ideas to help develop the versatility of agriculture for solving agricultural problems in Thailand and Asia. These programs also provided procedural information and opportunities for farmers in the Central Plains of Thailand as case studies for producing safe vegetables for both international and domestic markets. Thailand, as many other countries has challenges with food security and safe production including but not limited to: 1) failure of leaders to attract a new generation of farmers; 2) combating food contamination; 3) low quality food nutrition; 4) adaptation of pests in agriculture production to combat agriculture pest problems; 5) changes in market shares between food and non-food production (bio-fuel); 6) training of farmers and scientists; 7) education of farmers and scientists; and last but not least, 8) eradication of poor agricultural practices. These are the essential tools for constructing, maintaining and improving food safety and secure production in Thailand. In short, we all as educators, scientists, government officials, corporations and their representatives, down to the individual farmers need to do our part to ensure food safety and security for our countries and for the rest of the world. As I have stated, Thailand is striving to become the “Kitchen to the World” and that is our continuing goal.

Key words: Food safety, Food security, Kitchen to the world, Safe vegetable production, Sufficiency economy

Introduction

Thailand is known as “The Food Basket of Asia” since rice, vegetables, tropical fruits, poultry and livestock are cultivated abundantly in all parts of the country. Attention is needed to educate farmers in linking food security and safe food production. Knowledge of the current status can be a key in developing Education for Sustainable Development (ESD) programs on food production. In addition, people all around the world are concerned

with their health and there is an increasing demand for higher quality diet foods (FAO, 2008). Therefore, Thailand’s agricultural production for the 21st century faces a daunting task of satisfying the increasing demand for quality foods while still respecting the ever increasing global food standards. These various food control activities are undertaken by several organizations as listed below. The development of national GAP is driven by the government, in particular by the Ministry of Agriculture and Cooperative (MOAC). The most im-

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portant regulatory farming systems, which we must comply with to enter the domestic and international markets, are the regulation of farming systems such as integrated farming, natural farming, agroforestry, GAP, organic farming and the “New Theory” of His Majesty King Bhumibol Adulyadej of Thailand on managing agricultural lands for villager’s (food safety and security). Farmers who fulfill these requirements of the national GAP program can label their products with the GAP logo: the “Q” mark after certified by accredited certification body or government certification. In addition, a regional GAP program in the western part of Thailand has developed Thai GAP standards by the using Global GAP Standards. For the processing of agriculture food products, HACCP and GMP are increasingly important in such, the Ministry of Public Health is designed by law as responsible for (legal) food control operations with the support of food analytical services. This guarantees that the quality and safety of food production in Thailand will exceed the highest standards of agricultural production.

In this paper, I briefly discuss the programs implemented for dissemination of technological information and exchange to develop the versatility of agriculture to solve problems in Thailand. I review the procedural information and opportunities for new and old generations of farmers as case studies to produce vegetables for both international and domestic markets and examine food safety and security.

1. Thai’s Policy for Food Production

Thailand is an agriculture based country that not only produces agricultural products, but also is concerned with food safety standards. Unsafe food does not only affect consumer’s health, but also can lead to great economic impacts on every country. Presently, consumers’ awareness on food safety is increasing with pathogenic microbial and chemical contamination in the food chain and impacts on health from some advanced technologies, e.g. genetic modification food, genetic engineering products and food irradiation. Therefore, the most essential concerns are the consumers’ confidence in food safety. The major causes of unsafe foods include: 1) physical hazards - filth from unhygienic production and transportation, such as gravel,

debris, glass, etc.; 2) chemical hazards - toxic chemicals in foods, such as heavy metals, hazardous chemicals from soil, water, food containers, pesticides and some prohibited food additives and veterinary medicines; and last but not least 3) microbiological hazards and pathogenic microorganisms such as *Samonella spp.*, *Shigella spp.*, *E. coli* O157: H7, *Listeria monocytogenes*, etc. Microbial agents and chemical contaminants, including other hazards that may make food inconsumable for consumers, are of public concern (globally) and increase the incidence of food borne diseases. Food borne diseases are caused by various pathogenic microorganisms (Fig. 1). The World Health Organization (1999) reported the incidence of raising awareness on food safety and food borne diseases worldwide has revealed that 8.4 billion people do not have accesses to quality food and up to 30% of people suffer from food borne illnesses every year. The rate of acute diarrhea worldwide is approximately 1.5 billion people per year. Biological contamination has been reported to cause 70% of food borne diseases. In addition, developing countries indicate the incidence of food borne diseases may be 300 to 500 times higher than the reported cases worldwide (The World Health Organization, 1999). It has been estimated that approximately 150 million children under the age of 5 suffer from diarrhea and over 3 million die.

To reduce food quality and safety concerns, the Thai government has implemented a food safety policy to ensure strict food safety monitoring and control system in the country by focusing on food production and processing throughout the food chain (“From-Farm-To-Table” or “From-Farm-To-Forks”). All stakeholders from both govern-

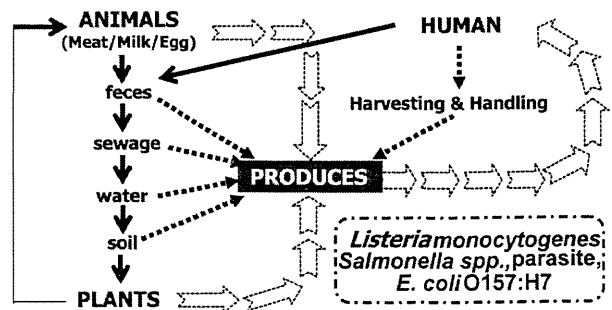


Fig. 1. Microorganisms that contaminate food and cause products to be unsafe.

mental and private sectors must be responsible for tracing unsafe foods and installing safety control measures to keep high quality standards and meet the international food quality and standard levels. This is the ultimate goal for consumer protection and international food trade. In Thailand, this standard is controlled by the Ministry of Agriculture and Cooperative, and the Ministry of Public Health has set up a list of strategies for food safety.

- The 1st strategy is the need for qualified personnel, equipment and management to detect contaminants in food and raw materials during import and export, including scientific information and risk assessment.
- The 2nd strategy is to encourage scientific education and training to assist farmers in using Good Agricultural Practices (GAP).
- The 3rd strategy is to educate factory workers and contractors to understand the standards and requirements of both domestic and international markets.
- The 4th strategy is to increase the ability to detect food contamination before it gets to the customers (both domestic and international markets).
- The 5th strategy is the need for specialized researchers to understand different countries trade barriers and specific standard.

Therefore, the most essential concern is the confidence of consumers in food safety and agricultural products.

2. Case Studies for Producing Safe Vegetables in Thailand

Vegetables are grown as cash crops for household consumption, local markets and (increasing) export by Thai farmers in all regions of the country. Strategically located in a rich tropical zone, Thailand has the advantage of biodiversity with hundreds of edible plant varieties. Data on vegetable production show that products are available in three main categories: fresh products, processed vegetable products and seeds products. For export, products are shipped as fresh produce or vegetables processed as dried, pickled, canned and frozen. About 39 varieties of vegetables are fed into 136 factories to be processed for export. During the period from 1999 to 2007, an average export volume of 1,507,595 Metric tons each year was ac-

hieved, with a value of about 31,224.6 baht or just less than 97.5 million USD (Office of Agricultural Economics, 2009). However, smallholder farmers in Thailand often become trapped in a cycle of ever-higher chemical input use with lower productivity and profitability that reduces sustainability of the natural resource base. Today, the opportunity for Thailand to become "Kitchen to the World" is a strategy for Thailand because of the vast abundance of food products that are available to consumers worldwide. To support Thai's national goal in promoting Thailand as a world leader in safe food production with high value quality products, the Faculty of Agriculture, Kasetsart University along with other universities has implemented programs for dissemination of innovative technological information, technology exchange to help develop versatility, and constant information for agriculturists in Thailand. Small villages at Nonthaburi Province, Central Thailand are used for case studies to develop safe vegetable production. This project is funded by the National Innovation Agency, Thailand since 2009. The overall objective of safe vegetable production is to reduce and stop the use of pesticides and chemical fertilizers, while conducting chemical residue testing of products before they go to customers in both the domestic and international markets, as well as assisting in the development of economically viable vegetable production systems without compromising the natural resource base. Achieving these goals will improve technologies for tropical vegetable crop production that were developed using a combination of on-the-farm testing and training to incorporate Education for Sustainable Development (ESD) procedures for the cooperative farmers.

The training program for farmers is presented in Figure 2. This model points out the challenges for food safety and agricultural production and reveals how ESD plays an important role in education for farmers. This procedure, improves the sustainable society and livelihood for the cooperative farmers. Farmers have many good opportunities to control the vegetable market in some degree by cooperating. Farmers can increase their sales volumes by linking with vegetable processors and professional domestic suppliers. This requires farmers to enlarge production and produce specific varieties and quality products needed by international and do-

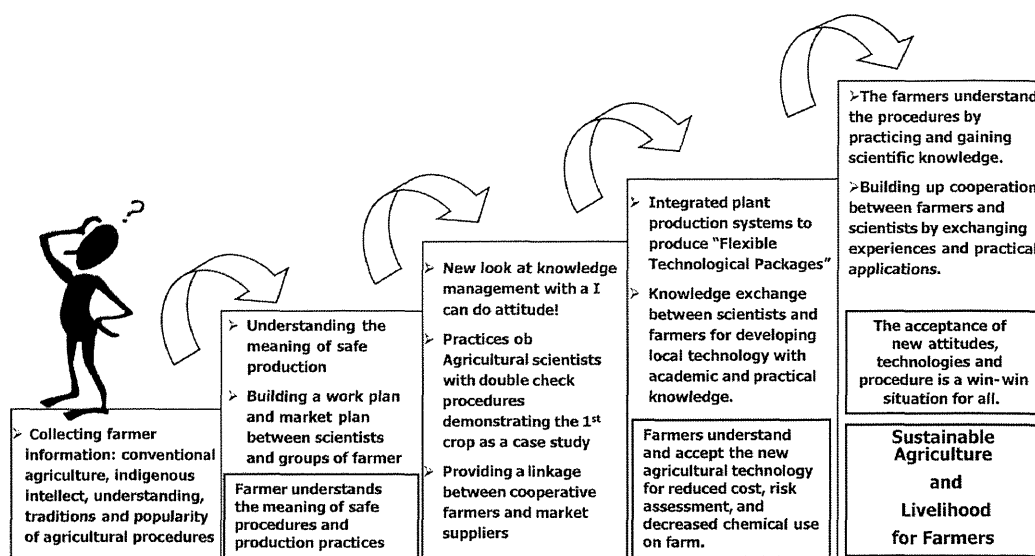


Fig. 2. Training procedures for farmers to step through to Education for Sustainable Development (ESD).

mestic markets. The main strategies for the farmers using ESD are as follows: 1) encourage the farmers to understand and pay more attention to safe production and vegetable quality; 2) set up farmer cooperatives; 3) set up cooperations between farmers and suppliers, and increase cooperation between farmers and scientists to incorporate integrated plant production systems to produce "Flexibility Technology Packages" (within this step); 4) farmers understand and accept the new agricultural technology for reducing costs; and 5) risk assessment and decreased chemicals used on the farms. In addition, groups of farmers have taken the platform to stabilize long-term cooperative relationships between groups of farmers and suppliers to negotiation a sustainable income for their family's livelihood. This is a win-win situation for all.

3. Food Security Challenges in Thailand

Thailand, as many other countries, has challenges with food security and safe production. In order to meet these challenges, the main principles are to respect one another, ensure equity among farmers and support organizations such as universities and government agencies (the following aspects should be considered):

1) The failure of leaders to attract a new generation of farmers: The economy of Thailand is an

emerging economy which is heavily export-dependent, with exports accounting for more than two thirds of gross domestic production (GDP) (Bank of Thailand, 2008). Most of Thailand's labor force works in agriculture. In addition, the relative contribution of agriculture to the GDP has declined while exports of goods and services have increased. The future of Thailand may not be the world's leading exporter or a major exporter of agricultural products, if we fail to attract a new generation of farmers. The data from the Institute for Population and Social Research, Mahidol University (2005) shows the decline in agriculturist careers over the past 40–50 years (Fig. 3). This is becoming a serious situation for Thailand's future agri-

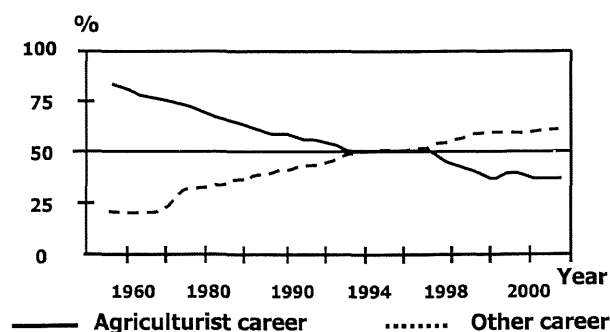


Fig. 3. Survey of employment and occupational mobility in Thailand from 1955-2008.

cultural production. Action plans to attract a new generation to work in the agricultural fields were distributed by the Faculty of Agriculture, Kasetsart University (KU) and KU-Alumni Organization to build a "Inheritance of Agri-Business" project. The goal of the project is to discover new ways to develop student interest in agriculture-related fields. The main strategies are to encourage the younger generation through new knowledge management to understand science technology and use this information for business management following the Deming Cycle (plan-do-check-action). This is done by developing a new attitude about the value of the agriculture sector and future of agricultural business (Agri-business) that provides food for the world population and this is a first class career.

2) To combat food contamination and food with low quality nutrition: Thailand is a major food supply country yet unsafe food products and malnutrition still exist amongst the population. Food production in itself is not enough to cope with the mounting challenges of feeding people. Thailand has significant challenges to improve the social welfare system and has achieved a dramatic reduction in malnutrition of pre-school children. Also, the production process is closely monitored by the Department of Agriculture under the Ministry of Agriculture and Cooperatives: GAP, including packing house facilities, must conform to GMP and HACCP requirements by the Food Safety Operation, Ministry of Public Health guaranteeing that the chemical residues are under the Maximum Residual Limits (MRLs) for detected chemicals, pathogenic microorganisms and pathogenic toxins. The officers of the Department of Agriculture and the Food Safety Operation must make a random sample to check the produce before a certificate can be issued. The products are tested for essential quality and analyzed for toxicity, contaminants or other dangerous residues. Products that meet the approvable can be labeled with the "Q" mark and Food Safety Label (Fig. 4). The Knowledge Network Institute of Thailand (2005) has conducted many studies and surveys on standards for combating food contamination and low quality food. The results of technological advances and elaborate scientific procedures in plant protection have been successfully introduced into Thai agricultural exports, because of high standards for hygiene and



Fig. 4. Standards of quality and hygiene in nationally accredited programs such as the Q Mark from the Ministry of Agriculture and Cooperative and Food Safety Labels from the Ministry of Publish Health demonstrate an ongoing commitment to excellence.

safety set by importing countries. Thai agricultural exports, with their high quality standards, enter the world market with full confidence, reassuring consumers of safety and quality.

3) The adaptation of pests in agriculture production to combat agriculture pest problems: Thailand has implemented programs for dissemination of innovative technological information to help develop a versatility and problem solving system for farmers, such as pest control (Paranakian, 1997; Tanticharoen, 2004) by elements found in nature, crop rotation, selection of chemicals with minimum side effects and biological control of pests that relies on predation, parasitism, herbivores or other natural mechanisms. These are important components of integrated pest management (IPM) programs to support the national goal of promoting Thailand as a world leader in the production of safe, high value and quality agricultural products. For long-term solutions in public interests, university, private sectors, scientists must conduct research with the farmers input, and base developments on studies and indigenous experiences to produce a flexible technological package that is suitable for farmers to use in their farms.

4) Changes in market shares between food and non-food production (bio-fuel): The energy supply needs of Thailand are predicted to increase from 7.4 million tons in 2003 to 258 million tons by 2030 (Office of the National Economics and Social Development Board, 2008). To face this increasing

demand, Thailand must produce more energy from its own resources, more specifically renewable sources. Types of renewable energy resources include hydroenergy, tidal energy, wind energy, solar energy, geothermal energy and biomass energy. Thailand has a high potential for energy production from biomass because Thailand is an agriculture-based country. Similar to other renewable energy sources, the use of biomass for production of electricity does not contribute to an increase in the overall concentrations of carbon dioxide (CO₂) in the atmosphere. Therefore, by theory the use of bio-energy will reduce global warming, but the increasing demand for bio-fuel is causing a major fundamental change in agricultural markets that could drive up the world prices for many farm products not limited to maize, sugarcane, cassava, palm oil and soy bean. Food prices have risen sharply over the past years and bio-fuels may be partly the cause of this increase. A key factor being the subsidized production of bio-fuels in under develops and developing countries even with the current oil prices not competitive at the present time. It seems that biomass is a very attractive option for both the chemical industry and for energy. However, if the resources are sustainable, where is the foundation for the future bio-based economy? As bio-energy demands increase, agriculture also has to provide consumable food for the ever increasing population along with economic growth. Linkages between bio-energy and food security are complex to say the very least. On the one hand, biomass production competes with food production for land and other agricultural production factors. Biomass production may contribute to rural development, for example increasing local employment and energy supply. Therefore, implementing bio-energy production in developing countries can lead to either an improvement or deterioration in the food security conditions. The impacts of bio-energy developments for food security depend on many factors that are specific to each country and are case by case for each country. Examples of these factors include the type of biomass used, the type of energy produced, and the type of land for biomass production, as well as developments in agricultural management and developments in the global food markets. However, the final solution is to increase productivity and yield of agricultural products by

using agricultural science technologies, which include new varieties, fertilization, irrigation, and cultivation systems. In addition, studies on land potential and quality, along with climate, water supplies, farm management and land-use change patterns are needed to help identify the potential biomass a country can produce. The cost of biomass production, economic potential, regional and national household-level consequences on food security would then need to be further examined to provide policymakers with a national basis to make decisions on bio-energy schemes.

5) Training, education and eradication of poor agricultural practices: It is also necessary to pay attention to the benefit of farmers and communities under the new paradigm, which addresses self-reliance, justice, dignity of farmers and local communities. The Philosophy of Sufficiency Economy bestowed by His Majesty the King Bhumibol Adulyadej guides Thailand's development policies, including the 10th National Economic and Social Development Plan to be implemented from 2007 to 2011 (Chulanont, 2007). The Philosophy intends to lead to a balanced life without excess. It has three components, namely moderation, reasonableness and the need to have a self-immune system. It also involves knowledge and integrity such as principles applicable to everyone at all levels from the individual to the community to the national level. The Royal Thai Government cooperated with the United Nations Development Program to launch the Thailand Human Development Report 2007, with the theme of "Sufficiency Economy and Human Development". The report highlighted a number of key messages about Sufficiency Economy. For example, the report stressed the philosophy's relevance to alleviating poverty and reducing the economic vulnerability of the poor. It also emphasized the potential means for community empowerment and the strengthening of communities as foundations of the local economy, as well as its role in guiding macro-economic policy making to immunize the country against shocks and to plan strategies for more equitable and sustainable growth. Through the promotion of social justice contentment, and creation of balance between social and ethical norms, the philosophy also perfectly dovetails with the efforts of the Royal Thai Government to address the challenges of income

inequality. Over the past 2 decades, Thailand has made great strides in reducing poverty, enabling Thailand to meet and even surpass the UN Millennium Development Goals (MDGs). However, many disparities still remain within groups as well as among different regions of the country. Our pro-poor and anti-poverty policies are therefore intended to address this great divide through promoting community development and housing for the poor as well as income generation and savings strategies.

The National Office of Socio-Economics tries to improve the quality of life for poor farmers living in rural areas by enhancing self-reliance and creating opportunities to improve the local economy with the aim to modernize a society with a knowledge-based economy. The Office of Agriculture Economics (2009) reported the factors that affect the impoverished farmers' income are plot size, size of farms, size of loans, operating costs, size of irrigation area, manpower, employees and the number of trained family members that apply new knowledge to their farming techniques. The philosophy of His Majesty's "New Theory" on Managing Agricultural Land is one way to enable the people to have enough food. The concept is "**do not put all your eggs into one basket**". In agricultural terms, monoculture farming is too risky, it is wise to diversify your farming, then your livelihood is not based on one crop, an integrated farming system is the answer for risk management. The farmers won't become rich but they will have sufficient food and won't go hungry under the Sufficiency Economy. The incorporation of the "New Theory" in the development of a family's agricultural land, which in Thailand averages 10–15 rai (1.6–2.4 hectare) per household, should be divided into a 30–30–30–10 strategy (Royal Development Projects Broad, 1997). Step one: use thirty per cent of the land for a water reservoir. This should be water that the farmers can use to irrigate their crops throughout the year. The farmer can also raise fish, aquatic plants and crops around the reservoir as other ways to earn additional household income. Step two: sixty per cent of the land used for agriculture is divided into two parts; 30 per cent for rice cultivation and 30 per cent for field or horticultural crops depending on local conditions and the market. Step three: the final ten per cent, a little over one rai

(0.16 hectare), is used for housing, trails and walkways, dikes, and also for growing household vegetables and raising livestock. His Majesty's "New Theory" the initiatives for agricultural development has the following strong points:

- This method can be used by small landholders that own about 15 rai (2.4 hectares; the average for Thailand)
- This method is for farmers already living frugally to be self-sufficient and to make the lives of these local farmers harmonious.
- This method is for self-sufficiency and the farmers can produce enough rice for their annual needs. The agricultural products that are exceed the demand of the family will go to the market and provide another way to earn household income.

The Sufficiency Economy Philosophy is of great relevance to Thailand. At the community level in particular, the principles are fundamental to empowerment and to building resilience through creating immunity to enable communities to face challenges in the age of globalization. Thailand does believe that other countries can also draw much benefit from these principles. Listed above are the essential tools that play an important role in constructing, maintaining and improving secure food production in Thailand.

4. Thailand's Opportunities to Become "Kitchen to the World"

Agriculture is the principal occupation in Thailand because it employs over half of Thai's population with half of this population being rice farmers (the backbone of the nation). The farmers grow rice to feed the entire population and export the rest to feed millions around the world. Other cash crops that make up the agricultural economy include sugarcane, maize, cassava, an immense variety of fruits, animals and seafood products. Thailand is thus considered as one of the world's important food exporting countries. Demand for food by the world population is fast growing with limitless expansion of the consumer market. Thailand is able to produce food sufficient to meet the domestic demands as well as enough to export to other countries. Thailand exported approximately 32 billion US dollars of products during the year 2008 (Office of Agricultural Economics, 2009). The

Table 1. Total exports and value of agriculture products from 2005–2008

Year	Export quantity (Metric tons)	Export value	
		Billion USD	Billion Bath
2005	24,556,045	19.57	626.25
2006	25,859,491	23.41	749.04
2007	31,614,855	26.10	835.28
2008	30,873,845	31.94	1,022.22

export value of agricultural products from Thailand has been increasing year by year as shown in Table 1. According to data supplied by the National Food Institute, Thailand (2003), the main groups of food exports are fishery products (34.05%), cereal grains and cereal products (19.95%), meat and poultry products (10.49%), fruits, vegetables and products (11.22%), sugar and confectioneries (9.27%), animal feed (5.52%) and others (9.50%). The major countries to which Thailand exports are Japan (20.75%), United States (17.41%), China (3.70%), Hong Kong (3.08%), EU (12.23%), ASEAN (15.99%), Africa (5.71%), Middle East (5.04%) and others (16.09%).

Thailand has successfully utilized innovations of scientific agricultural research and technology to develop a vibrant and dynamic agricultural sector. Both public and private investments in agricultural research and development have boosted significant impacts in yield increase and land productivity providing a competitive edge for the export of Thai's food and agricultural products into global markets. The new focus of agriculture is toward growing health concerns among consumers as well as environmental awareness. The new movement gives rise to chemical-free cultivation that helps to protect farmers from exposure to pesticides and to improve the ecological conditions in the agricultural fields. Farm productivity has significantly increased and the quality of Thai's foods and agricultural products has also been enhanced in terms of hygienic standards. Farmers can save energy and reduce costs for crop production and are rewarded by chemical-free products produced in larger quan-

ties that are in high demand in both domestic and international markets. In short, we all as educators, scientists, government officials, corporations, even the individual farmers need to do our part to ensure food safety and security for our countries and for the rest of the world. As I have stated, Thailand becoming "Kitchen to the World" is our expanding goal.

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